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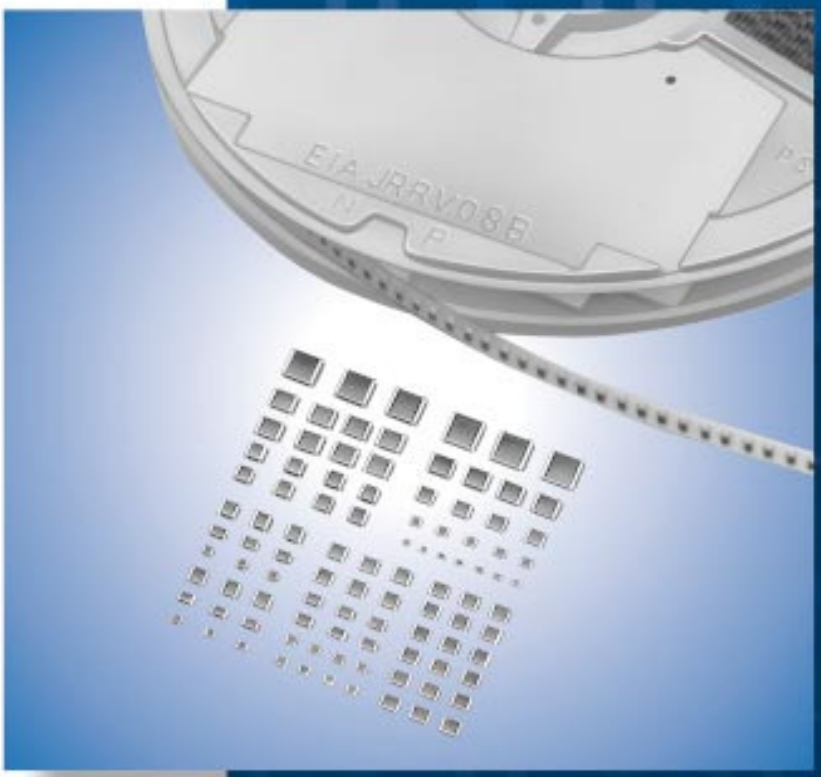
Chip Monolithic Ceramic Capacitors



muRata Innovator in Electronics

Murata Manufacturing Co., Ltd.

Cat.No.C02E-15

CONTENTS

Part Numbering — 2
Selection Guide — 7
1 **for General Purpose GRM Series** — 8
1 Specifications and Test Methods — 51
●GRM Series Data — 60
2 **Capacitor Array GNM Series** — 63
2 Specifications and Test Methods — 68
3 **Low ESL LLL/LLA/LLM Series** — 74
3 Specifications and Test Methods — 81
4 **High-Q Type GJM Series** — 85
4 Specifications and Test Methods — 95
5 **High Frequency GQM Series** — 98
5 Specifications and Test Methods — 105
●GQM Series Data — 108
6 **High Frequency Type ERB Series** — 109
6 Specifications and Test Methods — 116
●ERB Series Data — 119
7 **Monolithic Microchip GMA Series** — 121
7 Specifications and Test Methods — 123
8 **for Bonding GMD Series** — 127
8 Specifications and Test Methods — 132
Package — 136
⚠Caution — 140
Notice — 152
Reference Data — 159
9 **Medium Voltage Low Dissipation Factor** — 166
10 **Medium Voltage High Capacitance for General Use** — 171
11 **Only for LCD Backlight Inverter Circuit** — 176
12 **Only for Information Devices** — 179

13 **Only for Camera Flash Circuit** 183
14 **AC250V (r.m.s.) Type (Which Meet Japanese Law)** 187
15 **Safety Standard Recognized Type GC (UL, IEC60384-14 Class X1/Y2)** 191
16 **Safety Standard Recognized Type GD (IEC60384-14 Class Y3)** 192
17 **Safety Standard Recognized Type GF (IEC60384-14 Class Y2, X1/Y2)** 193
18 **Safety Standard Recognized Type GB (IEC60384-14 Class X2)** 195
GA3 Series Specifications and Test Methods 196
GRM/GR4/GR7/GA2/GA3 Series Data (Typical Example) 200
Package 203
⚠Caution 206
Notice 214
ISO 9001 Certifications 217

● Please refer to "Specifications and Test Methods" at the end of each chapter of 9 – 14 .

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	D
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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Continued from the preceding page.

❺Temperature Characteristics

Temperature Characteristic Codes			Temperature Characteristics			Operating Temperature Range
Code	Public STD Code		Reference 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 *6	-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	*3	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
W0	-	-	25°C	-55 to 125°C	±10% *4 +22, -33% *5	-55 to 125°C

*1 Please refer to table for Capacitance Change under reference temperature.
*2 Capacitance change is specified with 50% rated voltage applied.
*3 Murata Temperature Characteristic Code.
*4 Apply DC350V bias.
*5 No DC bias.
*6 Rated Voltage 100Vdc max : 25 to 85°C

Continued on the following page.

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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

Continued on the following page.

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❻Rated Voltage

Code	Rated Voltage
0E	DC2.5V
0G	DC4V
0J	DC6.3V
1A	DC10V
1C	DC16V
1E	DC25V
YA	DC35V
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 Step and E24 Series
			ERB	≦9.9pF	1pF Step and E24 Series
C	±0.25pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
		except CΔ	**GRM**	≦5pF	*1pF
		CΔ	**ERB**	≦9.9pF	1pF Step and E24 Series
			GQM	≦1pF	0.1pF
				1.1 to 9.9pF	1pF Step 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 Step 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	
		COG	**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

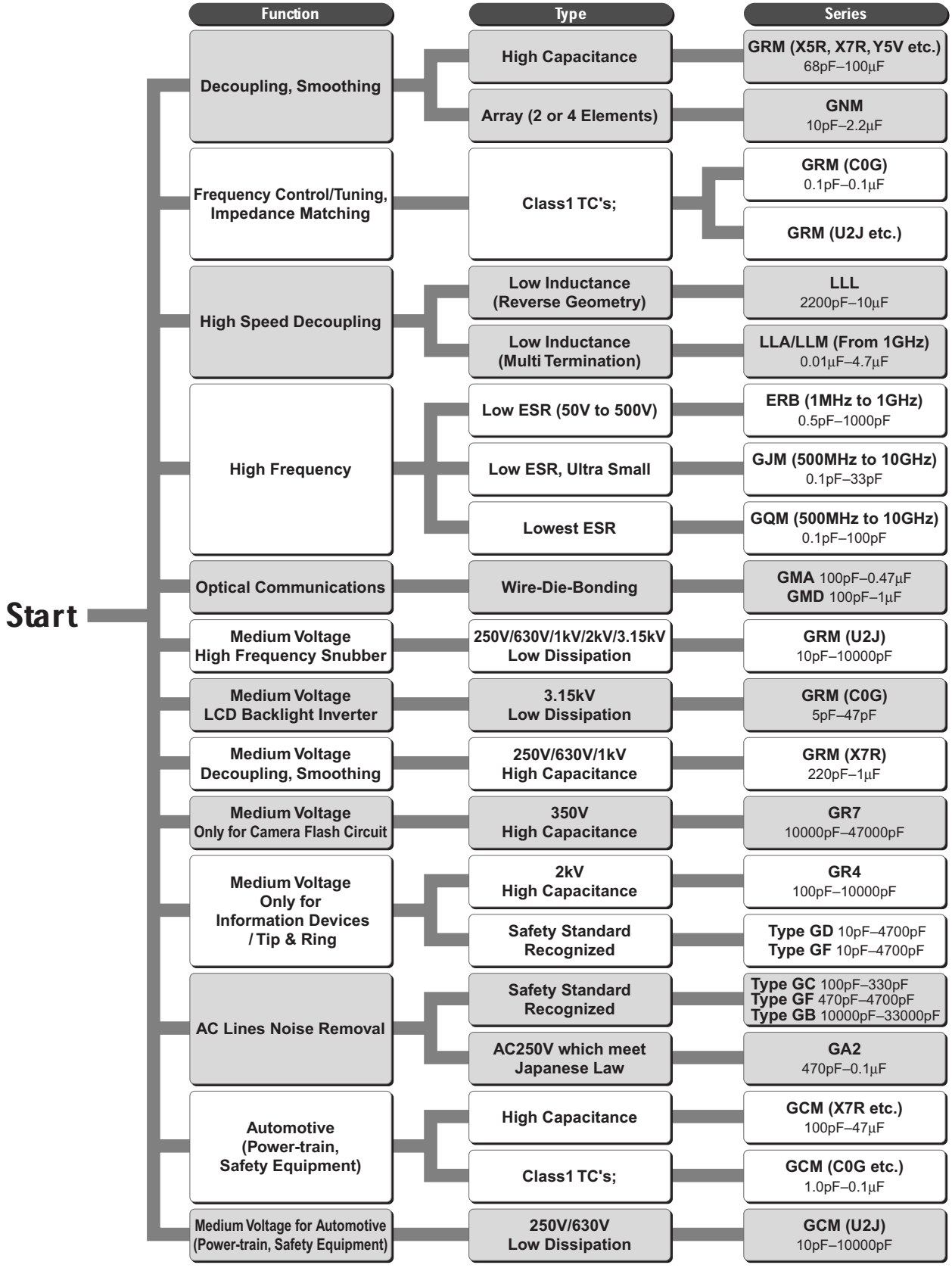
Expressed by three figures.

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

Please check MURATA home page (http://www.murata.com/index.html) in case you can not find the part number on the catalog.

Selection Guide of Chip Monolithic Ceramic Capacitors



1

Chip Monolithic Ceramic Capacitors

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for General Purpose GRM Series

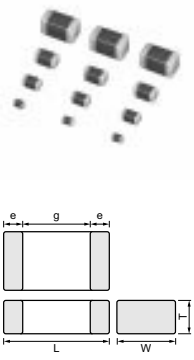
■ Features

1. Higher 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.

■ Applications

General electronic equipment

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 +0.15/-0.05	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)
*The figure indicates typical Specification.

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Temperature Compensating Type C0G (5C), U2J (7U) Characteristics

6 ex.6: T Dimension [mm]

TC	C0G(**5C**)												U2J(**7U**)								
LxW [mm]	0.4x0.2 (**02**) <01005>			0.6x0.3 (**03**) <0201>	1.0x0.5 (**15**) <0402>	1.6x0.8 (**18**) <0603>		2.0x1.25 (**21**) <0805>		3.2x1.6 (**31**) <1206>			0.6x0.3 (**03**) <0201>		1.0x0.5 (**15**) <0402>		1.6x0.8 (**18**) <0603>		2.0x1.25 (**21**) <0805>		3.2x1.6 (**31**) <1206>
Rated Voltage [Vdc] / Capacitance	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	50 (**1H**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	10 (**1A**)	50 (**1H**)	10 (**1A**)	50 (**1H**)	10 (**1A**)	50 (**1H**)
0.1pF(**R10**)				3	3, 5															
0.2pF(**R20**)	2			3	3, 5															
0.3pF(**R30**)	2			3	3, 5															
0.4pF(**R40**)	2			3	3, 5															
0.5pF(**R50**)	2			3	3, 5															
0.6pF(**R60**)	2			3	3, 5															
0.7pF(**R70**)	2			3	3, 5															
0.8pF(**R80**)	2			3	3, 5															
0.9pF(**R90**)	2			3	3, 5															
1.0pF(**1R0**)	2			3	3, 5								3		5					
1.1pF(**1R1**)	2			3	3, 5															
1.2pF(**1R2**)	2			3	3, 5															
1.3pF(**1R3**)	2			3	3, 5															
1.4pF(**1R4**)	2			3	3, 5															
1.5pF(**1R5**)	2			3	3, 5															
1.6pF(**1R6**)	2			3	3, 5															
1.7pF(**1R7**)	2			3	3, 5															
1.8pF(**1R8**)	2			3	3, 5															
1.9pF(**1R9**)	2			3	3, 5															
2.0pF(**2R0**)	2			3	3, 5								3		5					
2.1pF(**2R1**)	2			3	3, 5															
2.2pF(**2R2**)	2			3	3, 5															
2.3pF(**2R3**)	2			3	3, 5															
2.4pF(**2R4**)	2			3	3, 5															
2.5pF(**2R5**)	2			3	3, 5															
2.6pF(**2R6**)	2			3	3, 5															
2.7pF(**2R7**)	2			3	3, 5															
2.8pF(**2R8**)	2			3	3, 5															
2.9pF(**2R9**)	2			3	3, 5															
3.0pF(**3R0**)	2			3	3, 5								3		5					
3.1pF(**3R1**)	2			3	3, 5															
3.2pF(**3R2**)	2			3	3, 5															
3.3pF(**3R3**)	2			3	3, 5															
3.4pF(**3R4**)	2			3	3, 5															
3.5pF(**3R5**)	2			3	3, 5															
3.6pF(**3R6**)	2			3	3, 5															
3.7pF(**3R7**)	2			3	3, 5															
3.8pF(**3R8**)	2			3	3, 5															
3.9pF(**3R9**)	2			3	3, 5															
4.0pF(**4R0**)	2			3	3, 5								3		5					
4.1pF(**4R1**)	2			3	3, 5															
4.2pF(**4R2**)	2			3	3, 5															
4.3pF(**4R3**)	2			3	3, 5															
4.4pF(**4R4**)	2			3	3, 5															
4.5pF(**4R5**)	2			3	3, 5															
4.6pF(**4R6**)	2			3	3, 5															
4.7pF(**4R7**)	2			3	3, 5															
4.8pF(**4R8**)	2			3	3, 5															
4.9pF(**4R9**)	2			3	3, 5															

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

1

Capacitance Table

Continued from the preceding page.

6 ex.6: T Dimension [mm]

Capacitance \ TC	C0G(5C)											U2J(7U)								
LxW [mm]	0.4x0.2 (02) <01005>			0.6x0.3 (03) <0201>	1.0x0.5 (15) <0402>	1.6x0.8 (18) <0603>		2.0x1.25 (21) <0805>		3.2x1.6 (31) <1206>		0.6x0.3 (03) <0201>		1.0x0.5 (15) <0402>		1.6x0.8 (18) <0603>		2.0x1.25 (21) <0805>		3.2x1.6 (31) <1206>
Rated Voltage [Vdc]	16 (1C)	10 (1A)	6.3 (0J)	50 (1H)	50 (1H)	100 (1E)	50 (1H)	100 (1E)	50 (1H)	100 (1E)	50 (1H)	50 (1H)	25 (1E)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)	10 (1A)	50 (1H)
5.0pF(5R0)	2			3	3, 5							3		5						
5.1pF(5R1)	2			3	3, 5															
5.2pF(5R2)	2			3	3, 5															
5.3pF(5R3)	2			3	3, 5															
5.4pF(5R4)	2			3	3, 5															
5.5pF(5R5)	2			3	3, 5															
5.6pF(5R6)	2			3	3, 5															
5.7pF(5R7)	2			3	3, 5															
5.8pF(5R8)	2			3	3, 5															
5.9pF(5R9)	2			3	3, 5															
6.0pF(6R0)	2			3	3, 5							3		5						
6.1pF(6R1)	2			3	3, 5															
6.2pF(6R2)	2			3	3, 5															
6.3pF(6R3)	2			3	3, 5															
6.4pF(6R4)	2			3	3, 5															
6.5pF(6R5)	2			3	3, 5															
6.6pF(6R6)	2			3	3, 5															
6.7pF(6R7)	2			3	3, 5															
6.8pF(6R8)	2			3	3, 5															
6.9pF(6R9)	2			3	3, 5															
7.0pF(7R0)	2			3	3, 5							3		5						
7.1pF(7R1)	2			3	3, 5															
7.2pF(7R2)	2			3	3, 5															
7.3pF(7R3)	2			3	3, 5															
7.4pF(7R4)	2			3	3, 5															
7.5pF(7R5)	2			3	3, 5															
7.6pF(7R6)	2			3	3, 5															
7.7pF(7R7)	2			3	3, 5															
7.8pF(7R8)	2			3	3, 5															
7.9pF(7R9)	2			3	3, 5															
8.0pF(8R0)	2			3	3, 5							3		5						
8.1pF(8R1)	2			3	3, 5															
8.2pF(8R2)	2			3	3, 5															
8.3pF(8R3)	2			3	3, 5															
8.4pF(8R4)	2			3	3, 5															
8.5pF(8R5)	2			3	3, 5															
8.6pF(8R6)	2			3	3, 5															
8.7pF(8R7)	2			3	3, 5															
8.8pF(8R8)	2			3	3, 5															
8.9pF(8R9)	2			3	3, 5															
9.0pF(9R0)	2			3	3, 5							3		5						
9.1pF(9R1)	2			3	3, 5															
9.2pF(9R2)	2			3	3, 5															
9.3pF(9R3)	2			3	3, 5															
9.4pF(9R4)	2			3	3, 5															
9.5pF(9R5)	2			3	3, 5															
9.6pF(9R6)	2			3	3, 5															
9.7pF(9R7)	2			3	3, 5															
9.8pF(9R8)	2			3	3, 5															
9.9pF(9R9)	2			3	3, 5															

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

Capacitance Table

Continued from the preceding page.

6 ex.6: T Dimension [mm]

TC	C0G(**5C**)											U2J(**7U**)								
LxW [mm]	0.4x0.2 (**02**) <01005>			0.6x0.3 (**03**) <0201>	1.0x0.5 (**15**) <0402>	1.6x0.8 (**18**) <0603>		2.0x1.25 (**21**) <0805>		3.2x1.6 (**31**) <1206>		0.6x0.3 (**03**) <0201>		1.0x0.5 (**15**) <0402>		1.6x0.8 (**18**) <0603>		2.0x1.25 (**21**) <0805>		3.2x1.6 (**31**) <1206>
Rated Voltage [Vdc] / Capacitance	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	50 (**1H**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	100 (**1E**)	50 (**1H**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	10 (**1A**)	50 (**1H**)	10 (**1A**)	50 (**1H**)	10 (**1A**)	50 (**1H**)
10pF(**100**)	2			3	3, 5	8	8					3		5						
12pF(**120**)	2			3	3, 5	8	8					3		5						
15pF(**150**)	2			3	3, 5	8	8					3		5						
18pF(**180**)	2			3	3, 5	8	8						3	5						
22pF(**220**)	2			3	3, 5	8	8						3	5						
27pF(**270**)	2			3	3, 5	8	8						3	5						
33pF(**330**)	2			3	3, 5	8	8						3	5						
39pF(**390**)	2			3	3, 5	8	8						3	5						
47pF(**470**)	2			3	3, 5	8	8						3	5						
56pF(**560**)		2	2	3	3, 5	8	8						3	5						
68pF(**680**)		2	2	3	3, 5	8	8						3	5						
82pF(**820**)		2	2	3	3, 5	8	8						3	5						
100pF(**101**)		2	2	3	3, 5	8	8	6					3	5						
120pF(**121**)					3, 5	8	8	6						5						
150pF(**151**)					3, 5	8	8	6						5						
180pF(**181**)					3, 5	8	8	6						5						
220pF(**221**)					3, 5	8	8	6												
270pF(**271**)					3, 5	8	8	6												
330pF(**331**)					3, 5	8	8	6												
390pF(**391**)					3, 5	8	8	6												
470pF(**471**)					3, 5	8	8	6												
560pF(**561**)					3, 5	8	8	6												
680pF(**681**)					3, 5	8	8	6												
820pF(**821**)					5	8	8	6												
1000pF(**102**)					5	8	8	6								8				
1200pF(**122**)						8	8	6	6						5	8				
1500pF(**152**)						8	8	6	6						5	8				
1800pF(**182**)							8	6	6	9					5	8				
2200pF(**222**)							8	6	6	9					5	5, 8				
2700pF(**272**)							8	6	6	9					5	5, 8				
3300pF(**332**)							8	6	6	9					5	5, 8				
3900pF(**392**)							8		6	9					5	5, 8				
4700pF(**472**)									6	9	9				5	5, 8				
5600pF(**562**)									9	9	9					8	5			
6800pF(**682**)									9	9	9					8	5			
8200pF(**822**)									9	9	9					8	5			
10000pF(**103**)									9	9	9					8	5	6		
12000pF(**123**)									9		9						8	6		
15000pF(**153**)									9		9						8	6		
18000pF(**183**)									B		9						8	6		
22000pF(**223**)									B		9						8	9		
27000pF(**273**)											9							9		
33000pF(**333**)											9							A		
39000pF(**393**)											9							B		
47000pF(**473**)											M							B		
56000pF(**563**)											M								9	9
68000pF(**683**)											C								B	M
82000pF(**823**)											C								B	M
0.1μF(**104**)											C								B	M

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

1

Capacitance Table

Continued from the preceding page.

Temperature Compensating Type P2H(6P),R2H(6R),S2H(6S),T2H(6T) Characteristics

6 ex.6: T Dimension [mm]

TC	P2H (6P)	R2H (6R)		S2H (6S)		T2H (6T)	
LxW [mm]	1.0x0.5 (15) <0402>	0.6x0.3 (03) <0201>	1.0x0.5 (15) <0402>	0.6x0.3 (03) <0201>	1.0x0.5 (15) <0402>	0.6x0.3 (03) <0201>	1.0x0.5 (15) <0402>
Rated Voltage [Vdc] / Capacitance	50 (1H)	25 (1E)	50 (1H)	25 (1E)	50 (1H)	25 (1E)	50 (1H)
1.0pF(1R0)	5	3	5	3	5	3	5
2.0pF(2R0)	5	3	5	3	5	3	5
3.0pF(3R0)	5	3	5	3	5	3	5
4.0pF(4R0)	5	3	5	3	5	3	5
5.0pF(5R0)	5	3	5	3	5	3	5
6.0pF(6R0)	5	3	5	3	5	3	5
7.0pF(7R0)	5	3	5	3	5	3	5
8.0pF(8R0)	5	3	5	3	5	3	5
9.0pF(9R0)	5	3	5	3	5	3	5
10pF(100)	5	3	5	3	5	3	5
12pF(120)	5	3	5	3	5	3	5
15pF(150)	5	3	5	3	5	3	5
18pF(180)	5	3	5	3	5	3	5
22pF(220)	5	3	5	3	5	3	5
27pF(270)	5	3	5	3	5	3	5
33pF(330)		3	5	3	5	3	5
39pF(390)		3		3	5	3	5
47pF(470)		3		3		3	5
56pF(560)		3		3		3	5
68pF(680)		3		3		3	5
82pF(820)		3		3		3	5
100pF(101)		3		3		3	5

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

Capacitance Table

Continued from the preceding page.

High Dielectric Constant Type X7R(R7)/X7S(C7)/X7T(D7)/X7U(E7) Characteristics

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	0.4x0.2 (02) <01005>	0.6x0.3 (03) <0201>			1.0x0.5 (15) <0402>					1.6x0.8 (18) <0603>							2.0x1.25 (21) <0805>						
Rated Voltage [Vdc]	10 (1A)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)
68pF(**680**)	2																						
100pF(**101**)	2	3																					
150pF(**151**)	2	3																					
220pF(**221**)	2	3			5	X, 5				8	8												
330pF(**331**)	2	3			5	X, 5				8	8												
470pF(**471**)	2	3			5	X, 5				8	8												
680pF(**681**)		3			5	X, 5				8	8												
1000pF(**102**)		3			5	X, 5				8	8												
1500pF(**152**)		3			5	X, 5				8	8												
2200pF(**222**)			3		5	5	X			8	8												
3300pF(**332**)			3		5	5		X		8	8												
4700pF(**472**)				3	5	5	5	X		8	8												
6800pF(**682**)				3		5	5	X		8	8						9						
10000pF(**103**)				3		5	5	X		8	8	8					B						
15000pF(**153**)						5	5	5			8	8					B						
22000pF(**223**)						5	5	5			8	8					B						
33000pF(**333**)							5	5			8	8					B	9					
47000pF(**473**)							5	5			8	8					B	B					
68000pF(**683**)								5	5		8	8						B	9				
0.10μF(**104**)								5	5	8	8	8						B	B				
0.15μF(**154**)												8	8					B	B				
0.22μF(**224**)												8	8				A	B	B				
0.33μF(**334**)													8	8			A	9	B				
0.47μF(**474**)												8	8	8			B	B	9				
0.68μF(**684**)														8					9	9			
1.0μF(**105**)												8	8	5, 8				B	9, B	B			
2.2μF(**225**)														8	8	8			B	B	B		
4.7μF(**475**)																				B	B		
10μF(**106**)																					B	B	
22μF(**226**)																							B

Capacitance \ LxW [mm]	3.2x1.6 (31) <1206>							3.2x2.5 (32) <1210>						
Rated Voltage [Vdc]	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	100 (2A)	50 (1H)	35 (YA)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)
15000pF(**153**)	9													
22000pF(**223**)	M													
33000pF(**333**)	M													
47000pF(**473**)	M													
68000pF(**683**)	M													
0.10μF(**104**)	9													
0.15μF(**154**)	M	M												
0.22μF(**224**)	M	M												
0.33μF(**334**)		9												
0.47μF(**474**)	M	M												
0.68μF(**684**)	M	M						C	N					
1.0μF(**105**)	C	M						C						
2.2μF(**225**)		C	M	M				E						
4.7μF(**475**)		C	C	C					E					
10μF(**106**)			C	C	C					E	D			
22μF(**226**)					C	C					E	E		
47μF(**476**)							C						E	E

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

1

Capacitance Table

Continued from the preceding page.

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

5 ex.5: T Dimension [mm]

Capacitance \ LxW [mm]	0.6x0.3 (03) <0201>	1.0x0.5 (15) <0402>			1.6x0.8 (18) <0603>				2.0x1.25 (21) <0805>					3.2x1.6 (31) <1206>					3.2x2.5 (32) <1210>		
Rated Voltage [Vdc]	6.3 (0J)	25 (1E)	6.3 (0J)	4 (0G)	10 (1A)	6.3 (0J)	4 (0G)	2.5 (0E)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	25 (1E)	10 (1A)	6.3 (0J)
15000pF(153)	3																				
22000pF(223)	3																				
33000pF(333)	3																				
47000pF(473)	3																				
68000pF(683)		5																			
0.10µF(104)		5																			
0.15µF(154)			5	5																	
0.22µF(224)			5	5																	
0.33µF(334)			5	5																	
0.47µF(474)			5	5																	
0.68µF(684)				5																	
1.0µF(105)					5	5	8			6											
2.2µF(225)					8	8				9					6						
4.7µF(475)							8		B	B	9	9			9						
10µF(106)								8			B	9, B	9	C					D		
22µF(226)													B			C	C		E		
47µF(476)																	C	C		E	E
100µF(107)																		C			

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

Capacitance Table

Continued from the preceding page.

High Dielectric Constant Type X5R(R6) Characteristics

5 ex.5: T Dimension [mm] : Please refer to X7R(R7) etc Characteristics.

Capacitance \ LxW [mm]	0.4x0.2 (02) <01005>		0.6x0.3 (03) <0201>				1.0x0.5 (15) <0402>							1.6x0.8 (18) <0603>						
Rated Voltage [Vdc]	10 (1A)	6.3 (0J)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)
68pF(**680**)	2																			
100pF(**101**)	2																			
150pF(**151**)	2																			
220pF(**221**)	2																			
330pF(**331**)	2																			
470pF(**471**)	2																			
680pF(**681**)		2																		
1000pF(**102**)		2						5							8					
1500pF(**152**)		2			3															
2200pF(**222**)		2			3			5							8					
3300pF(**332**)		2			3															
4700pF(**472**)		2			3			5							8					
6800pF(**682**)		2			3															
10000pF(**103**)		2			3										8					
15000pF(**153**)						3														
22000pF(**223**)						3				5					8					
33000pF(**333**)						3				5	5									
47000pF(**473**)						3				5	5									
68000pF(**683**)									5	5	5									
0.10μF(**104**)									5	5	5					8	8			
0.15μF(**154**)											5	5						8		
0.22μF(**224**)											5	5				8	8	8		
0.33μF(**334**)											5	5								
0.47μF(**474**)											5	5				8	8	8		
0.68μF(**684**)											5	5								
1.0μF(**105**)											5					8	5, 8	5		
2.2μF(**225**)																	8	8		
4.7μF(**475**)													5						8	
10μF(**106**)																			8	8

Capacitance \ LxW [mm]	2.0x1.25 (21) <0805>							3.2x1.6 (31) <1206>							3.2x2.5 (32) <1210>						
Rated Voltage [Vdc]	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	100 (2A)	50 (1H)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	100 (2A)	50 (1H)	35 (YA)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)
6800pF(**682**)																					
10000pF(**103**)																					
15000pF(**153**)																					
22000pF(**223**)																					
33000pF(**333**)																					
47000pF(**473**)																					
68000pF(**683**)																					
0.10μF(**104**)																					
0.15μF(**154**)																					
0.22μF(**224**)																					
0.33μF(**334**)				B																	
0.47μF(**474**)				B																	
0.68μF(**684**)																					
1.0μF(**105**)			6	B																	
2.2μF(**225**)			9, B	9, B	B				C	6											
4.7μF(**475**)			B	9, B	9					9,C	9,C										
10μF(**106**)				B	9, B	9				C	9, C	9						E	D		
22μF(**226**)						B	9				C	C	C						E		
47μF(**476**)													C							E	E
100μF(**107**)													C	C							

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
0.1pF (**R10**)	±0.05pF (**W**)		GRM0335C1HR10WD01D	GRM1555C1HR10WA01D
	±0.1pF (**B**)		GRM0335C1HR10BD01D	GRM1555C1HR10BA01D
0.2pF (**R20**)	±0.05pF (**W**)	GRM0225C1CR20WD05L	GRM0335C1HR20WD01D	GRM1555C1HR20WA01D
	±0.1pF (**B**)	GRM0225C1CR20BD05L	GRM0335C1HR20BD01D	GRM1555C1HR20BA01D
0.3pF (**R30**)	±0.05pF (**W**)	GRM0225C1CR30WD05L	GRM0335C1HR30WD01D	GRM1555C1HR30WA01D
	±0.1pF (**B**)	GRM0225C1CR30BD05L	GRM0335C1HR30BD01D	GRM1555C1HR30BA01D
0.4pF (**R40**)	±0.05pF (**W**)	GRM0225C1CR40WD05L	GRM0335C1HR40WD01D	GRM1555C1HR40WA01D
	±0.1pF (**B**)	GRM0225C1CR40BD05L	GRM0335C1HR40BD01D	GRM1555C1HR40BA01D
0.5pF (**R50**)	±0.05pF (**W**)	GRM0225C1CR50WD05L	GRM0335C1HR50WD01D	GRM1555C1HR50WA01D
	±0.1pF (**B**)	GRM0225C1CR50BD05L	GRM0335C1HR50BD01D	GRM1555C1HR50BA01D
0.6pF (**R60**)	±0.05pF (**W**)	GRM0225C1CR60WD05L	GRM0335C1HR60WD01D	GRM1555C1HR60WA01D
	±0.1pF (**B**)	GRM0225C1CR60BD05L	GRM0335C1HR60BD01D	GRM1555C1HR60BA01D
0.7pF (**R70**)	±0.05pF (**W**)	GRM0225C1CR70WD05L	GRM0335C1HR70WD01D	GRM1555C1HR70WA01D
	±0.1pF (**B**)	GRM0225C1CR70BD05L	GRM0335C1HR70BD01D	GRM1555C1HR70BA01D
0.8pF (**R80**)	±0.05pF (**W**)	GRM0225C1CR80WD05L	GRM0335C1HR80WD01D	GRM1555C1HR80WA01D
	±0.1pF (**B**)	GRM0225C1CR80BD05L	GRM0335C1HR80BD01D	GRM1555C1HR80BA01D
0.9pF (**R90**)	±0.05pF (**W**)	GRM0225C1CR90WD05L	GRM0335C1HR90WD01D	GRM1555C1HR90WA01D
	±0.1pF (**B**)	GRM0225C1CR90BD05L	GRM0335C1HR90BD01D	GRM1555C1HR90BA01D
1.0pF (**1R0**)	±0.05pF (**W**)	GRM0225C1C1R0WD05L	GRM0335C1H1R0WD01D	GRM1555C1H1R0WA01D
	±0.1pF (**B**)	GRM0225C1C1R0BD05L	GRM0335C1H1R0BD01D	GRM1555C1H1R0BA01D
	±0.25pF (**C**)	GRM0225C1C1R0CD05L	GRM0335C1H1R0CD01D	GRM1555C1H1R0CA01D
1.1pF (**1R1**)	±0.05pF (**W**)	GRM0225C1C1R1WD05L	GRM0335C1H1R1WD01D	GRM1555C1H1R1WA01D
	±0.1pF (**B**)	GRM0225C1C1R1BD05L	GRM0335C1H1R1BD01D	GRM1555C1H1R1BA01D
	±0.25pF (**C**)	GRM0225C1C1R1CD05L	GRM0335C1H1R1CD01D	GRM1555C1H1R1CA01D
1.2pF (**1R2**)	±0.05pF (**W**)	GRM0225C1C1R2WD05L	GRM0335C1H1R2WD01D	GRM1555C1H1R2WA01D
	±0.1pF (**B**)	GRM0225C1C1R2BD05L	GRM0335C1H1R2BD01D	GRM1555C1H1R2BA01D
	±0.25pF (**C**)	GRM0225C1C1R2CD05L	GRM0335C1H1R2CD01D	GRM1555C1H1R2CA01D
1.3pF (**1R3**)	±0.05pF (**W**)	GRM0225C1C1R3WD05L	GRM0335C1H1R3WD01D	GRM1555C1H1R3WA01D
	±0.1pF (**B**)	GRM0225C1C1R3BD05L	GRM0335C1H1R3BD01D	GRM1555C1H1R3BA01D
	±0.25pF (**C**)	GRM0225C1C1R3CD05L	GRM0335C1H1R3CD01D	GRM1555C1H1R3CA01D
1.4pF (**1R4**)	±0.05pF (**W**)	GRM0225C1C1R4WD05L	GRM0335C1H1R4WD01D	GRM1555C1H1R4WA01D
	±0.1pF (**B**)	GRM0225C1C1R4BD05L	GRM0335C1H1R4BD01D	GRM1555C1H1R4BA01D
	±0.25pF (**C**)	GRM0225C1C1R4CD05L	GRM0335C1H1R4CD01D	GRM1555C1H1R4CA01D
1.5pF (**1R5**)	±0.05pF (**W**)	GRM0225C1C1R5WD05L	GRM0335C1H1R5WD01D	GRM1555C1H1R5WA01D
	±0.1pF (**B**)	GRM0225C1C1R5BD05L	GRM0335C1H1R5BD01D	GRM1555C1H1R5BA01D
	±0.25pF (**C**)	GRM0225C1C1R5CD05L	GRM0335C1H1R5CD01D	GRM1555C1H1R5CA01D
1.6pF (**1R6**)	±0.05pF (**W**)	GRM0225C1C1R6WD05L	GRM0335C1H1R6WD01D	GRM1555C1H1R6WA01D
	±0.1pF (**B**)	GRM0225C1C1R6BD05L	GRM0335C1H1R6BD01D	GRM1555C1H1R6BA01D
	±0.25pF (**C**)	GRM0225C1C1R6CD05L	GRM0335C1H1R6CD01D	GRM1555C1H1R6CA01D
1.7pF (**1R7**)	±0.05pF (**W**)	GRM0225C1C1R7WD05L	GRM0335C1H1R7WD01D	GRM1555C1H1R7WA01D
	±0.1pF (**B**)	GRM0225C1C1R7BD05L	GRM0335C1H1R7BD01D	GRM1555C1H1R7BA01D
	±0.25pF (**C**)	GRM0225C1C1R7CD05L	GRM0335C1H1R7CD01D	GRM1555C1H1R7CA01D
1.8pF (**1R8**)	±0.05pF (**W**)	GRM0225C1C1R8WD05L	GRM0335C1H1R8WD01D	GRM1555C1H1R8WA01D
	±0.1pF (**B**)	GRM0225C1C1R8BD05L	GRM0335C1H1R8BD01D	GRM1555C1H1R8BA01D
	±0.25pF (**C**)	GRM0225C1C1R8CD05L	GRM0335C1H1R8CD01D	GRM1555C1H1R8CA01D
1.9pF (**1R9**)	±0.05pF (**W**)	GRM0225C1C1R9WD05L	GRM0335C1H1R9WD01D	GRM1555C1H1R9WA01D
	±0.1pF (**B**)	GRM0225C1C1R9BD05L	GRM0335C1H1R9BD01D	GRM1555C1H1R9BA01D
	±0.25pF (**C**)	GRM0225C1C1R9CD05L	GRM0335C1H1R9CD01D	GRM1555C1H1R9CA01D
2.0pF (**2R0**)	±0.05pF (**W**)	GRM0225C1C2R0WD05L	GRM0335C1H2R0WD01D	GRM1555C1H2R0WA01D
	±0.1pF (**B**)	GRM0225C1C2R0BD05L	GRM0335C1H2R0BD01D	GRM1555C1H2R0BA01D
	±0.25pF (**C**)	GRM0225C1C2R0CD05L	GRM0335C1H2R0CD01D	GRM1555C1H2R0CA01D

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | 5C ❺ | 1C ❻ | R20 ❼ | W ❽ | D05 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging *

Packaging Code in Part Number is a code shows STD 180mm Reel Taping. *GRM022: **D** is applicable.

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
2.1pF (**2R1**)	±0.05pF (**W**)	**GRM0225C1C2R1WD05L**	**GRM0335C1H2R1WD01D**	**GRM1555C1H2R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R1BD05L**	**GRM0335C1H2R1BD01D**	**GRM1555C1H2R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R1CD05L**	**GRM0335C1H2R1CD01D**	**GRM1555C1H2R1CA01D**
2.2pF (**2R2**)	±0.05pF (**W**)	**GRM0225C1C2R2WD05L**	**GRM0335C1H2R2WD01D**	**GRM1555C1H2R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R2BD05L**	**GRM0335C1H2R2BD01D**	**GRM1555C1H2R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R2CD05L**	**GRM0335C1H2R2CD01D**	**GRM1555C1H2R2CA01D**
2.3pF (**2R3**)	±0.05pF (**W**)	**GRM0225C1C2R3WD05L**	**GRM0335C1H2R3WD01D**	**GRM1555C1H2R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R3BD05L**	**GRM0335C1H2R3BD01D**	**GRM1555C1H2R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R3CD05L**	**GRM0335C1H2R3CD01D**	**GRM1555C1H2R3CA01D**
2.4pF (**2R4**)	±0.05pF (**W**)	**GRM0225C1C2R4WD05L**	**GRM0335C1H2R4WD01D**	**GRM1555C1H2R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R4BD05L**	**GRM0335C1H2R4BD01D**	**GRM1555C1H2R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R4CD05L**	**GRM0335C1H2R4CD01D**	**GRM1555C1H2R4CA01D**
2.5pF (**2R5**)	±0.05pF (**W**)	**GRM0225C1C2R5WD05L**	**GRM0335C1H2R5WD01D**	**GRM1555C1H2R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R5BD05L**	**GRM0335C1H2R5BD01D**	**GRM1555C1H2R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R5CD05L**	**GRM0335C1H2R5CD01D**	**GRM1555C1H2R5CA01D**
2.6pF (**2R6**)	±0.05pF (**W**)	**GRM0225C1C2R6WD05L**	**GRM0335C1H2R6WD01D**	**GRM1555C1H2R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R6BD05L**	**GRM0335C1H2R6BD01D**	**GRM1555C1H2R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R6CD05L**	**GRM0335C1H2R6CD01D**	**GRM1555C1H2R6CA01D**
2.7pF (**2R7**)	±0.05pF (**W**)	**GRM0225C1C2R7WD05L**	**GRM0335C1H2R7WD01D**	**GRM1555C1H2R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R7BD05L**	**GRM0335C1H2R7BD01D**	**GRM1555C1H2R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R7CD05L**	**GRM0335C1H2R7CD01D**	**GRM1555C1H2R7CA01D**
2.8pF (**2R8**)	±0.05pF (**W**)	**GRM0225C1C2R8WD05L**	**GRM0335C1H2R8WD01D**	**GRM1555C1H2R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R8BD05L**	**GRM0335C1H2R8BD01D**	**GRM1555C1H2R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R8CD05L**	**GRM0335C1H2R8CD01D**	**GRM1555C1H2R8CA01D**
2.9pF (**2R9**)	±0.05pF (**W**)	**GRM0225C1C2R9WD05L**	**GRM0335C1H2R9WD01D**	**GRM1555C1H2R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C2R9BD05L**	**GRM0335C1H2R9BD01D**	**GRM1555C1H2R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C2R9CD05L**	**GRM0335C1H2R9CD01D**	**GRM1555C1H2R9CA01D**
3.0pF (**3R0**)	±0.05pF (**W**)	**GRM0225C1C3R0WD05L**	**GRM0335C1H3R0WD01D**	**GRM1555C1H3R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R0BD05L**	**GRM0335C1H3R0BD01D**	**GRM1555C1H3R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R0CD05L**	**GRM0335C1H3R0CD01D**	**GRM1555C1H3R0CA01D**
3.1pF (**3R1**)	±0.05pF (**W**)	**GRM0225C1C3R1WD05L**	**GRM0335C1H3R1WD01D**	**GRM1555C1H3R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R1BD05L**	**GRM0335C1H3R1BD01D**	**GRM1555C1H3R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R1CD05L**	**GRM0335C1H3R1CD01D**	**GRM1555C1H3R1CA01D**
3.2pF (**3R2**)	±0.05pF (**W**)	**GRM0225C1C3R2WD05L**	**GRM0335C1H3R2WD01D**	**GRM1555C1H3R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R2BD05L**	**GRM0335C1H3R2BD01D**	**GRM1555C1H3R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R2CD05L**	**GRM0335C1H3R2CD01D**	**GRM1555C1H3R2CA01D**
3.3pF (**3R3**)	±0.05pF (**W**)	**GRM0225C1C3R3WD05L**	**GRM0335C1H3R3WD01D**	**GRM1555C1H3R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R3BD05L**	**GRM0335C1H3R3BD01D**	**GRM1555C1H3R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R3CD05L**	**GRM0335C1H3R3CD01D**	**GRM1555C1H3R3CA01D**
3.4pF (**3R4**)	±0.05pF (**W**)	**GRM0225C1C3R4WD05L**	**GRM0335C1H3R4WD01D**	**GRM1555C1H3R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R4BD05L**	**GRM0335C1H3R4BD01D**	**GRM1555C1H3R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R4CD05L**	**GRM0335C1H3R4CD01D**	**GRM1555C1H3R4CA01D**
3.5pF (**3R5**)	±0.05pF (**W**)	**GRM0225C1C3R5WD05L**	**GRM0335C1H3R5WD01D**	**GRM1555C1H3R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R5BD05L**	**GRM0335C1H3R5BD01D**	**GRM1555C1H3R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R5CD05L**	**GRM0335C1H3R5CD01D**	**GRM1555C1H3R5CA01D**
3.6pF (**3R6**)	±0.05pF (**W**)	**GRM0225C1C3R6WD05L**	**GRM0335C1H3R6WD01D**	**GRM1555C1H3R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R6BD05L**	**GRM0335C1H3R6BD01D**	**GRM1555C1H3R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R6CD05L**	**GRM0335C1H3R6CD01D**	**GRM1555C1H3R6CA01D**
3.7pF (**3R7**)	±0.05pF (**W**)	**GRM0225C1C3R7WD05L**	**GRM0335C1H3R7WD01D**	**GRM1555C1H3R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R7BD05L**	**GRM0335C1H3R7BD01D**	**GRM1555C1H3R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R7CD05L**	**GRM0335C1H3R7CD01D**	**GRM1555C1H3R7CA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
3.8pF (**3R8**)	±0.05pF (**W**)	**GRM0225C1C3R8WD05L**	**GRM0335C1H3R8WD01D**	**GRM1555C1H3R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R8BD05L**	**GRM0335C1H3R8BD01D**	**GRM1555C1H3R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R8CD05L**	**GRM0335C1H3R8CD01D**	**GRM1555C1H3R8CA01D**
3.9pF (**3R9**)	±0.05pF (**W**)	**GRM0225C1C3R9WD05L**	**GRM0335C1H3R9WD01D**	**GRM1555C1H3R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C3R9BD05L**	**GRM0335C1H3R9BD01D**	**GRM1555C1H3R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C3R9CD05L**	**GRM0335C1H3R9CD01D**	**GRM1555C1H3R9CA01D**
4.0pF (**4R0**)	±0.05pF (**W**)	**GRM0225C1C4R0WD05L**	**GRM0335C1H4R0WD01D**	**GRM1555C1H4R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R0BD05L**	**GRM0335C1H4R0BD01D**	**GRM1555C1H4R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R0CD05L**	**GRM0335C1H4R0CD01D**	**GRM1555C1H4R0CA01D**
4.1pF (**4R1**)	±0.05pF (**W**)	**GRM0225C1C4R1WD05L**	**GRM0335C1H4R1WD01D**	**GRM1555C1H4R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R1BD05L**	**GRM0335C1H4R1BD01D**	**GRM1555C1H4R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R1CD05L**	**GRM0335C1H4R1CD01D**	**GRM1555C1H4R1CA01D**
4.2pF (**4R2**)	±0.05pF (**W**)	**GRM0225C1C4R2WD05L**	**GRM0335C1H4R2WD01D**	**GRM1555C1H4R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R2BD05L**	**GRM0335C1H4R2BD01D**	**GRM1555C1H4R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R2CD05L**	**GRM0335C1H4R2CD01D**	**GRM1555C1H4R2CA01D**
4.3pF (**4R3**)	±0.05pF (**W**)	**GRM0225C1C4R3WD05L**	**GRM0335C1H4R3WD01D**	**GRM1555C1H4R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R3BD05L**	**GRM0335C1H4R3BD01D**	**GRM1555C1H4R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R3CD05L**	**GRM0335C1H4R3CD01D**	**GRM1555C1H4R3CA01D**
4.4pF (**4R4**)	±0.05pF (**W**)	**GRM0225C1C4R4WD05L**	**GRM0335C1H4R4WD01D**	**GRM1555C1H4R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R4BD05L**	**GRM0335C1H4R4BD01D**	**GRM1555C1H4R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R4CD05L**	**GRM0335C1H4R4CD01D**	**GRM1555C1H4R4CA01D**
4.5pF (**4R5**)	±0.05pF (**W**)	**GRM0225C1C4R5WD05L**	**GRM0335C1H4R5WD01D**	**GRM1555C1H4R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R5BD05L**	**GRM0335C1H4R5BD01D**	**GRM1555C1H4R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R5CD05L**	**GRM0335C1H4R5CD01D**	**GRM1555C1H4R5CA01D**
4.6pF (**4R6**)	±0.05pF (**W**)	**GRM0225C1C4R6WD05L**	**GRM0335C1H4R6WD01D**	**GRM1555C1H4R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R6BD05L**	**GRM0335C1H4R6BD01D**	**GRM1555C1H4R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R6CD05L**	**GRM0335C1H4R6CD01D**	**GRM1555C1H4R6CA01D**
4.7pF (**4R7**)	±0.05pF (**W**)	**GRM0225C1C4R7WD05L**	**GRM0335C1H4R7WD01D**	**GRM1555C1H4R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R7BD05L**	**GRM0335C1H4R7BD01D**	**GRM1555C1H4R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R7CD05L**	**GRM0335C1H4R7CD01D**	**GRM1555C1H4R7CA01D**
4.8pF (**4R8**)	±0.05pF (**W**)	**GRM0225C1C4R8WD05L**	**GRM0335C1H4R8WD01D**	**GRM1555C1H4R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R8BD05L**	**GRM0335C1H4R8BD01D**	**GRM1555C1H4R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R8CD05L**	**GRM0335C1H4R8CD01D**	**GRM1555C1H4R8CA01D**
4.9pF (**4R9**)	±0.05pF (**W**)	**GRM0225C1C4R9WD05L**	**GRM0335C1H4R9WD01D**	**GRM1555C1H4R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C4R9BD05L**	**GRM0335C1H4R9BD01D**	**GRM1555C1H4R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C4R9CD05L**	**GRM0335C1H4R9CD01D**	**GRM1555C1H4R9CA01D**
5.0pF (**5R0**)	±0.05pF (**W**)	**GRM0225C1C5R0WD05L**	**GRM0335C1H5R0WD01D**	**GRM1555C1H5R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R0BD05L**	**GRM0335C1H5R0BD01D**	**GRM1555C1H5R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R0CD05L**	**GRM0335C1H5R0CD01D**	**GRM1555C1H5R0CA01D**
5.1pF (**5R1**)	±0.05pF (**W**)	**GRM0225C1C5R1WD05L**	**GRM0335C1H5R1WD01D**	**GRM1555C1H5R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R1BD05L**	**GRM0335C1H5R1BD01D**	**GRM1555C1H5R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R1CD05L**	**GRM0335C1H5R1CD01D**	**GRM1555C1H5R1CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R1DD05L**	**GRM0335C1H5R1DD01D**	**GRM1555C1H5R1DA01D**
5.2pF (**5R2**)	±0.05pF (**W**)	**GRM0225C1C5R2WD05L**	**GRM0335C1H5R2WD01D**	**GRM1555C1H5R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R2BD05L**	**GRM0335C1H5R2BD01D**	**GRM1555C1H5R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R2CD05L**	**GRM0335C1H5R2CD01D**	**GRM1555C1H5R2CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R2DD05L**	**GRM0335C1H5R2DD01D**	**GRM1555C1H5R2DA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | 5C ❺ | 1C ❻ | 3R8 ❼ | W ❽ | D05 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging *

Packaging Code in Part Number is a code shows STD 180mm Reel Taping. *GRM022: **D** is applicable.

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
5.3pF (**5R3**)	±0.05pF (**W**)	**GRM0225C1C5R3WD05L**	**GRM0335C1H5R3WD01D**	**GRM1555C1H5R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R3BD05L**	**GRM0335C1H5R3BD01D**	**GRM1555C1H5R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R3CD05L**	**GRM0335C1H5R3CD01D**	**GRM1555C1H5R3CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R3DD05L**	**GRM0335C1H5R3DD01D**	**GRM1555C1H5R3DA01D**
5.4pF (**5R4**)	±0.05pF (**W**)	**GRM0225C1C5R4WD05L**	**GRM0335C1H5R4WD01D**	**GRM1555C1H5R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R4BD05L**	**GRM0335C1H5R4BD01D**	**GRM1555C1H5R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R4CD05L**	**GRM0335C1H5R4CD01D**	**GRM1555C1H5R4CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R4DD05L**	**GRM0335C1H5R4DD01D**	**GRM1555C1H5R4DA01D**
5.5pF (**5R5**)	±0.05pF (**W**)	**GRM0225C1C5R5WD05L**	**GRM0335C1H5R5WD01D**	**GRM1555C1H5R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R5BD05L**	**GRM0335C1H5R5BD01D**	**GRM1555C1H5R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R5CD05L**	**GRM0335C1H5R5CD01D**	**GRM1555C1H5R5CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R5DD05L**	**GRM0335C1H5R5DD01D**	**GRM1555C1H5R5DA01D**
5.6pF (**5R6**)	±0.05pF (**W**)	**GRM0225C1C5R6WD05L**	**GRM0335C1H5R6WD01D**	**GRM1555C1H5R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R6BD05L**	**GRM0335C1H5R6BD01D**	**GRM1555C1H5R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R6CD05L**	**GRM0335C1H5R6CD01D**	**GRM1555C1H5R6CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R6DD05L**	**GRM0335C1H5R6DD01D**	**GRM1555C1H5R6DA01D**
5.7pF (**5R7**)	±0.05pF (**W**)	**GRM0225C1C5R7WD05L**	**GRM0335C1H5R7WD01D**	**GRM1555C1H5R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R7BD05L**	**GRM0335C1H5R7BD01D**	**GRM1555C1H5R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R7CD05L**	**GRM0335C1H5R7CD01D**	**GRM1555C1H5R7CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R7DD05L**	**GRM0335C1H5R7DD01D**	**GRM1555C1H5R7DA01D**
5.8pF (**5R8**)	±0.05pF (**W**)	**GRM0225C1C5R8WD05L**	**GRM0335C1H5R8WD01D**	**GRM1555C1H5R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R8BD05L**	**GRM0335C1H5R8BD01D**	**GRM1555C1H5R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R8CD05L**	**GRM0335C1H5R8CD01D**	**GRM1555C1H5R8CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R8DD05L**	**GRM0335C1H5R8DD01D**	**GRM1555C1H5R8DA01D**
5.9pF (**5R9**)	±0.05pF (**W**)	**GRM0225C1C5R9WD05L**	**GRM0335C1H5R9WD01D**	**GRM1555C1H5R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C5R9BD05L**	**GRM0335C1H5R9BD01D**	**GRM1555C1H5R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C5R9CD05L**	**GRM0335C1H5R9CD01D**	**GRM1555C1H5R9CA01D**
	±0.5pF (**D**)	**GRM0225C1C5R9DD05L**	**GRM0335C1H5R9DD01D**	**GRM1555C1H5R9DA01D**
6.0pF (**6R0**)	±0.05pF (**W**)	**GRM0225C1C6R0WD05L**	**GRM0335C1H6R0WD01D**	**GRM1555C1H6R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R0BD05L**	**GRM0335C1H6R0BD01D**	**GRM1555C1H6R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R0CD05L**	**GRM0335C1H6R0CD01D**	**GRM1555C1H6R0CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R0DD05L**	**GRM0335C1H6R0DD01D**	**GRM1555C1H6R0DA01D**
6.1pF (**6R1**)	±0.05pF (**W**)	**GRM0225C1C6R1WD05L**	**GRM0335C1H6R1WD01D**	**GRM1555C1H6R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R1BD05L**	**GRM0335C1H6R1BD01D**	**GRM1555C1H6R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R1CD05L**	**GRM0335C1H6R1CD01D**	**GRM1555C1H6R1CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R1DD05L**	**GRM0335C1H6R1DD01D**	**GRM1555C1H6R1DA01D**
6.2pF (**6R2**)	±0.05pF (**W**)	**GRM0225C1C6R2WD05L**	**GRM0335C1H6R2WD01D**	**GRM1555C1H6R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R2BD05L**	**GRM0335C1H6R2BD01D**	**GRM1555C1H6R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R2CD05L**	**GRM0335C1H6R2CD01D**	**GRM1555C1H6R2CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R2DD05L**	**GRM0335C1H6R2DD01D**	**GRM1555C1H6R2DA01D**
6.3pF (**6R3**)	±0.05pF (**W**)	**GRM0225C1C6R3WD05L**	**GRM0335C1H6R3WD01D**	**GRM1555C1H6R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R3BD05L**	**GRM0335C1H6R3BD01D**	**GRM1555C1H6R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R3CD05L**	**GRM0335C1H6R3CD01D**	**GRM1555C1H6R3CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R3DD05L**	**GRM0335C1H6R3DD01D**	**GRM1555C1H6R3DA01D**
6.4pF (**6R4**)	±0.05pF (**W**)	**GRM0225C1C6R4WD05L**	**GRM0335C1H6R4WD01D**	**GRM1555C1H6R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R4BD05L**	**GRM0335C1H6R4BD01D**	**GRM1555C1H6R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R4CD05L**	**GRM0335C1H6R4CD01D**	**GRM1555C1H6R4CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R4DD05L**	**GRM0335C1H6R4DD01D**	**GRM1555C1H6R4DA01D**
6.5pF (**6R5**)	±0.05pF (**W**)	**GRM0225C1C6R5WD05L**	**GRM0335C1H6R5WD01D**	**GRM1555C1H6R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R5BD05L**	**GRM0335C1H6R5BD01D**	**GRM1555C1H6R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R5CD05L**	**GRM0335C1H6R5CD01D**	**GRM1555C1H6R5CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R5DD05L**	**GRM0335C1H6R5DD01D**	**GRM1555C1H6R5DA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
6.6pF (**6R6**)	±0.05pF (**W**)	**GRM0225C1C6R6WD05L**	**GRM0335C1H6R6WD01D**	**GRM1555C1H6R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R6BD05L**	**GRM0335C1H6R6BD01D**	**GRM1555C1H6R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R6CD05L**	**GRM0335C1H6R6CD01D**	**GRM1555C1H6R6CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R6DD05L**	**GRM0335C1H6R6DD01D**	**GRM1555C1H6R6DA01D**
6.7pF (**6R7**)	±0.05pF (**W**)	**GRM0225C1C6R7WD05L**	**GRM0335C1H6R7WD01D**	**GRM1555C1H6R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R7BD05L**	**GRM0335C1H6R7BD01D**	**GRM1555C1H6R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R7CD05L**	**GRM0335C1H6R7CD01D**	**GRM1555C1H6R7CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R7DD05L**	**GRM0335C1H6R7DD01D**	**GRM1555C1H6R7DA01D**
6.8pF (**6R8**)	±0.05pF (**W**)	**GRM0225C1C6R8WD05L**	**GRM0335C1H6R8WD01D**	**GRM1555C1H6R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R8BD05L**	**GRM0335C1H6R8BD01D**	**GRM1555C1H6R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R8CD05L**	**GRM0335C1H6R8CD01D**	**GRM1555C1H6R8CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R8DD05L**	**GRM0335C1H6R8DD01D**	**GRM1555C1H6R8DA01D**
6.9pF (**6R9**)	±0.05pF (**W**)	**GRM0225C1C6R9WD05L**	**GRM0335C1H6R9WD01D**	**GRM1555C1H6R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C6R9BD05L**	**GRM0335C1H6R9BD01D**	**GRM1555C1H6R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C6R9CD05L**	**GRM0335C1H6R9CD01D**	**GRM1555C1H6R9CA01D**
	±0.5pF (**D**)	**GRM0225C1C6R9DD05L**	**GRM0335C1H6R9DD01D**	**GRM1555C1H6R9DA01D**
7.0pF (**7R0**)	±0.05pF (**W**)	**GRM0225C1C7R0WD05L**	**GRM0335C1H7R0WD01D**	**GRM1555C1H7R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R0BD05L**	**GRM0335C1H7R0BD01D**	**GRM1555C1H7R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R0CD05L**	**GRM0335C1H7R0CD01D**	**GRM1555C1H7R0CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R0DD05L**	**GRM0335C1H7R0DD01D**	**GRM1555C1H7R0DA01D**
7.1pF (**7R1**)	±0.05pF (**W**)	**GRM0225C1C7R1WD05L**	**GRM0335C1H7R1WD01D**	**GRM1555C1H7R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R1BD05L**	**GRM0335C1H7R1BD01D**	**GRM1555C1H7R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R1CD05L**	**GRM0335C1H7R1CD01D**	**GRM1555C1H7R1CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R1DD05L**	**GRM0335C1H7R1DD01D**	**GRM1555C1H7R1DA01D**
7.2pF (**7R2**)	±0.05pF (**W**)	**GRM0225C1C7R2WD05L**	**GRM0335C1H7R2WD01D**	**GRM1555C1H7R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R2BD05L**	**GRM0335C1H7R2BD01D**	**GRM1555C1H7R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R2CD05L**	**GRM0335C1H7R2CD01D**	**GRM1555C1H7R2CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R2DD05L**	**GRM0335C1H7R2DD01D**	**GRM1555C1H7R2DA01D**
7.3pF (**7R3**)	±0.05pF (**W**)	**GRM0225C1C7R3WD05L**	**GRM0335C1H7R3WD01D**	**GRM1555C1H7R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R3BD05L**	**GRM0335C1H7R3BD01D**	**GRM1555C1H7R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R3CD05L**	**GRM0335C1H7R3CD01D**	**GRM1555C1H7R3CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R3DD05L**	**GRM0335C1H7R3DD01D**	**GRM1555C1H7R3DA01D**
7.4pF (**7R4**)	±0.05pF (**W**)	**GRM0225C1C7R4WD05L**	**GRM0335C1H7R4WD01D**	**GRM1555C1H7R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R4BD05L**	**GRM0335C1H7R4BD01D**	**GRM1555C1H7R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R4CD05L**	**GRM0335C1H7R4CD01D**	**GRM1555C1H7R4CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R4DD05L**	**GRM0335C1H7R4DD01D**	**GRM1555C1H7R4DA01D**
7.5pF (**7R5**)	±0.05pF (**W**)	**GRM0225C1C7R5WD05L**	**GRM0335C1H7R5WD01D**	**GRM1555C1H7R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R5BD05L**	**GRM0335C1H7R5BD01D**	**GRM1555C1H7R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R5CD05L**	**GRM0335C1H7R5CD01D**	**GRM1555C1H7R5CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R5DD05L**	**GRM0335C1H7R5DD01D**	**GRM1555C1H7R5DA01D**
7.6pF (**7R6**)	±0.05pF (**W**)	**GRM0225C1C7R6WD05L**	**GRM0335C1H7R6WD01D**	**GRM1555C1H7R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R6BD05L**	**GRM0335C1H7R6BD01D**	**GRM1555C1H7R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R6CD05L**	**GRM0335C1H7R6CD01D**	**GRM1555C1H7R6CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R6DD05L**	**GRM0335C1H7R6DD01D**	**GRM1555C1H7R6DA01D**
7.7pF (**7R7**)	±0.05pF (**W**)	**GRM0225C1C7R7WD05L**	**GRM0335C1H7R7WD01D**	**GRM1555C1H7R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R7BD05L**	**GRM0335C1H7R7BD01D**	**GRM1555C1H7R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R7CD05L**	**GRM0335C1H7R7CD01D**	**GRM1555C1H7R7CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R7DD05L**	**GRM0335C1H7R7DD01D**	**GRM1555C1H7R7DA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | 5C ❺ | 1C ❻ | 6R6 ❼ | W ❽ | D05 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging *

Packaging Code in Part Number is a code shows STD 180mm Reel Taping. *GRM022: **D** is applicable.

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
7.8pF (**7R8**)	±0.05pF (**W**)	**GRM0225C1C7R8WD05L**	**GRM0335C1H7R8WD01D**	**GRM1555C1H7R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R8BD05L**	**GRM0335C1H7R8BD01D**	**GRM1555C1H7R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R8CD05L**	**GRM0335C1H7R8CD01D**	**GRM1555C1H7R8CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R8DD05L**	**GRM0335C1H7R8DD01D**	**GRM1555C1H7R8DA01D**
7.9pF (**7R9**)	±0.05pF (**W**)	**GRM0225C1C7R9WD05L**	**GRM0335C1H7R9WD01D**	**GRM1555C1H7R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C7R9BD05L**	**GRM0335C1H7R9BD01D**	**GRM1555C1H7R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C7R9CD05L**	**GRM0335C1H7R9CD01D**	**GRM1555C1H7R9CA01D**
	±0.5pF (**D**)	**GRM0225C1C7R9DD05L**	**GRM0335C1H7R9DD01D**	**GRM1555C1H7R9DA01D**
8.0pF (**8R0**)	±0.05pF (**W**)	**GRM0225C1C8R0WD05L**	**GRM0335C1H8R0WD01D**	**GRM1555C1H8R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R0BD05L**	**GRM0335C1H8R0BD01D**	**GRM1555C1H8R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R0CD05L**	**GRM0335C1H8R0CD01D**	**GRM1555C1H8R0CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R0DD05L**	**GRM0335C1H8R0DD01D**	**GRM1555C1H8R0DA01D**
8.1pF (**8R1**)	±0.05pF (**W**)	**GRM0225C1C8R1WD05L**	**GRM0335C1H8R1WD01D**	**GRM1555C1H8R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R1BD05L**	**GRM0335C1H8R1BD01D**	**GRM1555C1H8R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R1CD05L**	**GRM0335C1H8R1CD01D**	**GRM1555C1H8R1CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R1DD05L**	**GRM0335C1H8R1DD01D**	**GRM1555C1H8R1DA01D**
8.2pF (**8R2**)	±0.05pF (**W**)	**GRM0225C1C8R2WD05L**	**GRM0335C1H8R2WD01D**	**GRM1555C1H8R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R2BD05L**	**GRM0335C1H8R2BD01D**	**GRM1555C1H8R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R2CD05L**	**GRM0335C1H8R2CD01D**	**GRM1555C1H8R2CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R2DD05L**	**GRM0335C1H8R2DD01D**	**GRM1555C1H8R2DA01D**
8.3pF (**8R3**)	±0.05pF (**W**)	**GRM0225C1C8R3WD05L**	**GRM0335C1H8R3WD01D**	**GRM1555C1H8R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R3BD05L**	**GRM0335C1H8R3BD01D**	**GRM1555C1H8R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R3CD05L**	**GRM0335C1H8R3CD01D**	**GRM1555C1H8R3CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R3DD05L**	**GRM0335C1H8R3DD01D**	**GRM1555C1H8R3DA01D**
8.4pF (**8R4**)	±0.05pF (**W**)	**GRM0225C1C8R4WD05L**	**GRM0335C1H8R4WD01D**	**GRM1555C1H8R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R4BD05L**	**GRM0335C1H8R4BD01D**	**GRM1555C1H8R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R4CD05L**	**GRM0335C1H8R4CD01D**	**GRM1555C1H8R4CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R4DD05L**	**GRM0335C1H8R4DD01D**	**GRM1555C1H8R4DA01D**
8.5pF (**8R5**)	±0.05pF (**W**)	**GRM0225C1C8R5WD05L**	**GRM0335C1H8R5WD01D**	**GRM1555C1H8R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R5BD05L**	**GRM0335C1H8R5BD01D**	**GRM1555C1H8R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R5CD05L**	**GRM0335C1H8R5CD01D**	**GRM1555C1H8R5CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R5DD05L**	**GRM0335C1H8R5DD01D**	**GRM1555C1H8R5DA01D**
8.6pF (**8R6**)	±0.05pF (**W**)	**GRM0225C1C8R6WD05L**	**GRM0335C1H8R6WD01D**	**GRM1555C1H8R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R6BD05L**	**GRM0335C1H8R6BD01D**	**GRM1555C1H8R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R6CD05L**	**GRM0335C1H8R6CD01D**	**GRM1555C1H8R6CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R6DD05L**	**GRM0335C1H8R6DD01D**	**GRM1555C1H8R6DA01D**
8.7pF (**8R7**)	±0.05pF (**W**)	**GRM0225C1C8R7WD05L**	**GRM0335C1H8R7WD01D**	**GRM1555C1H8R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R7BD05L**	**GRM0335C1H8R7BD01D**	**GRM1555C1H8R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R7CD05L**	**GRM0335C1H8R7CD01D**	**GRM1555C1H8R7CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R7DD05L**	**GRM0335C1H8R7DD01D**	**GRM1555C1H8R7DA01D**
8.8pF (**8R8**)	±0.05pF (**W**)	**GRM0225C1C8R8WD05L**	**GRM0335C1H8R8WD01D**	**GRM1555C1H8R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R8BD05L**	**GRM0335C1H8R8BD01D**	**GRM1555C1H8R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R8CD05L**	**GRM0335C1H8R8CD01D**	**GRM1555C1H8R8CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R8DD05L**	**GRM0335C1H8R8DD01D**	**GRM1555C1H8R8DA01D**
8.9pF (**8R9**)	±0.05pF (**W**)	**GRM0225C1C8R9WD05L**	**GRM0335C1H8R9WD01D**	**GRM1555C1H8R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C8R9BD05L**	**GRM0335C1H8R9BD01D**	**GRM1555C1H8R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C8R9CD05L**	**GRM0335C1H8R9CD01D**	**GRM1555C1H8R9CA01D**
	±0.5pF (**D**)	**GRM0225C1C8R9DD05L**	**GRM0335C1H8R9DD01D**	**GRM1555C1H8R9DA01D**
9.0pF (**9R0**)	±0.05pF (**W**)	**GRM0225C1C9R0WD05L**	**GRM0335C1H9R0WD01D**	**GRM1555C1H9R0WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R0BD05L**	**GRM0335C1H9R0BD01D**	**GRM1555C1H9R0BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R0CD05L**	**GRM0335C1H9R0CD01D**	**GRM1555C1H9R0CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R0DD05L**	**GRM0335C1H9R0DD01D**	**GRM1555C1H9R0DA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		16(**1C**)	50(**1H**)	50(**1H**)
Capacitance	Tolerance	Part Number		
9.1pF (**9R1**)	±0.05pF (**W**)	**GRM0225C1C9R1WD05L**	**GRM0335C1H9R1WD01D**	**GRM1555C1H9R1WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R1BD05L**	**GRM0335C1H9R1BD01D**	**GRM1555C1H9R1BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R1CD05L**	**GRM0335C1H9R1CD01D**	**GRM1555C1H9R1CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R1DD05L**	**GRM0335C1H9R1DD01D**	**GRM1555C1H9R1DA01D**
9.2pF (**9R2**)	±0.05pF (**W**)	**GRM0225C1C9R2WD05L**	**GRM0335C1H9R2WD01D**	**GRM1555C1H9R2WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R2BD05L**	**GRM0335C1H9R2BD01D**	**GRM1555C1H9R2BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R2CD05L**	**GRM0335C1H9R2CD01D**	**GRM1555C1H9R2CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R2DD05L**	**GRM0335C1H9R2DD01D**	**GRM1555C1H9R2DA01D**
9.3pF (**9R3**)	±0.05pF (**W**)	**GRM0225C1C9R3WD05L**	**GRM0335C1H9R3WD01D**	**GRM1555C1H9R3WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R3BD05L**	**GRM0335C1H9R3BD01D**	**GRM1555C1H9R3BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R3CD05L**	**GRM0335C1H9R3CD01D**	**GRM1555C1H9R3CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R3DD05L**	**GRM0335C1H9R3DD01D**	**GRM1555C1H9R3DA01D**
9.4pF (**9R4**)	±0.05pF (**W**)	**GRM0225C1C9R4WD05L**	**GRM0335C1H9R4WD01D**	**GRM1555C1H9R4WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R4BD05L**	**GRM0335C1H9R4BD01D**	**GRM1555C1H9R4BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R4CD05L**	**GRM0335C1H9R4CD01D**	**GRM1555C1H9R4CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R4DD05L**	**GRM0335C1H9R4DD01D**	**GRM1555C1H9R4DA01D**
9.5pF (**9R5**)	±0.05pF (**W**)	**GRM0225C1C9R5WD05L**	**GRM0335C1H9R5WD01D**	**GRM1555C1H9R5WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R5BD05L**	**GRM0335C1H9R5BD01D**	**GRM1555C1H9R5BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R5CD05L**	**GRM0335C1H9R5CD01D**	**GRM1555C1H9R5CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R5DD05L**	**GRM0335C1H9R5DD01D**	**GRM1555C1H9R5DA01D**
9.6pF (**9R6**)	±0.05pF (**W**)	**GRM0225C1C9R6WD05L**	**GRM0335C1H9R6WD01D**	**GRM1555C1H9R6WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R6BD05L**	**GRM0335C1H9R6BD01D**	**GRM1555C1H9R6BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R6CD05L**	**GRM0335C1H9R6CD01D**	**GRM1555C1H9R6CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R6DD05L**	**GRM0335C1H9R6DD01D**	**GRM1555C1H9R6DA01D**
9.7pF (**9R7**)	±0.05pF (**W**)	**GRM0225C1C9R7WD05L**	**GRM0335C1H9R7WD01D**	**GRM1555C1H9R7WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R7BD05L**	**GRM0335C1H9R7BD01D**	**GRM1555C1H9R7BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R7CD05L**	**GRM0335C1H9R7CD01D**	**GRM1555C1H9R7CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R7DD05L**	**GRM0335C1H9R7DD01D**	**GRM1555C1H9R7DA01D**
9.8pF (**9R8**)	±0.05pF (**W**)	**GRM0225C1C9R8WD05L**	**GRM0335C1H9R8WD01D**	**GRM1555C1H9R8WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R8BD05L**	**GRM0335C1H9R8BD01D**	**GRM1555C1H9R8BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R8CD05L**	**GRM0335C1H9R8CD01D**	**GRM1555C1H9R8CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R8DD05L**	**GRM0335C1H9R8DD01D**	**GRM1555C1H9R8DA01D**
9.9pF (**9R9**)	±0.05pF (**W**)	**GRM0225C1C9R9WD05L**	**GRM0335C1H9R9WD01D**	**GRM1555C1H9R9WA01D**
	±0.1pF (**B**)	**GRM0225C1C9R9BD05L**	**GRM0335C1H9R9BD01D**	**GRM1555C1H9R9BA01D**
	±0.25pF (**C**)	**GRM0225C1C9R9CD05L**	**GRM0335C1H9R9CD01D**	**GRM1555C1H9R9CA01D**
	±0.5pF (**D**)	**GRM0225C1C9R9DD05L**	**GRM0335C1H9R9DD01D**	**GRM1555C1H9R9DA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | 5C ❺ | 1C ❻ | 9R1 ❼ | W ❽ | D05 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging *

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

*GRM022: D is applicable.

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>			0.6x0.3(**03**)<0201>
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)	50(**1H**)
Capacitance	Tolerance	Part Number			
10pF(**100**)	±2% (**G**)	**GRM0225C1C100GD05L**			**GRM0335C1H100GD01D**
	±5% (**J**)	**GRM0225C1C100JD05L**			**GRM0335C1H100JD01D**
12pF(**120**)	±2% (**G**)	**GRM0225C1C120GD05L**			**GRM0335C1H120GD01D**
	±5% (**J**)	**GRM0225C1C120JD05L**			**GRM0335C1H120JD01D**
15pF(**150**)	±2% (**G**)	**GRM0225C1C150GD05L**			**GRM0335C1H150GD01D**
	±5% (**J**)	**GRM0225C1C150JD05L**			**GRM0335C1H150JD01D**
18pF(**180**)	±2% (**G**)	**GRM0225C1C180GD05L**			**GRM0335C1H180GD01D**
	±5% (**J**)	**GRM0225C1C180JD05L**			**GRM0335C1H180JD01D**
22pF(**220**)	±2% (**G**)	**GRM0225C1C220GD05L**			**GRM0335C1H220GD01D**
	±5% (**J**)	**GRM0225C1C220JD05L**			**GRM0335C1H220JD01D**
27pF(**270**)	±2% (**G**)	**GRM0225C1C270GD05L**			**GRM0335C1H270GD01D**
	±5% (**J**)	**GRM0225C1C270JD05L**			**GRM0335C1H270JD01D**
33pF(**330**)	±2% (**G**)	**GRM0225C1C330GD05L**			**GRM0335C1H330GD01D**
	±5% (**J**)	**GRM0225C1C330JD05L**			**GRM0335C1H330JD01D**
39pF(**390**)	±2% (**G**)	**GRM0225C1C390GD05L**			**GRM0335C1H390GD01D**
	±5% (**J**)	**GRM0225C1C390JD05L**			**GRM0335C1H390JD01D**
47pF(**470**)	±2% (**G**)	**GRM0225C1C470GD05L**			**GRM0335C1H470GD01D**
	±5% (**J**)	**GRM0225C1C470JD05L**			**GRM0335C1H470JD01D**
56pF(**560**)	±2% (**G**)		**GRM0225C1A560GD05L**	**GRM0225C0J560GD05L**	**GRM0335C1H560GD01D**
	±5% (**J**)		**GRM0225C1A560JD05L**	**GRM0225C0J560JD05L**	**GRM0335C1H560JD01D**
68pF(**680**)	±2% (**G**)		**GRM0225C1A680GD05L**	**GRM0225C0J680GD05L**	**GRM0335C1H680GD01D**
	±5% (**J**)		**GRM0225C1A680JD05L**	**GRM0225C0J680JD05L**	**GRM0335C1H680JD01D**
82pF(**820**)	±2% (**G**)		**GRM0225C1A820GD05L**	**GRM0225C0J820GD05L**	**GRM0335C1H820GD01D**
	±5% (**J**)		**GRM0225C1A820JD05L**	**GRM0225C0J820JD05L**	**GRM0335C1H820JD01D**
100pF(**101**)	±2% (**G**)		**GRM0225C1A101GD05L**	**GRM0225C0J101GD05L**	**GRM0335C1H101GD01D**
	±5% (**J**)		**GRM0225C1A101JD05L**	**GRM0225C0J101JD05L**	**GRM0335C1H101JD01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		50(**1H**)
TC		C0G (**5C**)
Capacitance	Tolerance	Part Number
10pF (**100**)	±2% (**G**)	**GRM1555C1H100GA01D**
	±5% (**J**)	**GRM1555C1H100JA01D**
12pF (**120**)	±2% (**G**)	**GRM1555C1H120GA01D**
	±5% (**J**)	**GRM1555C1H120JA01D**
15pF (**150**)	±2% (**G**)	**GRM1555C1H150GA01D**
	±5% (**J**)	**GRM1555C1H150JA01D**
18pF (**180**)	±2% (**G**)	**GRM1555C1H180GA01D**
	±5% (**J**)	**GRM1555C1H180JA01D**
22pF (**220**)	±2% (**G**)	**GRM1555C1H220GA01D**
	±5% (**J**)	**GRM1555C1H220JA01D**
27pF (**270**)	±2% (**G**)	**GRM1555C1H270GA01D**
	±5% (**J**)	**GRM1555C1H270JA01D**
33pF (**330**)	±2% (**G**)	**GRM1555C1H330GA01D**
	±5% (**J**)	**GRM1555C1H330JA01D**
39pF (**390**)	±2% (**G**)	**GRM1555C1H390GA01D**
	±5% (**J**)	**GRM1555C1H390JA01D**
47pF (**470**)	±2% (**G**)	**GRM1555C1H470GA01D**
	±5% (**J**)	**GRM1555C1H470JA01D**
56pF (**560**)	±2% (**G**)	**GRM1555C1H560GA01D**
	±5% (**J**)	**GRM1555C1H560JA01D**
68pF (**680**)	±2% (**G**)	**GRM1555C1H680GA01D**
	±5% (**J**)	**GRM1555C1H680JA01D**
82pF (**820**)	±2% (**G**)	**GRM1555C1H820GA01D**
	±5% (**J**)	**GRM1555C1H820JA01D**
100pF (**101**)	±2% (**G**)	**GRM1555C1H101GA01D**
	±5% (**J**)	**GRM1555C1H101JA01D**
120pF (**121**)	±2% (**G**)	**GRM1555C1H121GA01D**
	±5% (**J**)	**GRM1555C1H121JA01D**
150pF (**151**)	±2% (**G**)	**GRM1555C1H151GA01D**
	±5% (**J**)	**GRM1555C1H151JA01D**
180pF (**181**)	±2% (**G**)	**GRM1555C1H181GA01D**
	±5% (**J**)	**GRM1555C1H181JA01D**
220pF (**221**)	±2% (**G**)	**GRM1555C1H221GA01D**
	±5% (**J**)	**GRM1555C1H221JA01D**
270pF (**271**)	±2% (**G**)	**GRM1555C1H271GA01D**
	±5% (**J**)	**GRM1555C1H271JA01D**
330pF (**331**)	±2% (**G**)	**GRM1555C1H331GA01D**
	±5% (**J**)	**GRM1555C1H331JA01D**
390pF (**391**)	±2% (**G**)	**GRM1555C1H391GA01D**
	±5% (**J**)	**GRM1555C1H391JA01D**
470pF (**471**)	±2% (**G**)	**GRM1555C1H471GA01D**
	±5% (**J**)	**GRM1555C1H471JA01D**
560pF (**561**)	±2% (**G**)	**GRM1555C1H561GA01D**
	±5% (**J**)	**GRM1555C1H561JA01D**
680pF (**681**)	±2% (**G**)	**GRM1555C1H681GA01D**
	±5% (**J**)	**GRM1555C1H681JA01D**
820pF (**821**)	±2% (**G**)	**GRM1555C1H821GA01D**
	±5% (**J**)	**GRM1555C1H821JA01D**
1000pF (**102**)	±2% (**G**)	**GRM1555C1H102GA01D**
	±5% (**J**)	**GRM1555C1H102JA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) **GR M 15 5 5C 1H 100 G Z01 D**

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>	
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number	
10pF(**100**)	±5% (**J**)	**GRM1885C2A100JA01D**	**GRM1885C1H100JA01D**
12pF(**120**)	±5% (**J**)	**GRM1885C2A120JA01D**	**GRM1885C1H120JA01D**
15pF(**150**)	±5% (**J**)	**GRM1885C2A150JA01D**	**GRM1885C1H150JA01D**
18pF(**180**)	±5% (**J**)	**GRM1885C2A180JA01D**	**GRM1885C1H180JA01D**
22pF(**220**)	±5% (**J**)	**GRM1885C2A220JA01D**	**GRM1885C1H220JA01D**
27pF(**270**)	±5% (**J**)	**GRM1885C2A270JA01D**	**GRM1885C1H270JA01D**
33pF(**330**)	±5% (**J**)	**GRM1885C2A330JA01D**	**GRM1885C1H330JA01D**
39pF(**390**)	±5% (**J**)	**GRM1885C2A390JA01D**	**GRM1885C1H390JA01D**
47pF(**470**)	±5% (**J**)	**GRM1885C2A470JA01D**	**GRM1885C1H470JA01D**
56pF(**560**)	±5% (**J**)	**GRM1885C2A560JA01D**	**GRM1885C1H560JA01D**
68pF(**680**)	±5% (**J**)	**GRM1885C2A680JA01D**	**GRM1885C1H680JA01D**
82pF(**820**)	±5% (**J**)	**GRM1885C2A820JA01D**	**GRM1885C1H820JA01D**
100pF(**101**)	±5% (**J**)	**GRM1885C2A101JA01D**	**GRM1885C1H101JA01D**
120pF(**121**)	±5% (**J**)	**GRM1885C2A121JA01D**	**GRM1885C1H121JA01D**
150pF(**151**)	±5% (**J**)	**GRM1885C2A151JA01D**	**GRM1885C1H151JA01D**
180pF(**181**)	±5% (**J**)	**GRM1885C2A181JA01D**	**GRM1885C1H181JA01D**
220pF(**221**)	±5% (**J**)	**GRM1885C2A221JA01D**	**GRM1885C1H221JA01D**
270pF(**271**)	±5% (**J**)	**GRM1885C2A271JA01D**	**GRM1885C1H271JA01D**
330pF(**331**)	±5% (**J**)	**GRM1885C2A331JA01D**	**GRM1885C1H331JA01D**
390pF(**391**)	±5% (**J**)	**GRM1885C2A391JA01D**	**GRM1885C1H391JA01D**
470pF(**471**)	±5% (**J**)	**GRM1885C2A471JA01D**	**GRM1885C1H471JA01D**
560pF(**561**)	±5% (**J**)	**GRM1885C2A561JA01D**	**GRM1885C1H561JA01D**
680pF(**681**)	±5% (**J**)	**GRM1885C2A681JA01D**	**GRM1885C1H681JA01D**
820pF(**821**)	±5% (**J**)	**GRM1885C2A821JA01D**	**GRM1885C1H821JA01D**
1000pF(**102**)	±5% (**J**)	**GRM1885C2A102JA01D**	**GRM1885C1H102JA01D**
1200pF(**122**)	±5% (**J**)	**GRM1885C2A122JA01D**	**GRM1885C1H122JA01D**
1500pF(**152**)	±5% (**J**)	**GRM1885C2A152JA01D**	**GRM1885C1H152JA01D**
1800pF(**182**)	±5% (**J**)		**GRM1885C1H182JA01D**
2200pF(**222**)	±5% (**J**)		**GRM1885C1H222JA01D**
2700pF(**272**)	±5% (**J**)		**GRM1885C1H272JA01D**
3300pF(**332**)	±5% (**J**)		**GRM1885C1H332JA01D**
3900pF(**392**)	±5% (**J**)		**GRM1885C1H392JA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		2.0x1.25(**21**)<0805>		3.2x1.6(**31**)<1206>	
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number			
10pF(**100**)	±5% (**J**)	**GRM2165C2A100JA01D**			
12pF(**120**)	±5% (**J**)	**GRM2165C2A120JA01D**			
15pF(**150**)	±5% (**J**)	**GRM2165C2A150JA01D**			
18pF(**180**)	±5% (**J**)	**GRM2165C2A180JA01D**			
22pF(**220**)	±5% (**J**)	**GRM2165C2A220JA01D**			
27pF(**270**)	±5% (**J**)	**GRM2165C2A270JA01D**			
33pF(**330**)	±5% (**J**)	**GRM2165C2A330JA01D**			
39pF(**390**)	±5% (**J**)	**GRM2165C2A390JA01D**			
47pF(**470**)	±5% (**J**)	**GRM2165C2A470JA01D**			
56pF(**560**)	±5% (**J**)	**GRM2165C2A560JA01D**			
68pF(**680**)	±5% (**J**)	**GRM2165C2A680JA01D**			
82pF(**820**)	±5% (**J**)	**GRM2165C2A820JA01D**			
100pF(**101**)	±5% (**J**)	**GRM2165C2A101JA01D**			
120pF(**121**)	±5% (**J**)	**GRM2165C2A121JA01D**			
150pF(**151**)	±5% (**J**)	**GRM2165C2A151JA01D**			
180pF(**181**)	±5% (**J**)	**GRM2165C2A181JA01D**			
220pF(**221**)	±5% (**J**)	**GRM2165C2A221JA01D**			
270pF(**271**)	±5% (**J**)	**GRM2165C2A271JA01D**			
330pF(**331**)	±5% (**J**)	**GRM2165C2A331JA01D**			
390pF(**391**)	±5% (**J**)	**GRM2165C2A391JA01D**			
470pF(**471**)	±5% (**J**)	**GRM2165C2A471JA01D**			
560pF(**561**)	±5% (**J**)	**GRM2165C2A561JA01D**			
680pF(**681**)	±5% (**J**)	**GRM2165C2A681JA01D**			
820pF(**821**)	±5% (**J**)	**GRM2165C2A821JA01D**			
1000pF(**102**)	±5% (**J**)	**GRM2165C2A102JA01D**			
1200pF(**122**)	±5% (**J**)	**GRM2165C2A122JA01D**	**GRM2165C1H122JA01D**		
1500pF(**152**)	±5% (**J**)	**GRM2165C2A152JA01D**	**GRM2165C1H152JA01D**		
1800pF(**182**)	±5% (**J**)	**GRM2165C2A182JA01D**	**GRM2165C1H182JA01D**	**GRM3195C2A182JA01D**	
2200pF(**222**)	±5% (**J**)	**GRM2165C2A222JA01D**	**GRM2165C1H222JA01D**	**GRM3195C2A222JA01D**	
2700pF(**272**)	±5% (**J**)	**GRM2165C2A272JA01D**	**GRM2165C1H272JA01D**	**GRM3195C2A272JA01D**	
3300pF(**332**)	±5% (**J**)	**GRM2165C2A332JA01D**	**GRM2165C1H332JA01D**	**GRM3195C2A332JA01D**	
3900pF(**392**)	±5% (**J**)		**GRM2165C1H392JA01D**	**GRM3195C2A392JA01D**	
4700pF(**472**)	±5% (**J**)		**GRM2165C1H472JA01D**	**GRM3195C2A472JA01D**	**GRM3195C1H472JA01D**
5600pF(**562**)	±5% (**J**)		**GRM2195C1H562JA01D**	**GRM3195C2A562JA01D**	**GRM3195C1H562JA01D**
6800pF(**682**)	±5% (**J**)		**GRM2195C1H682JA01D**	**GRM3195C2A682JA01D**	**GRM3195C1H682JA01D**
8200pF(**822**)	±5% (**J**)		**GRM2195C1H822JA01D**	**GRM3195C2A822JA01D**	**GRM3195C1H822JA01D**
10000pF(**103**)	±5% (**J**)		**GRM2195C1H103JA01D**	**GRM3195C2A103JA01D**	**GRM3195C1H103JA01D**
12000pF(**123**)	±5% (**J**)		**GRM2195C1H123JA01D**		**GRM3195C1H123JA01D**
15000pF(**153**)	±5% (**J**)		**GRM2195C1H153JA01D**		**GRM3195C1H153JA01D**
18000pF(**183**)	±5% (**J**)		**GRM21B5C1H183JA01L**		**GRM3195C1H183JA01D**
22000pF(**223**)	±5% (**J**)		**GRM21B5C1H223JA01L**		**GRM3195C1H223JA01D**
27000pF(**273**)	±5% (**J**)				**GRM3195C1H273JA01D**
33000pF(**333**)	±5% (**J**)				**GRM3195C1H333JA01D**
39000pF(**393**)	±5% (**J**)				**GRM3195C1H393JA01D**
47000pF(**473**)	±5% (**J**)				**GRM31M5C1H473JA01L**
56000pF(**563**)	±5% (**J**)				**GRM31M5C1H563JA01L**
68000pF(**683**)	±5% (**J**)				**GRM31C5C1H683JA01L**
82000pF(**823**)	±5% (**J**)				**GRM31C5C1H823JA01L**
100000pF(**104**)	±5% (**J**)				**GRM31C5C1H104JA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 21 ❸ | 6 ❹ | 5C ❺ | 2A ❻ | 101 ❼ | J ❽ | A01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics Low Profile

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		50(**1H**)
Capacitance	Tolerance	Part Number
0.1pF (**R10**)	±0.1pF (**B**)	**GRM1535C1HR10BDD5D**
0.2pF (**R20**)	±0.1pF (**B**)	**GRM1535C1HR20BDD5D**
0.3pF (**R30**)	±0.1pF (**B**)	**GRM1535C1HR30BDD5D**
0.4pF (**R40**)	±0.1pF (**B**)	**GRM1535C1HR40BDD5D**
0.5pF (**R50**)	±0.1pF (**B**)	**GRM1535C1HR50BDD5D**
0.6pF (**R60**)	±0.1pF (**B**)	**GRM1535C1HR60BDD5D**
0.7pF (**R70**)	±0.1pF (**B**)	**GRM1535C1HR70BDD5D**
0.8pF (**R80**)	±0.1pF (**B**)	**GRM1535C1HR80BDD5D**
0.9pF (**R90**)	±0.1pF (**B**)	**GRM1535C1HR90BDD5D**
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM1535C1H1R0CDD5D**
1.1pF (**1R1**)	±0.25pF (**C**)	**GRM1535C1H1R1CDD5D**
1.2pF (**1R2**)	±0.25pF (**C**)	**GRM1535C1H1R2CDD5D**
1.3pF (**1R3**)	±0.25pF (**C**)	**GRM1535C1H1R3CDD5D**
1.4pF (**1R4**)	±0.25pF (**C**)	**GRM1535C1H1R4CDD5D**
1.5pF (**1R5**)	±0.25pF (**C**)	**GRM1535C1H1R5CDD5D**
1.6pF (**1R6**)	±0.25pF (**C**)	**GRM1535C1H1R6CDD5D**
1.7pF (**1R7**)	±0.25pF (**C**)	**GRM1535C1H1R7CDD5D**
1.8pF (**1R8**)	±0.25pF (**C**)	**GRM1535C1H1R8CDD5D**
1.9pF (**1R9**)	±0.25pF (**C**)	**GRM1535C1H1R9CDD5D**
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM1535C1H2R0CDD5D**
2.1pF (**2R1**)	±0.25pF (**C**)	**GRM1535C1H2R1CDD5D**
2.2pF (**2R2**)	±0.25pF (**C**)	**GRM1535C1H2R2CDD5D**
2.3pF (**2R3**)	±0.25pF (**C**)	**GRM1535C1H2R3CDD5D**
2.4pF (**2R4**)	±0.25pF (**C**)	**GRM1535C1H2R4CDD5D**
2.5pF (**2R5**)	±0.25pF (**C**)	**GRM1535C1H2R5CDD5D**
2.6pF (**2R6**)	±0.25pF (**C**)	**GRM1535C1H2R6CDD5D**
2.7pF (**2R7**)	±0.25pF (**C**)	**GRM1535C1H2R7CDD5D**
2.8pF (**2R8**)	±0.25pF (**C**)	**GRM1535C1H2R8CDD5D**
2.9pF (**2R9**)	±0.25pF (**C**)	**GRM1535C1H2R9CDD5D**
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM1535C1H3R0CDD5D**
3.1pF (**3R1**)	±0.25pF (**C**)	**GRM1535C1H3R1CDD5D**
3.2pF (**3R2**)	±0.25pF (**C**)	**GRM1535C1H3R2CDD5D**
3.3pF (**3R3**)	±0.25pF (**C**)	**GRM1535C1H3R3CDD5D**
3.4pF (**3R4**)	±0.25pF (**C**)	**GRM1535C1H3R4CDD5D**
3.5pF (**3R5**)	±0.25pF (**C**)	**GRM1535C1H3R5CDD5D**
3.6pF (**3R6**)	±0.25pF (**C**)	**GRM1535C1H3R6CDD5D**
3.7pF (**3R7**)	±0.25pF (**C**)	**GRM1535C1H3R7CDD5D**
3.8pF (**3R8**)	±0.25pF (**C**)	**GRM1535C1H3R8CDD5D**
3.9pF (**3R9**)	±0.25pF (**C**)	**GRM1535C1H3R9CDD5D**
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM1535C1H4R0CDD5D**
4.1pF (**4R1**)	±0.25pF (**C**)	**GRM1535C1H4R1CDD5D**
4.2pF (**4R2**)	±0.25pF (**C**)	**GRM1535C1H4R2CDD5D**
4.3pF (**4R3**)	±0.25pF (**C**)	**GRM1535C1H4R3CDD5D**
4.4pF (**4R4**)	±0.25pF (**C**)	**GRM1535C1H4R4CDD5D**
4.5pF (**4R5**)	±0.25pF (**C**)	**GRM1535C1H4R5CDD5D**
4.6pF (**4R6**)	±0.25pF (**C**)	**GRM1535C1H4R6CDD5D**
4.7pF (**4R7**)	±0.25pF (**C**)	**GRM1535C1H4R7CDD5D**
4.8pF (**4R8**)	±0.25pF (**C**)	**GRM1535C1H4R8CDD5D**
4.9pF (**4R9**)	±0.25pF (**C**)	**GRM1535C1H4R9CDD5D**
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM1535C1H5R0CDD5D**

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		50(**1H**)
Capacitance	Tolerance	Part Number
5.1pF (**5R1**)	±0.5pF (**D**)	**GRM1535C1H5R1DDD5D**
5.2pF (**5R2**)	±0.5pF (**D**)	**GRM1535C1H5R2DDD5D**
5.3pF (**5R3**)	±0.5pF (**D**)	**GRM1535C1H5R3DDD5D**
5.4pF (**5R4**)	±0.5pF (**D**)	**GRM1535C1H5R4DDD5D**
5.5pF (**5R5**)	±0.5pF (**D**)	**GRM1535C1H5R5DDD5D**
5.6pF (**5R6**)	±0.5pF (**D**)	**GRM1535C1H5R6DDD5D**
5.7pF (**5R7**)	±0.5pF (**D**)	**GRM1535C1H5R7DDD5D**
5.8pF (**5R8**)	±0.5pF (**D**)	**GRM1535C1H5R8DDD5D**
5.9pF (**5R9**)	±0.5pF (**D**)	**GRM1535C1H5R9DDD5D**
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM1535C1H6R0DDD5D**
6.1pF (**6R1**)	±0.5pF (**D**)	**GRM1535C1H6R1DDD5D**
6.2pF (**6R2**)	±0.5pF (**D**)	**GRM1535C1H6R2DDD5D**
6.3pF (**6R3**)	±0.5pF (**D**)	**GRM1535C1H6R3DDD5D**
6.4pF (**6R4**)	±0.5pF (**D**)	**GRM1535C1H6R4DDD5D**
6.5pF (**6R5**)	±0.5pF (**D**)	**GRM1535C1H6R5DDD5D**
6.6pF (**6R6**)	±0.5pF (**D**)	**GRM1535C1H6R6DDD5D**
6.7pF (**6R7**)	±0.5pF (**D**)	**GRM1535C1H6R7DDD5D**
6.8pF (**6R8**)	±0.5pF (**D**)	**GRM1535C1H6R8DDD5D**
6.9pF (**6R9**)	±0.5pF (**D**)	**GRM1535C1H6R9DDD5D**
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM1535C1H7R0DDD5D**
7.1pF (**7R1**)	±0.5pF (**D**)	**GRM1535C1H7R1DDD5D**
7.2pF (**7R2**)	±0.5pF (**D**)	**GRM1535C1H7R2DDD5D**
7.3pF (**7R3**)	±0.5pF (**D**)	**GRM1535C1H7R3DDD5D**
7.4pF (**7R4**)	±0.5pF (**D**)	**GRM1535C1H7R4DDD5D**
7.5pF (**7R5**)	±0.5pF (**D**)	**GRM1535C1H7R5DDD5D**
7.6pF (**7R6**)	±0.5pF (**D**)	**GRM1535C1H7R6DDD5D**
7.7pF (**7R7**)	±0.5pF (**D**)	**GRM1535C1H7R7DDD5D**
7.8pF (**7R8**)	±0.5pF (**D**)	**GRM1535C1H7R8DDD5D**
7.9pF (**7R9**)	±0.5pF (**D**)	**GRM1535C1H7R9DDD5D**
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM1535C1H8R0DDD5D**
8.1pF (**8R1**)	±0.5pF (**D**)	**GRM1535C1H8R1DDD5D**
8.2pF (**8R2**)	±0.5pF (**D**)	**GRM1535C1H8R2DDD5D**
8.3pF (**8R3**)	±0.5pF (**D**)	**GRM1535C1H8R3DDD5D**
8.4pF (**8R4**)	±0.5pF (**D**)	**GRM1535C1H8R4DDD5D**
8.5pF (**8R5**)	±0.5pF (**D**)	**GRM1535C1H8R5DDD5D**
8.6pF (**8R6**)	±0.5pF (**D**)	**GRM1535C1H8R6DDD5D**
8.7pF (**8R7**)	±0.5pF (**D**)	**GRM1535C1H8R7DDD5D**
8.8pF (**8R8**)	±0.5pF (**D**)	**GRM1535C1H8R8DDD5D**
8.9pF (**8R9**)	±0.5pF (**D**)	**GRM1535C1H8R9DDD5D**
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM1535C1H9R0DDD5D**
9.1pF (**9R1**)	±0.5pF (**D**)	**GRM1535C1H9R1DDD5D**
9.2pF (**9R2**)	±0.5pF (**D**)	**GRM1535C1H9R2DDD5D**
9.3pF (**9R3**)	±0.5pF (**D**)	**GRM1535C1H9R3DDD5D**
9.4pF (**9R4**)	±0.5pF (**D**)	**GRM1535C1H9R4DDD5D**
9.5pF (**9R5**)	±0.5pF (**D**)	**GRM1535C1H9R5DDD5D**
9.6pF (**9R6**)	±0.5pF (**D**)	**GRM1535C1H9R6DDD5D**
9.7pF (**9R7**)	±0.5pF (**D**)	**GRM1535C1H9R7DDD5D**
9.8pF (**9R8**)	±0.5pF (**D**)	**GRM1535C1H9R8DDD5D**
9.9pF (**9R9**)	±0.5pF (**D**)	**GRM1535C1H9R9DDD5D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics Low Profile

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		50(**1H**)
Capacitance	Tolerance	Part Number
10pF(**100**)	±5% (**J**)	**GRM1535C1H100JDD5D**
12pF(**120**)	±5% (**J**)	**GRM1535C1H120JDD5D**
15pF(**150**)	±5% (**J**)	**GRM1535C1H150JDD5D**
18pF(**180**)	±5% (**J**)	**GRM1535C1H180JDD5D**
22pF(**220**)	±5% (**J**)	**GRM1535C1H220JDD5D**
27pF(**270**)	±5% (**J**)	**GRM1535C1H270JDD5D**
33pF(**330**)	±5% (**J**)	**GRM1535C1H330JDD5D**
39pF(**390**)	±5% (**J**)	**GRM1535C1H390JDD5D**
47pF(**470**)	±5% (**J**)	**GRM1535C1H470JDD5D**
56pF(**560**)	±5% (**J**)	**GRM1535C1H560JDD5D**
68pF(**680**)	±5% (**J**)	**GRM1535C1H680JDD5D**
82pF(**820**)	±5% (**J**)	**GRM1535C1H820JDD5D**
100pF(**101**)	±5% (**J**)	**GRM1535C1H101JDD5D**
120pF(**121**)	±5% (**J**)	**GRM1535C1H121JDD5D**
150pF(**151**)	±5% (**J**)	**GRM1535C1H151JDD5D**
180pF(**181**)	±5% (**J**)	**GRM1535C1H181JDD5D**
220pF(**221**)	±5% (**J**)	**GRM1535C1H221JDD5D**
270pF(**271**)	±5% (**J**)	**GRM1535C1H271JDD5D**
330pF(**331**)	±5% (**J**)	**GRM1535C1H331JDD5D**
390pF(**391**)	±5% (**J**)	**GRM1535C1H391JDD5D**
470pF(**471**)	±5% (**J**)	**GRM1535C1H471JDD5D**
560pF(**561**)	±5% (**J**)	**GRM1535C1H561JDD5D**
680pF(**681**)	±5% (**J**)	**GRM1535C1H681JDD5D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) **GR** **M** **15** **3** **5C** **1H** **100** **J** **DD5** **D**
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics Low Profile

LxW [mm]		2.0x1.25(**21**)<0805>		3.2x1.6(**31**)<1206>	
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number			
100pF(**101**)	±5% (**J**)	**GRM2165C2A101JA01D**			
120pF(**121**)	±5% (**J**)	**GRM2165C2A121JA01D**			
150pF(**151**)	±5% (**J**)	**GRM2165C2A151JA01D**			
180pF(**181**)	±5% (**J**)	**GRM2165C2A181JA01D**			
220pF(**221**)	±5% (**J**)	**GRM2165C2A221JA01D**			
270pF(**271**)	±5% (**J**)	**GRM2165C2A271JA01D**			
330pF(**331**)	±5% (**J**)	**GRM2165C2A331JA01D**			
390pF(**391**)	±5% (**J**)	**GRM2165C2A391JA01D**			
470pF(**471**)	±5% (**J**)	**GRM2165C2A471JA01D**			
560pF(**561**)	±5% (**J**)	**GRM2165C2A561JA01D**			
680pF(**681**)	±5% (**J**)	**GRM2165C2A681JA01D**			
820pF(**821**)	±5% (**J**)	**GRM2165C2A821JA01D**			
1000pF(**102**)	±5% (**J**)	**GRM2165C2A102JA01D**			
1200pF(**122**)	±5% (**J**)	**GRM2165C2A122JA01D**	**GRM2165C1H122JA01D**		
1500pF(**152**)	±5% (**J**)	**GRM2165C2A152JA01D**	**GRM2165C1H152JA01D**		
1800pF(**182**)	±5% (**J**)	**GRM2165C2A182JA01D**	**GRM2165C1H182JA01D**	**GRM3195C2A182JA01D**	
2200pF(**222**)	±5% (**J**)	**GRM2165C2A222JA01D**	**GRM2165C1H222JA01D**	**GRM3195C2A222JA01D**	
2700pF(**272**)	±5% (**J**)	**GRM2165C2A272JA01D**	**GRM2165C1H272JA01D**	**GRM3195C2A272JA01D**	
3300pF(**332**)	±5% (**J**)	**GRM2165C2A332JA01D**	**GRM2165C1H332JA01D**	**GRM3195C2A332JA01D**	
3900pF(**392**)	±5% (**J**)		**GRM2165C1H392JA01D**	**GRM3195C2A392JA01D**	
4700pF(**472**)	±5% (**J**)		**GRM2165C1H472JA01D**	**GRM3195C2A472JA01D**	**GRM3195C1H472JA01D**
5600pF(**562**)	±5% (**J**)		**GRM2195C1H562JA01D**	**GRM3195C2A562JA01D**	**GRM3195C1H562JA01D**
6800pF(**682**)	±5% (**J**)		**GRM2195C1H682JA01D**	**GRM3195C2A682JA01D**	**GRM3195C1H682JA01D**
8200pF(**822**)	±5% (**J**)		**GRM2195C1H822JA01D**	**GRM3195C2A822JA01D**	**GRM3195C1H822JA01D**
10000pF(**103**)	±5% (**J**)		**GRM2195C1H103JA01D**	**GRM3195C2A103JA01D**	**GRM3195C1H103JA01D**
12000pF(**123**)	±5% (**J**)		**GRM2195C1H123JA01D**		**GRM3195C1H123JA01D**
15000pF(**153**)	±5% (**J**)		**GRM2195C1H153JA01D**		**GRM3195C1H153JA01D**
18000pF(**183**)	±5% (**J**)				**GRM3195C1H183JA01D**
22000pF(**223**)	±5% (**J**)				**GRM3195C1H223JA01D**
27000pF(**273**)	±5% (**J**)				**GRM3195C1H273JA01D**
33000pF(**333**)	±5% (**J**)				**GRM3195C1H333JA01D**
39000pF(**393**)	±5% (**J**)				**GRM3195C1H393JA01D**
47000pF(**473**)	±5% (**J**)				**GRM31M5C1H473JA01L**
56000pF(**563**)	±5% (**J**)				**GRM31M5C1H563JA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

Temperature Compensating Type U2J(7U) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>		1.0x0.5(**15**)<0402>	
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	50(**1H**)	10(**1A**)
Capacitance	Tolerance	Part Number			
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM0337U1H1R0CD01D**		**GRM1557U1H1R0CZ01D**	
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM0337U1H2R0CD01D**		**GRM1557U1H2R0CZ01D**	
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM0337U1H3R0CD01D**		**GRM1557U1H3R0CZ01D**	
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM0337U1H4R0CD01D**		**GRM1557U1H4R0CZ01D**	
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM0337U1H5R0CD01D**		**GRM1557U1H5R0CZ01D**	
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM0337U1H6R0DD01D**		**GRM1557U1H6R0DZ01D**	
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM0337U1H7R0DD01D**		**GRM1557U1H7R0DZ01D**	
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM0337U1H8R0DD01D**		**GRM1557U1H8R0DZ01D**	
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM0337U1H9R0DD01D**		**GRM1557U1H9R0DZ01D**	
10pF (**100**)	±5% (**J**)	**GRM0337U1H100JD01D**		**GRM1557U1H100JZ01D**	
12pF (**120**)	±5% (**J**)	**GRM0337U1H120JD01D**		**GRM1557U1H120JZ01D**	
15pF (**150**)	±5% (**J**)	**GRM0337U1H150JD01D**		**GRM1557U1H150JZ01D**	
18pF (**180**)	±5% (**J**)		**GRM0337U1E180JD01D**	**GRM1557U1H180JZ01D**	
22pF (**220**)	±5% (**J**)		**GRM0337U1E220JD01D**	**GRM1557U1H220JZ01D**	
27pF (**270**)	±5% (**J**)		**GRM0337U1E270JD01D**	**GRM1557U1H270JZ01D**	
33pF (**330**)	±5% (**J**)		**GRM0337U1E330JD01D**	**GRM1557U1H330JZ01D**	
39pF (**390**)	±5% (**J**)		**GRM0337U1E390JD01D**	**GRM1557U1H390JZ01D**	
47pF (**470**)	±5% (**J**)		**GRM0337U1E470JD01D**	**GRM1557U1H470JZ01D**	
56pF (**560**)	±5% (**J**)		**GRM0337U1E560JD01D**	**GRM1557U1H560JZ01D**	
68pF (**680**)	±5% (**J**)		**GRM0337U1E680JD01D**	**GRM1557U1H680JZ01D**	
82pF (**820**)	±5% (**J**)		**GRM0337U1E820JD01D**	**GRM1557U1H820JZ01D**	
100pF (**101**)	±5% (**J**)		**GRM0337U1E101JD01D**	**GRM1557U1H101JZ01D**	
120pF (**121**)	±5% (**J**)			**GRM1557U1H121JZ01D**	
150pF (**151**)	±5% (**J**)			**GRM1557U1H151JZ01D**	
180pF (**181**)	±5% (**J**)			**GRM1557U1H181JZ01D**	
1200pF (**122**)	±5% (**J**)				**GRM1557U1A122JA01D**
1500pF (**152**)	±5% (**J**)				**GRM1557U1A152JA01D**
1800pF (**182**)	±5% (**J**)				**GRM1557U1A182JA01D**
2200pF (**222**)	±5% (**J**)				**GRM1557U1A222JA01D**
2700pF (**272**)	±5% (**J**)				**GRM1557U1A272JA01D**
3300pF (**332**)	±5% (**J**)				**GRM1557U1A332JA01D**
3900pF (**392**)	±5% (**J**)				**GRM1557U1A392JA01D**
4700pF (**472**)	±5% (**J**)				**GRM1557U1A472JA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 03 ❸ | 3 ❹ | 7U ❺ | 1H ❻ | 1R0 ❼ | C ❽ | D01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type U2J(7U) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>	
Rated Volt. [Vdc]		50(**1H**)	10(**1A**)
Capacitance	Tolerance	Part Number	
1000pF(**102**)	±5% (**J**)	**GRM1887U1H102JA01D**	
1200pF(**122**)	±5% (**J**)	**GRM1887U1H122JA01D**	
1500pF(**152**)	±5% (**J**)	**GRM1887U1H152JA01D**	
1800pF(**182**)	±5% (**J**)	**GRM1887U1H182JA01D**	
2200pF(**222**)	±5% (**J**)	**GRM1887U1H222JA01D**	
2700pF(**272**)	±5% (**J**)	**GRM1887U1H272JA01D**	
3300pF(**332**)	±5% (**J**)	**GRM1887U1H332JA01D**	
3900pF(**392**)	±5% (**J**)	**GRM1887U1H392JA01D**	
4700pF(**472**)	±5% (**J**)	**GRM1887U1H472JA01D**	
5600pF(**562**)	±5% (**J**)	**GRM1887U1H562JA01D**	
6800pF(**682**)	±5% (**J**)	**GRM1887U1H682JA01D**	
8200pF(**822**)	±5% (**J**)	**GRM1887U1H822JA01D**	
10000pF(**103**)	±5% (**J**)	**GRM1887U1H103JA01D**	
12000pF(**123**)	±5% (**J**)		**GRM1887U1A123JA01D**
15000pF(**153**)	±5% (**J**)		**GRM1887U1A153JA01D**
18000pF(**183**)	±5% (**J**)		**GRM1887U1A183JA01D**
22000pF(**223**)	±5% (**J**)		**GRM1887U1A223JA01D**

LxW [mm]		2.0x1.25(**21**)<0805>		3.2x1.6(**31**)<1206>
Rated Volt. [Vdc]		50(**1H**)	10(**1A**)	50(**1H**)
Capacitance	Tolerance	Part Number		
10000pF(**103**)	±5% (**J**)	**GRM2167U1H103JA01D**		
12000pF(**123**)	±5% (**J**)	**GRM2167U1H123JA01D**		
15000pF(**153**)	±5% (**J**)	**GRM2167U1H153JA01D**		
18000pF(**183**)	±5% (**J**)	**GRM2167U1H183JA01D**		
22000pF(**223**)	±5% (**J**)	**GRM2197U1H223JA01D**		
27000pF(**273**)	±5% (**J**)	**GRM2197U1H273JA01D**		
33000pF(**333**)	±5% (**J**)	**GRM21A7U1H333JA39L**		
39000pF(**393**)	±5% (**J**)	**GRM21B7U1H393JA01L**		
47000pF(**473**)	±5% (**J**)	**GRM21B7U1H473JA01L**		
56000pF(**563**)	±5% (**J**)		**GRM2197U1A563JA01D**	**GRM3197U1H563JA01D**
68000pF(**683**)	±5% (**J**)		**GRM21B7U1A683JA01L**	**GRM31M7U1H683JA01L**
82000pF(**823**)	±5% (**J**)		**GRM21B7U1A823JA01L**	**GRM31M7U1H823JA01L**
100000pF(**104**)	±5% (**J**)		**GRM21B7U1A104JA01L**	**GRM31M7U1H104JA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

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Temperature Compensating Type U2J(7U) Characteristics Low Profile

LxW [mm]		1.6x0.8(**18**)<0603>	
Rated Volt. [Vdc]		50(**1H**)	10(**1A**)
Capacitance	Tolerance	Part Number	
2200pF(**222**)	±5% (**J**)	**GRM1857U1H222JA44D**	
2700pF(**272**)	±5% (**J**)	**GRM1857U1H272JA44D**	
3300pF(**332**)	±5% (**J**)	**GRM1857U1H332JA44D**	
3900pF(**392**)	±5% (**J**)	**GRM1857U1H392JA44D**	
4700pF(**472**)	±5% (**J**)	**GRM1857U1H472JA44D**	
5600pF(**562**)	±5% (**J**)		**GRM1857U1A562JA44D**
6800pF(**682**)	±5% (**J**)		**GRM1857U1A682JA44D**
8200pF(**822**)	±5% (**J**)		**GRM1857U1A822JA44D**
10000pF(**103**)	±5% (**J**)		**GRM1857U1A103JA44D**

LxW [mm]		2.0x1.25(**21**)<0805>		3.2x1.6(**31**)<1206>
Rated Volt. [Vdc]		50(**1H**)	10(**1A**)	50(**1H**)
Capacitance	Tolerance	Part Number		
10000pF(**103**)	±5% (**J**)	**GRM2167U1H103JA01D**		
12000pF(**123**)	±5% (**J**)	**GRM2167U1H123JA01D**		
15000pF(**153**)	±5% (**J**)	**GRM2167U1H153JA01D**		
18000pF(**183**)	±5% (**J**)	**GRM2167U1H183JA01D**		
22000pF(**223**)	±5% (**J**)	**GRM2197U1H223JA01D**		
27000pF(**273**)	±5% (**J**)	**GRM2197U1H273JA01D**		
33000pF(**333**)	±5% (**J**)	**GRM21A7U1H333JA39L**		
56000pF(**563**)	±5% (**J**)		**GRM2197U1A563JA01D**	**GRM3197U1H563JA01D**
68000pF(**683**)	±5% (**J**)			**GRM31M7U1H683JA01L**
82000pF(**823**)	±5% (**J**)			**GRM31M7U1H823JA01L**
100000pF(**104**)	±5% (**J**)			**GRM31M7U1H104JA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 18 ❸ | 5 ❹ | 7U ❺ | 1H ❻ | 222 ❼ | J ❽ | A44 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type P2H(6P) Characteristics

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		50(**1H**)
Capacitance	Tolerance	
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM1556P1H1R0CZ01D**
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM1556P1H2R0CZ01D**
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM1556P1H3R0CZ01D**
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM1556P1H4R0CZ01D**
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM1556P1H5R0CZ01D**
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM1556P1H6R0DZ01D**
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM1556P1H7R0DZ01D**
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM1556P1H8R0DZ01D**
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM1556P1H9R0DZ01D**
10pF (**100**)	±5% (**J**)	**GRM1556P1H100JZ01D**
12pF (**120**)	±5% (**J**)	**GRM1556P1H120JZ01D**
15pF (**150**)	±5% (**J**)	**GRM1556P1H150JZ01D**
18pF (**180**)	±5% (**J**)	**GRM1556P1H180JZ01D**
22pF (**220**)	±5% (**J**)	**GRM1556P1H220JZ01D**
27pF (**270**)	±5% (**J**)	**GRM1556P1H270JZ01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type R2H(6R) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM0336R1E1R0CD01D**	**GRM1556R1H1R0CD01D**
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM0336R1E2R0CD01D**	**GRM1556R1H2R0CZ01D**
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM0336R1E3R0CD01D**	**GRM1556R1H3R0CZ01D**
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM0336R1E4R0CD01D**	**GRM1556R1H4R0CZ01D**
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM0336R1E5R0CD01D**	**GRM1556R1H5R0CZ01D**
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM0336R1E6R0DD01D**	**GRM1556R1H6R0DZ01D**
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM0336R1E7R0DD01D**	**GRM1556R1H7R0DZ01D**
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM0336R1E8R0DD01D**	**GRM1556R1H8R0DZ01D**
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM0336R1E9R0DD01D**	**GRM1556R1H9R0DZ01D**
10pF (**100**)	±5% (**J**)	**GRM0336R1E100JD01D**	**GRM1556R1H100JZ01D**
12pF (**120**)	±5% (**J**)	**GRM0336R1E120JD01D**	**GRM1556R1H120JZ01D**
15pF (**150**)	±5% (**J**)	**GRM0336R1E150JD01D**	**GRM1556R1H150JZ01D**
18pF (**180**)	±5% (**J**)	**GRM0336R1E180JD01D**	**GRM1556R1H180JZ01D**
22pF (**220**)	±5% (**J**)	**GRM0336R1E220JD01D**	**GRM1556R1H220JZ01D**
27pF (**270**)	±5% (**J**)	**GRM0336R1E270JD01D**	**GRM1556R1H270JZ01D**
33pF (**330**)	±5% (**J**)	**GRM0336R1E330JD01D**	**GRM1556R1H330JZ01D**
39pF (**390**)	±5% (**J**)	**GRM0336R1E390JD01D**	
47pF (**470**)	±5% (**J**)	**GRM0336R1E470JD01D**	
56pF (**560**)	±5% (**J**)	**GRM0336R1E560JD01D**	
68pF (**680**)	±5% (**J**)	**GRM0336R1E680JD01D**	
82pF (**820**)	±5% (**J**)	**GRM0336R1E820JD01D**	
100pF (**101**)	±5% (**J**)	**GRM0336R1E101JD01D**	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

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Temperature Compensating Type S2H(6S) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM0336S1E1R0CD01D**	**GRM1556S1H1R0CD01D**
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM0336S1E2R0CD01D**	**GRM1556S1H2R0CZ01D**
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM0336S1E3R0CD01D**	**GRM1556S1H3R0CZ01D**
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM0336S1E4R0CD01D**	**GRM1556S1H4R0CZ01D**
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM0336S1E5R0CD01D**	**GRM1556S1H5R0CZ01D**
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM0336S1E6R0DD01D**	**GRM1556S1H6R0DZ01D**
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM0336S1E7R0DD01D**	**GRM1556S1H7R0DZ01D**
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM0336S1E8R0DD01D**	**GRM1556S1H8R0DZ01D**
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM0336S1E9R0DD01D**	**GRM1556S1H9R0DZ01D**
10pF (**100**)	±5% (**J**)	**GRM0336S1E100JD01D**	**GRM1556S1H100JZ01D**
12pF (**120**)	±5% (**J**)	**GRM0336S1E120JD01D**	**GRM1556S1H120JZ01D**
15pF (**150**)	±5% (**J**)	**GRM0336S1E150JD01D**	**GRM1556S1H150JZ01D**
18pF (**180**)	±5% (**J**)	**GRM0336S1E180JD01D**	**GRM1556S1H180JZ01D**
22pF (**220**)	±5% (**J**)	**GRM0336S1E220JD01D**	**GRM1556S1H220JZ01D**
27pF (**270**)	±5% (**J**)	**GRM0336S1E270JD01D**	**GRM1556S1H270JZ01D**
33pF (**330**)	±5% (**J**)	**GRM0336S1E330JD01D**	**GRM1556S1H330JZ01D**
39pF (**390**)	±5% (**J**)	**GRM0336S1E390JD01D**	**GRM1556S1H390JZ01D**
47pF (**470**)	±5% (**J**)	**GRM0336S1E470JD01D**	
56pF (**560**)	±5% (**J**)	**GRM0336S1E560JD01D**	
68pF (**680**)	±5% (**J**)	**GRM0336S1E680JD01D**	
82pF (**820**)	±5% (**J**)	**GRM0336S1E820JD01D**	
100pF (**101**)	±5% (**J**)	**GRM0336S1E101JD01D**	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 03 ❸ | 3 ❹ | 6S ❺ | 1E ❻ | 1R0 ❼ | C ❽ | D01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type T2H(6T) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
1.0pF (**1R0**)	±0.25pF (**C**)	**GRM0336T1E1R0CD01D**	**GRM1556T1H1R0CD01D**
2.0pF (**2R0**)	±0.25pF (**C**)	**GRM0336T1E2R0CD01D**	**GRM1556T1H2R0CD01D**
3.0pF (**3R0**)	±0.25pF (**C**)	**GRM0336T1E3R0CD01D**	**GRM1556T1H3R0CD01D**
4.0pF (**4R0**)	±0.25pF (**C**)	**GRM0336T1E4R0CD01D**	**GRM1556T1H4R0CD01D**
5.0pF (**5R0**)	±0.25pF (**C**)	**GRM0336T1E5R0CD01D**	**GRM1556T1H5R0CD01D**
6.0pF (**6R0**)	±0.5pF (**D**)	**GRM0336T1E6R0DD01D**	**GRM1556T1H6R0DD01D**
7.0pF (**7R0**)	±0.5pF (**D**)	**GRM0336T1E7R0DD01D**	**GRM1556T1H7R0DD01D**
8.0pF (**8R0**)	±0.5pF (**D**)	**GRM0336T1E8R0DD01D**	**GRM1556T1H8R0DD01D**
9.0pF (**9R0**)	±0.5pF (**D**)	**GRM0336T1E9R0DD01D**	**GRM1556T1H9R0DD01D**
10pF (**100**)	±5% (**J**)	**GRM0336T1E100JD01D**	**GRM1556T1H100JD01D**
12pF (**120**)	±5% (**J**)	**GRM0336T1E120JD01D**	**GRM1556T1H120JD01D**
15pF (**150**)	±5% (**J**)	**GRM0336T1E150JD01D**	**GRM1556T1H150JD01D**
18pF (**180**)	±5% (**J**)	**GRM0336T1E180JD01D**	**GRM1556T1H180JD01D**
22pF (**220**)	±5% (**J**)	**GRM0336T1E220JD01D**	**GRM1556T1H220JD01D**
27pF (**270**)	±5% (**J**)	**GRM0336T1E270JD01D**	**GRM1556T1H270JD01D**
33pF (**330**)	±5% (**J**)	**GRM0336T1E330JD01D**	**GRM1556T1H330JD01D**
39pF (**390**)	±5% (**J**)	**GRM0336T1E390JD01D**	**GRM1556T1H390JD01D**
47pF (**470**)	±5% (**J**)	**GRM0336T1E470JD01D**	**GRM1556T1H470JD01D**
56pF (**560**)	±5% (**J**)	**GRM0336T1E560JD01D**	**GRM1556T1H560JD01D**
68pF (**680**)	±5% (**J**)	**GRM0336T1E680JD01D**	**GRM1556T1H680JD01D**
82pF (**820**)	±5% (**J**)	**GRM0336T1E820JD01D**	**GRM1556T1H820JD01D**
100pF (**101**)	±5% (**J**)	**GRM0336T1E101JD01D**	**GRM1556T1H101JD01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

High Dielectric Constant Type X7R(R7) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>
Rated Volt. [Vdc]		10(**1A**)
Capacitance	Tolerance	Part Number
68pF(**680**)	±10% (**K**)	**GRM022R71A680KA01L**
100pF(**101**)	±10% (**K**)	**GRM022R71A101KA01L**
150pF(**151**)	±10% (**K**)	**GRM022R71A151KA01L**
220pF(**221**)	±10% (**K**)	**GRM022R71A221KA01L**
330pF(**331**)	±10% (**K**)	**GRM022R71A331KA01L**
470pF(**471**)	±10% (**K**)	**GRM022R71A471KA01L**

LxW [mm]		0.6x0.3(**03**)<0201>		
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number		
100pF(**101**)	±10% (**K**)	**GRM033R71E101KA01D**		
150pF(**151**)	±10% (**K**)	**GRM033R71E151KA01D**		
220pF(**221**)	±10% (**K**)	**GRM033R71E221KA01D**		
330pF(**331**)	±10% (**K**)	**GRM033R71E331KA01D**		
470pF(**471**)	±10% (**K**)	**GRM033R71E471KA01D**		
680pF(**681**)	±10% (**K**)	**GRM033R71E681KA01D**		
1000pF(**102**)	±10% (**K**)	**GRM033R71E102KA01D**		
1500pF(**152**)	±10% (**K**)	**GRM033R71E152KA01D**		
2200pF(**222**)	±10% (**K**)		**GRM033R71C222KA88D**	
3300pF(**332**)	±10% (**K**)		**GRM033R71C332KA88D**	
4700pF(**472**)	±10% (**K**)			**GRM033R71A472KA01D**
6800pF(**682**)	±10% (**K**)			**GRM033R71A682KA01D**
10000pF(**103**)	±10% (**K**)			**GRM033R71A103KA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | R7 ❺ | 1A ❻ | 680 ❼ | K ❽ | A01 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging*

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

*GRM022: D is applicable.

High Dielectric Constant Type X7R(R7) Characteristics

LxW [mm]		1.0x0.5(**15**)<0402>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
220pF(**221**)	±10% (**K**)	**GRM155R72A221KA01D**	**GRM155R71H221KA01D**		
330pF(**331**)	±10% (**K**)	**GRM155R72A331KA01D**	**GRM155R71H331KA01D**		
470pF(**471**)	±10% (**K**)	**GRM155R72A471KA01D**	**GRM155R71H471KA01D**		
680pF(**681**)	±10% (**K**)	**GRM155R72A681KA01D**	**GRM155R71H681KA01D**		
1000pF(**102**)	±10% (**K**)	**GRM155R72A102KA01D**	**GRM155R71H102KA01D**		
1500pF(**152**)	±10% (**K**)	**GRM155R72A152KA01D**	**GRM155R71H152KA01D**		
2200pF(**222**)	±10% (**K**)	**GRM155R72A222KA01D**	**GRM155R71H222KA01D**		
3300pF(**332**)	±10% (**K**)	**GRM155R72A332KA01D**	**GRM155R71H332KA01D**		
4700pF(**472**)	±10% (**K**)	**GRM155R72A472KA01D**	**GRM155R71H472KA01D**	**GRM155R71E472KA01D**	
6800pF(**682**)	±10% (**K**)		**GRM155R71H682KA88D**	**GRM155R71E682KA01D**	
10000pF(**103**)	±10% (**K**)		**GRM155R71H103KA88D**	**GRM155R71E103KA01D**	
15000pF(**153**)	±10% (**K**)		**GRM155R71H153KA12D**	**GRM155R71E153KA61D**	**GRM155R71C153KA01D**
22000pF(**223**)	±10% (**K**)		**GRM155R71H223KA12D**	**GRM155R71E223KA61D**	**GRM155R71C223KA01D**
33000pF(**333**)	±10% (**K**)			**GRM155R71E333KA88D**	**GRM155R71C333KA01D**
47000pF(**473**)	±10% (**K**)			**GRM155R71E473KA88D**	**GRM155R71C473KA01D**
68000pF(**683**)	±10% (**K**)				**GRM155R71C683KA88D**
0.10μF(**104**)	±10% (**K**)				**GRM155R71C104KA88D**

LxW [mm]		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		10(**1A**)
Capacitance	Tolerance	Part Number
68000pF(**683**)	±10% (**K**)	**GRM155R71A683KA01D**
0.10μF(**104**)	±10% (**K**)	**GRM155R71A104KA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

High Dielectric Constant Type X7R(R7)/X7S(C7) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
220pF(**221**)	±10% (**K**)	**GRM188R72A221KA01D**	**GRM188R71H221KA01D**		
330pF(**331**)	±10% (**K**)	**GRM188R72A331KA01D**	**GRM188R71H331KA01D**		
470pF(**471**)	±10% (**K**)	**GRM188R72A471KA01D**	**GRM188R71H471KA01D**		
680pF(**681**)	±10% (**K**)	**GRM188R72A681KA01D**	**GRM188R71H681KA01D**		
1000pF(**102**)	±10% (**K**)	**GRM188R72A102KA01D**	**GRM188R71H102KA01D**		
1500pF(**152**)	±10% (**K**)	**GRM188R72A152KA01D**	**GRM188R71H152KA01D**		
2200pF(**222**)	±10% (**K**)	**GRM188R72A222KA01D**	**GRM188R71H222KA01D**		
3300pF(**332**)	±10% (**K**)	**GRM188R72A332KA01D**	**GRM188R71H332KA01D**		
4700pF(**472**)	±10% (**K**)	**GRM188R72A472KA01D**	**GRM188R71H472KA01D**		
6800pF(**682**)	±10% (**K**)	**GRM188R72A682KA01D**	**GRM188R71H682KA01D**		
10000pF(**103**)	±10% (**K**)	**GRM188R72A103KA01D**	**GRM188R71H103KA01D**	**GRM188R71E103KA01D**	
15000pF(**153**)	±10% (**K**)		**GRM188R71H153KA01D**	**GRM188R71E153KA01D**	
22000pF(**223**)	±10% (**K**)		**GRM188R71H223KA01D**	**GRM188R71E223KA01D**	
33000pF(**333**)	±10% (**K**)		**GRM188R71H333KA61D**	**GRM188R71E333KA01D**	
47000pF(**473**)	±10% (**K**)		**GRM188R71H473KA61D**	**GRM188R71E473KA01D**	
68000pF(**683**)	±10% (**K**)		**GRM188R71H683KA93D**	**GRM188R71E683KA01D**	
0.10μF(**104**)	±10% (**K**)	**GRM188R72A104KA35D**	**GRM188R71H104KA93D**	**GRM188R71E104KA01D**	
0.15μF(**154**)	±10% (**K**)			**GRM188R71E154KA01D**	**GRM188R71C154KA01D**
0.22μF(**224**)	±10% (**K**)			**GRM188R71E224KA88D**	**GRM188R71C224KA01D**
0.33μF(**334**)	±10% (**K**)				**GRM188R71C334KA01D**
0.47μF(**474**)	±10% (**K**)			**GRM188R71E474KA12D***	**GRM188R71C474KA88D**
1.0μF(**105**)	±10% (**K**)			**GRM188R71E105KA12D***	**GRM188R71C105KA12D***

LxW [mm]		1.6x0.8(**18**)<0603>		
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
0.33μF(**334**)	±10% (**K**)	**GRM188R71A334KA61D**		
0.47μF(**474**)	±10% (**K**)	**GRM188R71A474KA61D**		
0.68μF(**684**)	±10% (**K**)	**GRM188R71A684KA61D**		
1.0μF(**105**)	±10% (**K**)	**GRM188R71A105KA61D***		
2.2μF(**225**)	±10% (**K**)	**GRM188R71A225KE15D***	**GRM188C70J225KE20D***	**GRM188C70G225KE20D***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR | M | 18 | 8 | R7 | 2A | 221 | K | A01 | D
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

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

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
6800pF (**682**)	±10% (**K**)	**GRM219R72A682KA01D**			
10000pF (**103**)	±10% (**K**)	**GRM21BR72A103KA01L**			
15000pF (**153**)	±10% (**K**)	**GRM21BR72A153KA01L**			
22000pF (**223**)	±10% (**K**)	**GRM21BR72A223KA01L**			
33000pF (**333**)	±10% (**K**)	**GRM21BR72A333KA01L**	**GRM219R71H333KA01D**		
47000pF (**473**)	±10% (**K**)	**GRM21BR72A473KA01L**	**GRM21BR71H473KA01L**		
68000pF (**683**)	±10% (**K**)		**GRM21BR71H683KA01L**	**GRM219R71E683KA01D**	
0.10μF (**104**)	±10% (**K**)		**GRM21BR71H104KA01L**	**GRM21BR71E104KA01L**	
0.15μF (**154**)	±10% (**K**)		**GRM21BR71H154KA01L**	**GRM21BR71E154KA01L**	
0.22μF (**224**)	±10% (**K**)	**GRM21AR72A224KAC5L**	**GRM21BR71H224KA01L**	**GRM21BR71E224KA01L**	
0.33μF (**334**)	±10% (**K**)	**GRM21AR72A334KAC5L**	**GRM219R71H334KA88D**	**GRM21BR71E334KA01L**	
0.47μF (**474**)	±10% (**K**)	**GRM21BR72A474KA73L**	**GRM21BR71H474KA88L**	**GRM219R71E474KA88D**	
0.68μF (**684**)	±10% (**K**)			**GRM219R71E684KA88D**	**GRM219R71C684KA01D**
1.0μF (**105**)	±10% (**K**)		**GRM21BR71H105KA12L**	**GRM21BR71E105KA99L**	**GRM21BR71C105KA01L**
				GRM219R71E105KA88D	
2.2μF (**225**)	±10% (**K**)			**GRM21BR71E225KA73L***	**GRM21BR71C225KA12L**
4.7μF (**475**)	±10% (**K**)				**GRM21BR71C475KA73L***

LxW [mm]		2.0x1.25(**21**)<0805>		
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
2.2μF (**225**)	±10% (**K**)	**GRM21BR71A225KA01L**		
4.7μF (**475**)	±10% (**K**)	**GRM21BR71A475KA73L***		
10μF (**106**)	±10% (**K**)	**GRM21BR71A106KE51L***	**GRM21BR70J106KE76L***	
22μF (**226**)	±20% (**M**)			**GRM21BE70G226ME51L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

*: Please refer to GRM Series Specifications and Test Method(2).

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

LxW [mm]		3.2x1.6(31)<1206>			
Rated Volt. [Vdc]		100(2A)	50(1H)	25(1E)	16(1C)
Capacitance	Tolerance	Part Number			
15000pF(153)	±10% (K)	GRM319R72A153KA01L			
22000pF(223)	±10% (K)	GRM31MR72A223KA01L			
33000pF(333)	±10% (K)	GRM31MR72A333KA01L			
47000pF(473)	±10% (K)	GRM31MR72A473KA01L			
68000pF(683)	±10% (K)	GRM31MR72A683KA01L			
0.10μF(104)	±10% (K)	GRM319R72A104KA01D			
0.15μF(154)	±10% (K)	GRM31MR72A154KA01L	GRM31MR71H154KA01L		
0.22μF(224)	±10% (K)	GRM31MR72A224KA01L	GRM31MR71H224KA01L		
0.33μF(334)	±10% (K)		GRM319R71H334KA01D		
0.47μF(474)	±10% (K)	GRM31MR72A474KA35L	GRM31MR71H474KA01L		
0.68μF(684)	±10% (K)	GRM31MR72A684KA35L	GRM31MR71H684KA88L		
1.0μF(105)	±10% (K)	GRM31CR72A105KA01L	GRM31MR71H105KA88L		
2.2μF(225)	±10% (K)		GRM31CR71H225KA88L	GRM31MR71E225KA93L	GRM31MR71C225KA35L
4.7μF(475)	±10% (K)		GRM31CR71H475KA12L	GRM31CR71E475KA88L	GRM31CR71C475KA01L
10μF(106)	±10% (K)			GRM31CR71E106KA12L*	GRM31CR71C106KAC7L*

LxW [mm]		3.2x1.6(31)<1206>		
Rated Volt. [Vdc]		10(1A)	6.3(0J)	4(0G)
Capacitance	Tolerance	Part Number		
10μF(106)	±10% (K)	GRM31CR71A106KA01L		
22μF(226)	±20% (M)	GRM31CR71A226ME15L*	GRM31CR70J226ME19L*	
47μF(476)	±20% (M)			GRM31CE70G476ME15L*

LxW [mm]		3.2x2.5(32)<1210>			
Rated Volt. [Vdc]		100(2A)	50(1H)	35(YA)	25(1E)
Capacitance	Tolerance	Part Number			
0.68μF(684)	±10% (K)	GRM32CR72A684KA01L	GRM32NR71H684KA01L		
1.0μF(105)	±10% (K)	GRM32CR72A105KA35L			
2.2μF(225)	±10% (K)	GRM32ER72A225KA35L			
4.7μF(475)	±10% (K)		GRM32ER71H475KA88L		
10μF(106)	±10% (K)			GRM32ER7YA106KA12L	GRM32DR71E106KA12L
22μF(226)	±20% (M)				GRM32ER71E226ME15L*

LxW [mm]		3.2x2.5(32)<1210>		
Rated Volt. [Vdc]		16(1C)	10(1A)	6.3(0J)
Capacitance	Tolerance	Part Number		
22μF(226)	±20% (M)	GRM32ER71C226ME18L*		
47μF(476)	±20% (M)		GRM32ER71A476ME15L*	GRM32ER70J476ME20L*

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 31 ❸ | 9 ❹ | R7 ❺ | 2A ❻ | 153 ❼ | K ❽ | A01 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

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

LxW [mm]		1.0x0.5(**15**)<0402>		
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number		
220pF(**221**)	±10% (**K**)	**GRM15XR71H221KA86D**		
330pF(**331**)	±10% (**K**)	**GRM15XR71H331KA86D**		
470pF(**471**)	±10% (**K**)	**GRM15XR71H471KA86D**		
680pF(**681**)	±10% (**K**)	**GRM15XR71H681KA86D**		
1000pF(**102**)	±10% (**K**)	**GRM15XR71H102KA86D**		
1500pF(**152**)	±10% (**K**)	**GRM15XR71H152KA86D**		
2200pF(**222**)	±10% (**K**)		**GRM15XR71E222KA86D**	
3300pF(**332**)	±10% (**K**)			**GRM15XR71C332KA86D**
4700pF(**472**)	±10% (**K**)			**GRM15XR71C472KA86D**
6800pF(**682**)	±10% (**K**)			**GRM15XR71C682KA86D**
10000pF(**103**)	±10% (**K**)			**GRM15XR71C103KA86D**

LxW [mm]		1.6x0.8(**18**)<0603>
Rated Volt. [Vdc]		10(**1A**)
Capacitance	Tolerance	Part Number
1.0μF(**105**)	±10% (**K**)	**GRM185D71A105KE36D***

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
6800pF(**682**)	±10% (**K**)	**GRM219R72A682KA01D**			
33000pF(**333**)	±10% (**K**)		**GRM219R71H333KA01D**		
68000pF(**683**)	±10% (**K**)			**GRM219R71E683KA01D**	
0.22μF(**224**)	±10% (**K**)	**GRM21AR72A224KAC5L**			
0.33μF(**334**)	±10% (**K**)	**GRM21AR72A334KAC5L**	**GRM219R71H334KA88D**		
0.47μF(**474**)	±10% (**K**)			**GRM219R71E474KA88D**	
0.68μF(**684**)	±10% (**K**)			**GRM219R71E684KA88D**	**GRM219R71C684KA01D**
1.0μF(**105**)	±10% (**K**)			**GRM219R71E105KA88D**	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GRM Series Specifications and Test Method(2).

LxW [mm]		3.2x1.6(**31**)<1206>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
15000pF(**153**)	±10% (**K**)	**GRM319R72A153KA01L**			
22000pF(**223**)	±10% (**K**)	**GRM31MR72A223KA01L**			
33000pF(**333**)	±10% (**K**)	**GRM31MR72A333KA01L**			
47000pF(**473**)	±10% (**K**)	**GRM31MR72A473KA01L**			
68000pF(**683**)	±10% (**K**)	**GRM31MR72A683KA01L**			
0.10μF(**104**)	±10% (**K**)	**GRM319R72A104KA01D**			
0.15μF(**154**)	±10% (**K**)	**GRM31MR72A154KA01L**	**GRM31MR71H154KA01L**		
0.22μF(**224**)	±10% (**K**)	**GRM31MR72A224KA01L**	**GRM31MR71H224KA01L**		
0.33μF(**334**)	±10% (**K**)		**GRM319R71H334KA01D**		
0.47μF(**474**)	±10% (**K**)	**GRM31MR72A474KA35L**	**GRM31MR71H474KA01L**		
0.68μF(**684**)	±10% (**K**)	**GRM31MR72A684KA35L**	**GRM31MR71H684KA88L**		
1.0μF(**105**)	±10% (**K**)		**GRM31MR71H105KA88L**		
2.2μF(**225**)	±10% (**K**)			**GRM31MR71E225KA93L**	**GRM31MR71C225KA35L**

LxW [mm]		3.2x2.5(**32**)<1210>	
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number	
0.68μF(**684**)	±10% (**K**)	**GRM32CR72A684KA01L**	**GRM32NR71H684KA01L**
1.0μF(**105**)	±10% (**K**)	**GRM32CR72A105KA35L**	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

1

High Dielectric Constant Type X6S(C8) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>	
Rated Volt. [Vdc]		6.3(**0J**)	2.5(**0E**)
Capacitance	Tolerance	Part Number	
15000pF(**153**)	±10% (**K**)	**GRM033C80J153KE01D***	
22000pF(**223**)	±10% (**K**)	**GRM033C80J223KE01D***	
33000pF(**333**)	±10% (**K**)	**GRM033C80J333KE01D***	
47000pF(**473**)	±10% (**K**)	**GRM033C80J473KE19D***	
0.10μF(**104**)	±10% (**K**)	**GRM033C80J104KE84D***	
0.22μF(**224**)	±10% (**K**)		**GRM033C80E224ME15D***

LxW [mm]		1.0x0.5(**15**)<0402>		
Rated Volt. [Vdc]		25(**1E**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
68000pF(**683**)	±10% (**K**)	**GRM155C81E683KA12D**		
0.10μF(**104**)	±10% (**K**)	**GRM155C81E104KA12D**		
0.15μF(**154**)	±10% (**K**)		**GRM155C80J154KE01D***	**GRM155C80G154KE01D***
0.22μF(**224**)	±10% (**K**)		**GRM155C80J224KE01D***	**GRM155C80G224KE01D***
0.33μF(**334**)	±10% (**K**)		**GRM155C80J334KE01D***	**GRM155C80G334KE01D***
0.47μF(**474**)	±10% (**K**)		**GRM155C80J474KE19D***	**GRM155C80G474KE01D***
0.68μF(**684**)	±10% (**K**)			**GRM155C80G684KE19D***

LxW [mm]		1.6x0.8(**18**)<0603>			
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)	2.5(**0E**)
Capacitance	Tolerance	Part Number			
1.0μF(**105**)	±10% (**K**)			**GRM188C80G105MA01D**	
2.2μF(**225**)	±10% (**K**)	**GRM188C81A225KE34D***	**GRM188C80J225KE19D***		
4.7μF(**475**)	±10% (**K**)			**GRM188C80G475KE19D***	
10μF(**106**)	±20% (**M**)				**GRM188C80E106ME47D***

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
1.0μF(**105**)	±10% (**K**)		**GRM216C81C105KA12D***		
2.2μF(**225**)	±10% (**K**)		**GRM219C81C225KA12D***		
4.7μF(**475**)	±10% (**K**)	**GRM21BC81E475KA12L***	**GRM21BC81C475KA88L***	**GRM219C81A475KE34D***	**GRM219C80J475KE19D***
10μF(**106**)	±10% (**K**)			**GRM21BC81A106KE18L***	**GRM21BC80J106KE19L***
					GRM219C80J106KE39D*

LxW [mm]		2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
10μF(**106**)	±10% (**K**)	**GRM219C80G106KE19D***
22μF(**226**)	±20% (**M**)	**GRM21BC80G226ME39L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 03 ❸ | 3 ❹ | C8 ❺ | 0J ❻ | 153 ❼ | K ❽ | E01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

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

LxW [mm]		3.2x1.6(31)<1206>			
Rated Volt. [Vdc]		25(1E)	16(1C)	10(1A)	6.3(0J)
Capacitance	Tolerance	Part Number			
2.2µF (225)	±10% (K)		GRM316C81C225KA12D*		
4.7µF (475)	±10% (K)		GRM319C81C475KA12D*		
10µF (106)	±10% (K)	GRM31CC81E106KE15L*			
22µF (226)	±20% (M)			GRM31CC81A226ME19L*	GRM31CC80J226ME19L*
47µF (476)	±20% (M)				GRM31CC80J476ME18L*

LxW [mm]		3.2x1.6(31)<1206>
Rated Volt. [Vdc]		4(0G)
Capacitance	Tolerance	Part Number
47µF (476)	±20% (M)	GRM31CC80G476ME19L*
100µF (107)	±20% (M)	GRM31CD80G107ME39L*

LxW [mm]		3.2x2.5(32)<1210>		
Rated Volt. [Vdc]		25(1E)	10(1A)	6.3(0J)
Capacitance	Tolerance	Part Number		
10µF (106)	±10% (K)	GRM32DC81E106KA12L		
22µF (226)	±20% (M)	GRM32EC81E226ME15L*		
47µF (476)	±20% (M)		GRM32EC81A476ME19L*	GRM32EC80J476ME64L*

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GRM Series Specifications and Test Method(2).

High Dielectric Constant Type X6S(C8) Characteristics Low Profile

LxW [mm]		1.6x0.8(18)<0603>	
Rated Volt. [Vdc]		10(1A)	6.3(0J)
Capacitance	Tolerance	Part Number	
1.0µF (105)	±10% (K)	GRM185C81A105KE36D*	GRM185C80J105KE26D*

LxW [mm]		2.0x1.25(21)<0805>			
Rated Volt. [Vdc]		16(1C)	10(1A)	6.3(0J)	4(0G)
Capacitance	Tolerance	Part Number			
1.0µF (105)	±10% (K)	GRM216C81C105KA12D*			
2.2µF (225)	±10% (K)	GRM219C81C225KA12D*			
4.7µF (475)	±10% (K)		GRM219C81A475KE34D*	GRM219C80J475KE19D*	
10µF (106)	±10% (K)			GRM219C80J106KE39D*	GRM219C80G106KE19D*

LxW [mm]		3.2x1.6(31)<1206>
Rated Volt. [Vdc]		16(1C)
Capacitance	Tolerance	Part Number
2.2µF (225)	±10% (K)	GRM316C81C225KA12D*
4.7µF (475)	±10% (K)	GRM319C81C475KA12D*

LxW [mm]		3.2x2.5(32)<1210>
Rated Volt. [Vdc]		25(1E)
Capacitance	Tolerance	Part Number
10µF (106)	±10% (K)	GRM32DC81E106KA12L

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GRM Series Specifications and Test Method(2).

1

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		0.4x0.2(**02**)<01005>	
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number	
68pF(**680**)	±10% (**K**)	**GRM022R61A680KA01L**	
100pF(**101**)	±10% (**K**)	**GRM022R61A101KA01L**	
150pF(**151**)	±10% (**K**)	**GRM022R61A151KA01L**	
220pF(**221**)	±10% (**K**)	**GRM022R61A221KA01L**	
330pF(**331**)	±10% (**K**)	**GRM022R61A331KA01L**	
470pF(**471**)	±10% (**K**)	**GRM022R61A471KA01L**	
680pF(**681**)	±10% (**K**)		**GRM022R60J681KE19L***
1000pF(**102**)	±10% (**K**)		**GRM022R60J102KE19L***
1500pF(**152**)	±10% (**K**)		**GRM022R60J152KE19L***
2200pF(**222**)	±10% (**K**)		**GRM022R60J222KE19L***
3300pF(**332**)	±10% (**K**)		**GRM022R60J332KE19L***
4700pF(**472**)	±10% (**K**)		**GRM022R60J472KE19L***
6800pF(**682**)	±10% (**K**)		**GRM022R60J682KE19L***
10000pF(**103**)	±10% (**K**)		**GRM022R60J103KE19L***

LxW [mm]		0.6x0.3(**03**)<0201>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
100pF(**101**)	±10% (**K**)				
150pF(**151**)	±10% (**K**)				
220pF(**221**)	±10% (**K**)				
330pF(**331**)	±10% (**K**)				
470pF(**471**)	±10% (**K**)				
680pF(**681**)	±10% (**K**)				
1000pF(**102**)	±10% (**K**)				
1500pF(**152**)	±10% (**K**)			**GRM033R61A152KA01D**	
2200pF(**222**)	±10% (**K**)			**GRM033R61A222KA01D**	
3300pF(**332**)	±10% (**K**)			**GRM033R61A332KA01D**	
4700pF(**472**)	±10% (**K**)			**GRM033R61A472KA01D**	
6800pF(**682**)	±10% (**K**)			**GRM033R61A682KA01D**	
10000pF(**103**)	±10% (**K**)			**GRM033R61A103KA01D**	
15000pF(**153**)	±10% (**K**)				**GRM033R60J153KE01D***
22000pF(**223**)	±10% (**K**)				**GRM033R60J223KE01D***
33000pF(**333**)	±10% (**K**)				**GRM033R60J333KE01D***
47000pF(**473**)	±10% (**K**)				**GRM033R60J473KE19D***
0.10μF(**104**)	±10% (**K**)			**GRM033R61A104KE84D***	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
[ ] : Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 02 ❸ | 2 ❹ | R6 ❺ | 1A ❻ | 680 ❼ | K ❽ | A01 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging *

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

***GRM022**: **D** is applicable.

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		1.0x0.5(**15**)<0402>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
220pF(**221**)	±10% (**K**)				
330pF(**331**)	±10% (**K**)				
470pF(**471**)	±10% (**K**)				
680pF(**681**)	±10% (**K**)				
1000pF(**102**)	±10% (**K**)		GRM155R61H102KA01D		
1500pF(**152**)	±10% (**K**)				
2200pF(**222**)	±10% (**K**)		GRM155R61H222KA01D		
3300pF(**332**)	±10% (**K**)				
4700pF(**472**)	±10% (**K**)		GRM155R61H472KA01D		
6800pF(**682**)	±10% (**K**)				
10000pF(**103**)	±10% (**K**)				
15000pF(**153**)	±10% (**K**)				
22000pF(**223**)	±10% (**K**)				GRM155R61C223KA01D
33000pF(**333**)	±10% (**K**)				GRM155R61C333KA01D
47000pF(**473**)	±10% (**K**)				GRM155R61C473KA01D
68000pF(**683**)	±10% (**K**)			GRM155R61E683KA87D	GRM155R61C683KA88D
0.10μF(**104**)	±10% (**K**)			GRM155R61E104KA87D	GRM155R61C104KA88D

LxW [mm]		1.0x0.5(**15**)<0402>		
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
33000pF(**333**)	±10% (**K**)	GRM155R61A333KA01D		
47000pF(**473**)	±10% (**K**)	GRM155R61A473KA01D		
68000pF(**683**)	±10% (**K**)	GRM155R61A683KA01D		
0.10μF(**104**)	±10% (**K**)	GRM155R61A104KA01D		
0.15μF(**154**)	±10% (**K**)	GRM155R61A154KE19D*	GRM155R60J154KE01D*	
0.22μF(**224**)	±10% (**K**)	GRM155R61A224KE19D*	GRM155R60J224KE01D*	
0.33μF(**334**)	±10% (**K**)	GRM155R61A334KE15D*	GRM155R60J334KE01D*	
0.47μF(**474**)	±10% (**K**)	GRM155R61A474KE15D*	GRM155R60J474KE19D*	
0.68μF(**684**)	±10% (**K**)	GRM155R61A684KE15D*	GRM155R60J684KE19D*	
1.0μF(**105**)	±10% (**K**)	GRM155R61A105KE15D*		
4.7μF(**475**)	±20% (**M**)			GRM155R60G475ME87D*

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
[ ] : Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
220pF(**221**)	±10% (**K**)				
330pF(**331**)	±10% (**K**)				
470pF(**471**)	±10% (**K**)				
680pF(**681**)	±10% (**K**)				
1000pF(**102**)	±10% (**K**)		GRM188R61H102KA01D		
1500pF(**152**)	±10% (**K**)				
2200pF(**222**)	±10% (**K**)		GRM188R61H222KA01D		
3300pF(**332**)	±10% (**K**)				
4700pF(**472**)	±10% (**K**)		GRM188R61H472KA01D		
6800pF(**682**)	±10% (**K**)				
10000pF(**103**)	±10% (**K**)		GRM188R61H103KA01D		
15000pF(**153**)	±10% (**K**)				
22000pF(**223**)	±10% (**K**)		GRM188R61H223KA01D		
33000pF(**333**)	±10% (**K**)				
47000pF(**473**)	±10% (**K**)				
68000pF(**683**)	±10% (**K**)				
0.10μF(**104**)	±10% (**K**)			GRM188R61E104KA01D	GRM188R61C104KA01D
0.15μF(**154**)	±10% (**K**)				
0.22μF(**224**)	±10% (**K**)			GRM188R61E224KA88D	GRM188R61C224KA88D
0.33μF(**334**)	±10% (**K**)				
0.47μF(**474**)	±10% (**K**)			GRM188R61E474KA12D*	GRM188R61C474KA93D*
1.0μF(**105**)	±10% (**K**)			GRM188R61E105KA12D*	GRM188R61C105KA93D*
2.2μF(**225**)	±10% (**K**)				GRM188R61C225KE15D*

LxW [mm]		1.6x0.8(**18**)<0603>		
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
0.15μF(**154**)	±10% (**K**)	GRM188R61A154KA01D		
0.22μF(**224**)	±10% (**K**)	GRM188R61A224KA01D		
0.33μF(**334**)	±10% (**K**)			
0.47μF(**474**)	±10% (**K**)	GRM188R61A474KA61D		
0.68μF(**684**)	±10% (**K**)			
2.2μF(**225**)	±10% (**K**)	GRM188R61A225KE34D*		
4.7μF(**475**)	±10% (**K**)		GRM188R60J475KE19D*	
10μF(**106**)	±20% (**M**)		GRM188R60J106ME47D*	GRM188R60G106ME47D*

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
: Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 18 ❸ | 8 ❹ | R6 ❺ | 1H ❻ | 102 ❼ | K ❽ | A01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		2.0x1.25(21)<0805>			
Rated Volt. [Vdc]		100(2A)	50(1H)	25(1E)	16(1C)
Capacitance	Tolerance	Part Number			
6800pF (682)	±10% (K)				
10000pF (103)	±10% (K)				
15000pF (153)	±10% (K)				
22000pF (223)	±10% (K)				
33000pF (333)	±10% (K)				
47000pF (473)	±10% (K)				
68000pF (683)	±10% (K)				
0.10μF (104)	±10% (K)				
0.15μF (154)	±10% (K)				
0.22μF (224)	±10% (K)				
0.33μF (334)	±10% (K)				GRM21BR61C334KA01L
0.47μF (474)	±10% (K)				GRM21BR61C474KA01L
0.68μF (684)	±10% (K)				
1.0μF (105)	±10% (K)			GRM216R61E105KA12D	GRM21BR61C105KA01L
2.2μF (225)	±10% (K)			GRM21BR61E225KA12L	GRM21BR61C225KA88L*
				GRM219R61E225KA12D*	GRM219R61C225KA88D*
4.7μF (475)	±10% (K)			GRM21BR61E475KA12L*	GRM21BR61C475KA88L*
					GRM219R61C475KE15D*
10μF (106)	±10% (K)				GRM21BR61C106KE15L*

LxW [mm]		2.0x1.25(21)<0805>		
Rated Volt. [Vdc]		10(1A)	6.3(0J)	4(0G)
Capacitance	Tolerance	Part Number		
2.2μF (225)	±10% (K)	GRM21BR61A225KA01L		
4.7μF (475)	±10% (K)	GRM219R61A475KE34D*		
10μF (106)	±10% (K)	GRM21BR61A106KE19L*	GRM219R60J106KE19D*	
		GRM219R61A106KE44D*		
22μF (226)	±20% (M)		GRM21BR60J226ME39L*	GRM219R60G226ME66D*

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
: Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

1

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		3.2x1.6(31)<1206>			
Rated Volt. [Vdc]		100(2A)	50(1H)	25(1E)	16(1C)
Capacitance	Tolerance	Part Number			
15000pF(153)	±10% (K)				
22000pF(223)	±10% (K)				
33000pF(333)	±10% (K)				
47000pF(473)	±10% (K)				
68000pF(683)	±10% (K)				
0.10μF(104)	±10% (K)				
0.15μF(154)	±10% (K)				
0.22μF(224)	±10% (K)				
0.33μF(334)	±10% (K)				
0.47μF(474)	±10% (K)				
0.68μF(684)	±10% (K)				
1.0μF(105)	±10% (K)				
2.2μF(225)	±10% (K)		GRM31CR61H225KA88L	GRM316R61E225KA12D*	
4.7μF(475)	±10% (K)			GRM31CR61E475KA88L	GRM31CR61C475KA01L
				GRM319R61E475KA12D*	GRM319R61C475KA88D*
10μF(106)	±10% (K)			GRM31CR61E106KA12L*	GRM31CR61C106KA88L
					GRM319R61C106KE15D*
22μF(226)	±20% (M)				GRM31CR61C226ME15L*

LxW [mm]		3.2x1.6(31)<1206>		
Rated Volt. [Vdc]		10(1A)	6.3(0J)	4(0G)
Capacitance	Tolerance	Part Number		
10μF(106)	±10% (K)	GRM319R61A106KE19L*		
22μF(226)	±20% (M)	GRM31CR61A226ME19L*	GRM31CR60J226ME19L*	
47μF(476)	±20% (M)		GRM31CR60J476ME19L*	
100μF(107)	±20% (M)		GRM31CR60J107ME39L*	GRM31CR60G107ME39L*

LxW [mm]		3.2x2.5(32)<1210>			
Rated Volt. [Vdc]		100(2A)	50(1H)	35(YA)	25(1E)
Capacitance	Tolerance	Part Number			
0.68μF(684)	±10% (K)				
1.0μF(105)	±10% (K)				
2.2μF(225)	±10% (K)				
4.7μF(475)	±10% (K)				
10μF(106)	±10% (K)			GRM32ER6YA106KA12L	GRM32DR61E106KA12L
22μF(226)	±20% (M)				GRM32ER61E226ME15L*

LxW [mm]		3.2x2.5(32)<1210>		
Rated Volt. [Vdc]		16(1C)	10(1A)	6.3(0J)
Capacitance	Tolerance	Part Number		
22μF(226)	±20% (M)			
47μF(476)	±20% (M)	GRM32ER61C476ME15L*	GRM32ER61A476ME20L*	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

: Please refer to X7R(R7) etc Characteristics.

*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 31 ❸ | C ❹ | R6 ❺ | 1H ❻ | 225 ❼ | K ❽ | A88 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

High Dielectric Constant Type X5R(R6) Characteristics Low Profile

LxW [mm]		1.0x0.5(**15**)<0402>		
Rated Volt. [Vdc]		16(**1C**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number		
220pF(**221**)	±10% (**K**)			
330pF(**331**)	±10% (**K**)			
470pF(**471**)	±10% (**K**)			
680pF(**681**)	±10% (**K**)			
1000pF(**102**)	±10% (**K**)			
1500pF(**152**)	±10% (**K**)			
2200pF(**222**)	±10% (**K**)			
3300pF(**332**)	±10% (**K**)			
4700pF(**472**)	±10% (**K**)			
6800pF(**682**)	±10% (**K**)			
10000pF(**103**)	±10% (**K**)			

LxW [mm]		1.6x0.8(**18**)<0603>	
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number	
1.0μF(**105**)	±10% (**K**)	**GRM185R61C105KE44D***	**GRM185R61A105KE36D***

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
6800pF(**682**)	±10% (**K**)				
33000pF(**333**)	±10% (**K**)				
68000pF(**683**)	±10% (**K**)				
0.22μF(**224**)	±10% (**K**)				
0.33μF(**334**)	±10% (**K**)				
0.47μF(**474**)	±10% (**K**)				
0.68μF(**684**)	±10% (**K**)				
1.0μF(**105**)	±10% (**K**)			**GRM216R61E105KA12D**	
2.2μF(**225**)	±10% (**K**)			**GRM219R61E225KA12D***	**GRM219R61C225KA88D***
4.7μF(**475**)	±10% (**K**)				**GRM219R61C475KE15D***

LxW [mm]		2.0x1.25(**21**)<0805>		
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number		
4.7μF(**475**)	±10% (**K**)	**GRM219R61A475KE34D***		
10μF(**106**)	±10% (**K**)	**GRM219R61A106KE44D***	**GRM219R60J106KE19D***	
22μF(**226**)	±20% (**M**)			**GRM219R60G226ME66D***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
: Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

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High Dielectric Constant Type X5R(R6) Characteristics Low Profile

LxW [mm]		3.2x1.6(**31**)<1206>			
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number			
15000pF(**153**)	±10% (**K**)				
22000pF(**223**)	±10% (**K**)				
33000pF(**333**)	±10% (**K**)				
47000pF(**473**)	±10% (**K**)				
68000pF(**683**)	±10% (**K**)				
0.10μF(**104**)	±10% (**K**)				
0.15μF(**154**)	±10% (**K**)				
0.22μF(**224**)	±10% (**K**)				
0.33μF(**334**)	±10% (**K**)				
0.47μF(**474**)	±10% (**K**)				
0.68μF(**684**)	±10% (**K**)				
1.0μF(**105**)	±10% (**K**)				
2.2μF(**225**)	±10% (**K**)			**GRM316R61E225KA12D***	
4.7μF(**475**)	±10% (**K**)			**GRM319R61E475KA12D***	**GRM319R61C475KA88D***
10μF(**106**)	±10% (**K**)				**GRM319R61C106KE15D***

LxW [mm]		3.2x1.6(**31**)<1206>
Rated Volt. [Vdc]		10(**1A**)
Capacitance	Tolerance	Part Number
10μF(**106**)	±10% (**K**)	**GRM319R61A106KE19D***

LxW [mm]		3.2x2.5(**32**)<1210>		
Rated Volt. [Vdc]		100(**2A**)	50(**1H**)	25(**1E**)
Capacitance	Tolerance	Part Number		
0.68μF(**684**)	±10% (**K**)			
1.0μF(**105**)	±10% (**K**)			
10μF(**106**)	±10% (**K**)			**GRM32DR61E106KA12L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
: Please refer to X7R(R7) etc Characteristics.
*: Please refer to GRM Series Specifications and Test Method(2).

(Part Number) GR ❶ | M ❷ | 31 ❸ | 6 ❹ | R6 ❺ | 1E ❻ | 225 ❼ | K ❽ | A12 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

GRM Series Specifications and Test Methods (1) (Note1) Typical Inspection

(Note1) This Specifications and Test Methods indicates typical inspection.
Please refer to individual specifications (our product specifications or the approval sheet).
In case Non "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (2).

No.	Item	Specifications		Test Method
		Temperature Compensating Type	High Dielectric Type	
1	Operating Temperature Range	–55 to +125°C (2P/R/S/T, 3P/R/S/T/U, 4P/R/S/T/U: –25 to +85°C)	B1, B3, F1: –25 to +85°C R1, R7: –55 to +125°C R6: –55 to +85°C C8: –55 to +105°C E4: +10 to +85°C F5: –30 to +85°C	Reference temperature: 25°C (2Δ, 3Δ, 4Δ, B1, B3, F1, R1: 20°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 (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°C 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°C 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.: 50/35/25V: : 0.025 max.* *GRM32D R7/R6/C8 1E106: 0.035 max. 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) (Note1) Typical Inspection

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Continued from the preceding page.

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
9	Capacitance Temperature Characteristics	No bias	Within the specified tolerance (Table A-1)	B1, B3: Within ±10% (–25 to +85°C) R1, R7: Within ±15% (–55 to +125°C) R6: Within ±15% (–55 to +85°C) E4: Within +22/–56% (+10 to +85°C) F1: Within +30/–80% (–25 to +85°C) F5: Within +22/–82% (–30 to +85°C) C8: Within ±22% (–55 to +105°C)	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°C/ΔC: +20 to +125°C: other temp. coeffs.: +25 to +85°C/+20 to +85°C) 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.
		50% of the Rated Voltage		B1: Within +10/–30% R1: Within +15/–40% F1: Within +30/–95%	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Do not apply to 1X/25V	*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.	

Step	Temperature (°C)
1	Reference Temperature ±2
2	–55±3 (for ΔC to 7U/R6/R7/C8) –30±3 (for F5), 10±3 (for E4) –25±3 (for other TC)
3	Reference Temperature ±2
4	125±3 (for ΔC/R7), 105±3 (for C8) 85±3 (for other TC)
5	Reference Temperature ±2

(2) High Dielectric Constant Type
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.

Step	Temperature (°C)	Applying Voltage (V)
1	Reference Temperature ±2	No bias
2	–55±3 (for C8, R1, R7, R6) –25±3 (for B1, B3, F1) –30±3 (for F5)/10±3 (for E4)	
3	Reference Temperature ±2	
4	125±3 (for R1, R7)/ 85±3 (for B1, B3, R6 F1, F5, E4)/105±3 (for C8)	
5	Reference Temperature ±2	50% of the rated voltage
6	–55±3 (for R1)/ –25±3 (for B1, F1)	
7	Reference Temperature ±2	
8	125±3 (for R1)/ 85±3 (for B1, F1)	

No.	Item	Specifications	Test Method
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. 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)

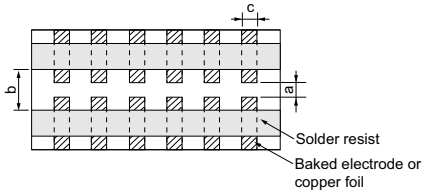

Fig. 1a

(in mm)

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

Continued on the following page.

GRM Series Specifications and Test Methods (1) (Note1) Typical Inspection

(Note1) This Specifications and Test Methods indicates typical inspection.
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In case "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (2).

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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.: 50/35/25V: : 0.025 max.* *GRM32D R7/R6/C8 1E106: 0.035 max. 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	Appearance	No marking defects		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.
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Within ±10%	

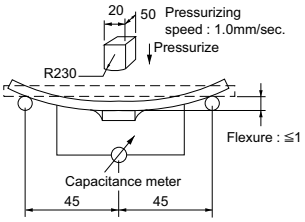

Fig. 3a

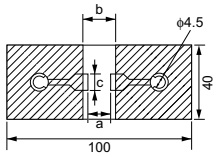

Fig. 2a

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)

No.	Item	Specifications	Test Method
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 an 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.

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GRM Series Specifications and Test Methods (1) (Note1) Typical Inspection

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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°C for 1 minute. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C 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°C 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°C, 1 min. Step 2: 170 to 200°C, 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.: 50/35/25V: : 0.025 max.* *GRM32D R7/R6/C8 1E106: 0.035 max. 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: Temp. (°C) Min. Operating Temp. +0/–3, Time (min.) 30±3 Step 2: Temp. (°C) Room Temp., Time (min.) 2 to 3 Step 3: Temp. (°C) Max. Operating Temp. +3/–0, Time (min.) 30±3 Step 4: Temp. (°C) Room Temp., Time (min.) 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/–10°C 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.: 50/35/25V: : 0.025 max.* *GRM32D R7/R6/C8 1E106: 0.035 max. 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) (Note1) Typical Inspection

(Note1) This Specifications and Test Methods indicates typical inspection.
Please refer to individual specifications (our product specifications or the approval sheet).
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In case "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (2).

Continued from the preceding page.

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°C 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.: 50/35/25/16/10V : 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°C 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°C. 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.: 50/35/25/16/10V : 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)		

Continued on the following page.

1

GRM Series Specifications and Test Methods (1) (Note1) Typical Inspection

(Note1) This Specifications and Test Methods indicates typical inspection.
Please refer to individual specifications (our product specifications or the approval sheet).
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In case "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (2).

Continued from the preceding page.

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%* of the rated voltage at the maximum operating temperature ±3°C 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 voltage* at the maximum operating temperature ±3°C for one hour. Remove and set for 24±2 hours at room temperature. Perform initial measurement. *GRM155C81E 683/104, GRM21BR71H105, GRM21BR72A474, GRM21BR71C225, GRM31CR71H475, GRM32E R6/R7 YA106, GRM32D R7/R6/C8 1E106: 150% of the rated voltage.
		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.: 50/35/25/16/10V : 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/°C)*1	Capacitance Change from 25°C (%)					
		–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°C to 125°C (for ΔC)/85°C (for other TC).

(2)

Char.	Nominal Values (ppm/°C)*2	Capacitance Change from 20°C (%)					
		–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°C to 125°C (for ΔC)/85°C (for other TC).

GRM Series Specifications and Test Methods (2) (Note1) Typical Inspection

(Note1) This Specifications and Test Methods indicates typical inspection.
Please refer to individual specifications (our product specifications or the approval sheet).
In case Non "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GRM Series Specifications and Test Methods (2).

No.	Item	Specifications	Test Method
1	Operating Temperature Range	B1, B3, F1: –25 to +85°C R1, R7, C7, D7, E7: –55 to +125°C C6, R6: –55 to +85°C F5: –30 to +85°C C8, D8: –55 to +105°C,	Reference temperature: 25°C (B1, B3, R1, F1: 20°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 (GRM02 size is based on Microscope)
5	Dielectric Strength	No defects or abnormalities	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.
6	Insulation Resistance	More than 50Ω · F	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.
7	Capacitance	Within the specified tolerance *Table 1 **GRM155 B3/R6 1A 124 to 105** **GRM185 B3/R6 1C/1A 105** **GRM185 C8/D7 1A 105** **GRM188 B3/R6 1C/1A 225** **GRM188 R7/C8 1A 225** **GRM188 B3/R6 1A 335** **GRM219 B3/R6 1C/1A 475, 106** **GRM219 C8 1A 475** **GRM21B B3/R6 1C/1A 106** **GRM21B R7/C8 1A 106** **GRM319 B3/R6 1C/1A 106**	The capacitance/D.F. should be measured at reference temperature at the measuring frequency and voltage shown in the table. Nominal Capacitance / Measuring Frequency / Measuring Voltage C≦10μF (10V min.)* / 1±0.1kHz / 1.0±0.2Vrms C≦10μF (6.3V max.) / 1±0.1kHz / 0.5±0.1Vrms C>10μF / 120±24Hz / 0.5±0.1Vrms *For items in Table1 / 1±0.1kHz / 0.5±0.1Vrms GRM188C80E106: Perform a heat treatment at 150+0/-10°C for one hour and then set for 24±2 hours at room temperature.
8	Dissipation Factor (D.F.)	B1, B3, R1, R6*, R7*, C7, C8, E7, D7: 0.1 max. C6: 0.125 max. D8: 0.15 max. F1, F5: 0.2 max. *GRM31CR71E106: 0.125 max. GRM31CR6 0J/0G 107: 0.15 max.	
9	Capacitance Temperature Characteristics — No bias	B1, B3 : Within ±10% (–25 to +85°C) F1 : Within +30/–80% (–25 to +85°C) R6 : Within ±15% (–55 to +85°C) R1, R7 : Within ±15% (–55 to +125°C) F5 : Within +22/–82% (–30 to +85°C) C6 : Within ±22% (–55 to +85°C) C7 : Within ±22% (–55 to +125°C) C8 : Within ±22% (–55 to +105°C) D7 : Within +22/–33% (–55 to +125°C) E7 : Within +22/–56% (–55 to +125°C) D8 : Within +22/–33% (–55 to +105°C)	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. *GRM32DR60J226, GRM43 B1/B3/R6 0J/1A 336/476 only: 1.0±0.2Vrms Step / Temperature (°C) / Applying Voltage (V) 1 / 25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5) 20±2 (for B1, B3, F1, R1) / No bias 2 / –55±3 (for R1, R6, R7, C6, C7, C8, D7, D8, E7) –30±3 (for F5) –25±3 (for B1, B3, F1) / No bias 3 / 25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5) 20±2 (for B1, B3, F1, R1) / No bias 4 / 125±3 (for R1, R7, C7, D7, E7) 105±3 (for C8, D8) 85±3 (for B1, B3, F1, F5, R6, C6) / No bias 5 / 20±2 (for B1, F1, R1) / 50% of the rated voltage 6 / –55±3 (for R1) –25±3 (for B1, F1) / 50% of the rated voltage 7 / 20±2 (for B1, F1, R1) / 50% of the rated voltage 8 / 125±3 (for R1) 85±3 (for B1, F1) / 50% of the rated voltage •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.
	Capacitance Temperature Characteristics — 50% of the Rated Voltage	B1: Within +10/–30% R1: Within +15/–40% F1: Within +30/–95%	

Continued on the following page.

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GRM Series Specifications and Test Methods (2) (Note1) Typical Inspection

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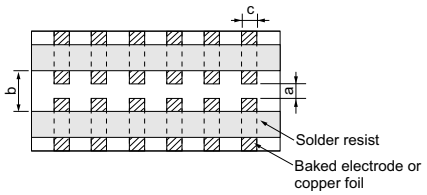
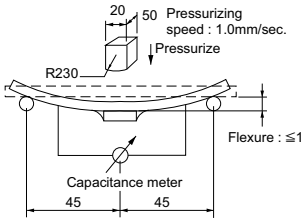
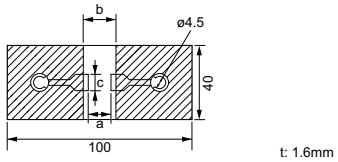
No.	Item		Specifications	Test Method
10	Adhesive Strength of Termination		No removal of the terminations or other defects should occur.  Fig. 1a	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1a using an eutectic solder. Then apply 10N* force in parallel with the test jig for 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*, R7*, C7, C8, E7, D7: 0.1 max. C6: 0.125 max. D8: 0.15 max. F1, F5: 0.2 max. *GRM31CR71E106: 0.125 max. GRM31CR6 0J/0G 107: 0.15 max.	
12	Deflection	Appearance	No marking defects	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.
		Capacitance Change	Within ±10%	
			 Fig.3a	 t: 1.6mm Fig. 2a
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°C for 10 to 30 seconds. After preheating, immerse in an 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.

(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 (2) (Note1) Typical Inspection

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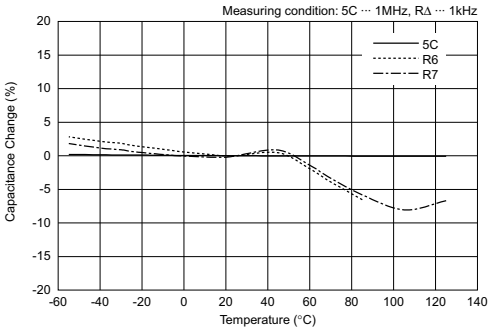
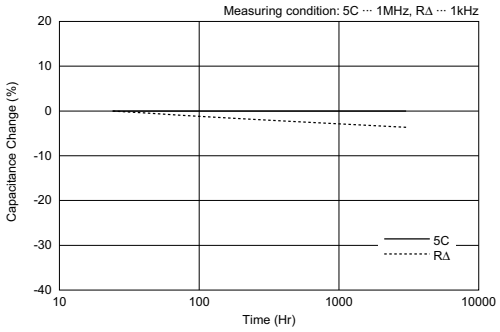
No.	Item		Specifications	Test Method
14	Resistance to Soldering Heat	Appearance	No defects or abnormalities	Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in an eutectic solder* or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Set at room temperature for 24±2 hours, then measure. *Do not apply to GRM02. •Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/–10°C 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°C, 1 min. Step 2: 170 to 200°C, 1 min.
		Capacitance Change	B1, B3, R1, R6*, R7, C6, C7, C8*, E7, D7, D8: Within ±7.5% F1, F5: Within ±20% *GRM188R6 0J/0G 106, GRM188C80E106, GRM219R60G226: within ±12.5% GRM155R60G475: Within ±15%	
		D.F.	B1, B3, R1, R6*, R7*, C7, C8, E7, D7: 0.1 max. C6: 0.125 max. D8: 0.15 max. F1, F5: 0.2 max. *GRM31CR71E106: 0.125 max. GRM31CR6 0J/0G 107: 0.15 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. (°C) Min. Operating Temp. +0/–3, Time (min.) 30±3 Step 2: Room Temp., 2 to 3 Step 3: Temp. (°C) 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°C for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement. GRM188R60J106 only Measurement after test Perform a heat treatment and then let sit for 24±2 hours at room temperature, then measure.
		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*, R7*, C7, C8, E7, D7: 0.1 max. C6: 0.125 max. D8: 0.15 max. F1, F5: 0.2 max. *GRM31CR71E106: 0.125 max. GRM31CR6 0J/0G 107: 0.15 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°C 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°C 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°C 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°C. 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°C 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°C 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% *GRM188C80E106, GRM219R60G226: within ±15%	
		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	

1 GRM Series Data

■ Capacitance - Temperature Characteristics

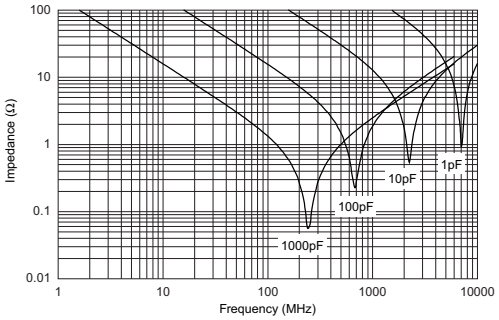


■ Capacitance Change - Aging

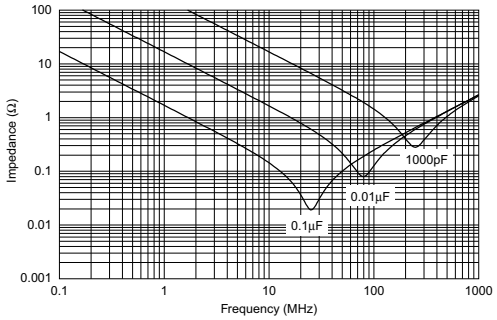


■ Impedance - Frequency Characteristics

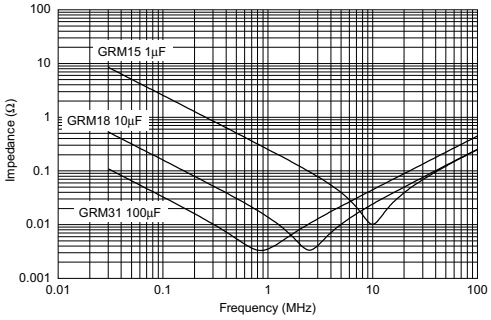
5C: GRM15



RΔ: GRM15



RΔ



The data herein are given in typical values, not guaranteed ratings.
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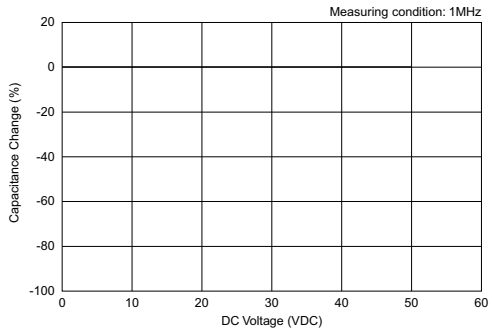
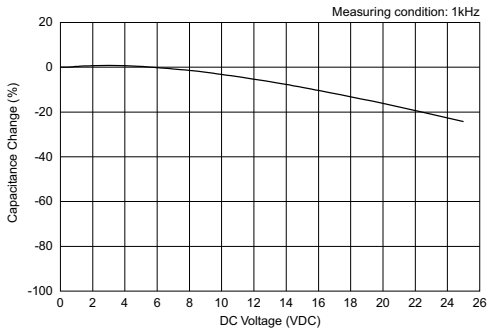
■ Capacitance - DC Voltage Characteristics

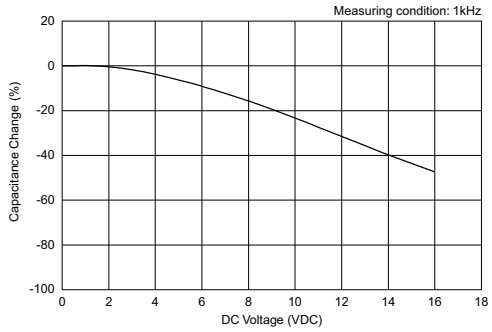
Temperature Compensating Type: GRM1555C1H102JA01



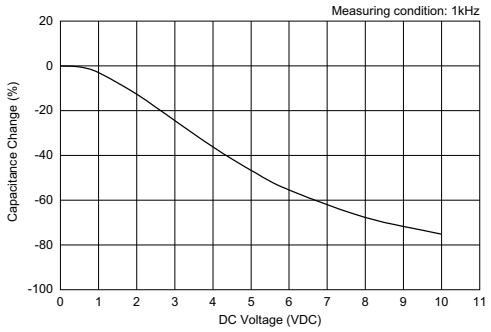
High Dielectric Constant Type: GRM155R71E103KA01



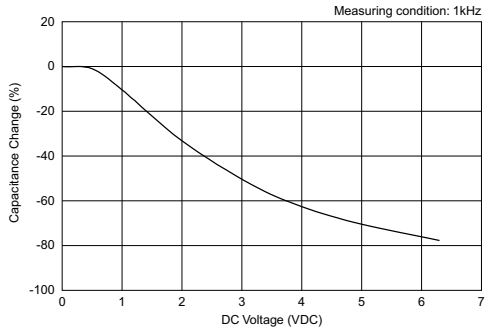
High Dielectric Constant Type: GRM155R71C104KA88



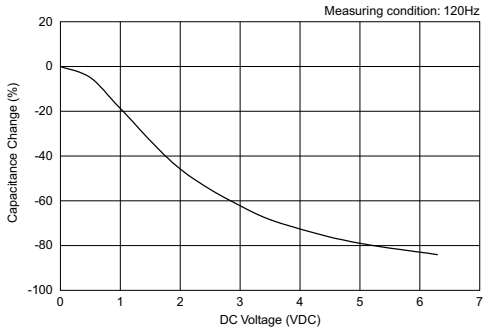
High Dielectric Constant Type: GRM155R61A105KE15



High Dielectric Constant Type: GRM188R60J106ME47



High Dielectric Constant Type: GRM31CR60J107ME39



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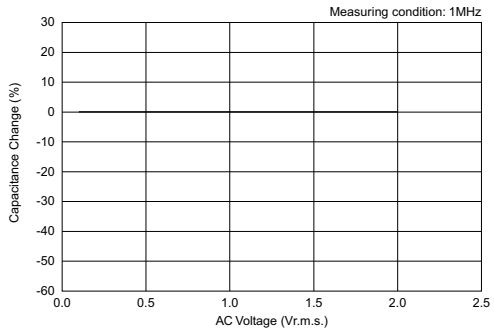
1

GRM Series Data

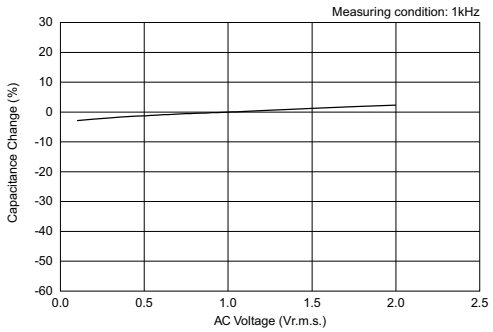
Continued from the preceding page.

■ Capacitance - AC Voltage Characteristics

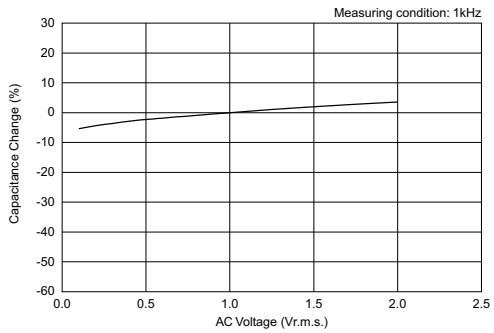
Temperature Compensating Type: GRM1555C1H102JA01



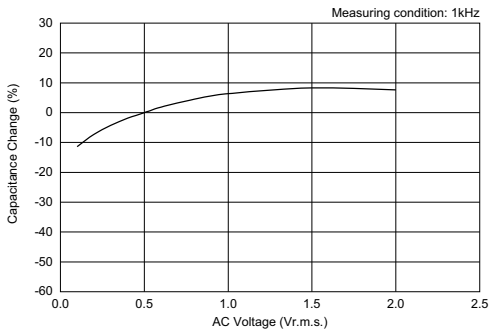
High Dielectric Constant Type: GRM155R71E103KA01



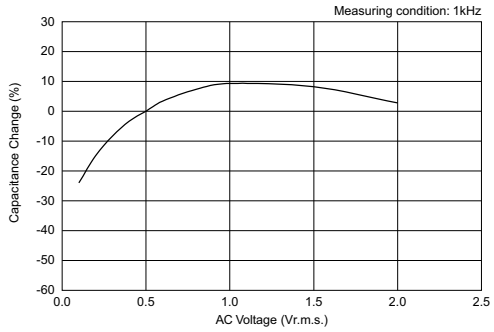
High Dielectric Constant Type: GRM155R71C104KA88



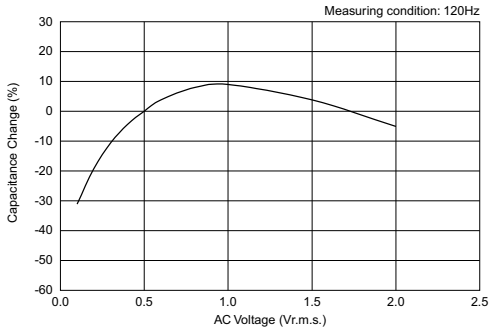
High Dielectric Constant Type: GRM155R61A105KE15



High Dielectric Constant Type: GRM188R60J106ME47



High Dielectric Constant Type: GRM31CR60J107ME39



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Chip Monolithic Ceramic Capacitors

muRata

Capacitor Array GNM Series

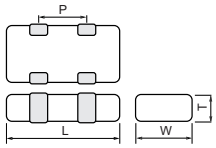
■ Features

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

■ Applications

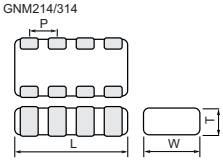
General electronic equipment

GNM0M2/1M2/212



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	

GNM214/314



Part Number	Dimensions (mm)			
	L	W	T	P
GNM214	2.0±0.15	1.25±0.15	0.5 +0.05/-0.1	0.5±0.05
			0.6±0.1	
			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	

Capacitance Table

Temperature Compensating Type C0G (5C) Characteristics

0.6 ex.0.6: T Dimension [mm]

Capacitance \ LxW [mm]	1.37x1.0 (**1M**) <0504>	2.0x1.25 (**21**) <0805>	3.2x1.6 (**31**) <1206>	
Number of Elements	2(**2**)	4(**4**)		
Rated Voltage [Vdc]	50 (**1H**)	50 (**1H**)	100 (**2A**)	50 (**1H**)
10pF(**100**)	**0.6**	**0.6**	**0.8**	**0.8**
15pF(**150**)	**0.6**	**0.6**	**0.8**	**0.8**
22pF(**220**)	**0.6**	**0.6**	**0.8**	**0.8**
33pF(**330**)	**0.6**	**0.6**	**0.8**	**0.8**
47pF(**470**)	**0.6**	**0.6**	**0.8**	**0.8**
68pF(**680**)	**0.6**	**0.6**	**0.8**	**0.8**
100pF(**101**)	**0.6**	**0.6**	**0.8**	**0.8**
150pF(**151**)	**0.6**	**0.6**	**0.8**	**0.8**
220pF(**221**)	**0.6**	**0.6**		**0.8**
330pF(**331**)				**0.8**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

Capacitance Table

Continued from the preceding page.

High Dielectric Constant Type X7R(R7)/X7S(C7) Characteristics

0.6 ex.0.6: T Dimension [mm]

LxW [mm]	1.37x1.0 (**1M**) <0504>					2.0x1.25 (**21**) <0805>			3.2x1.6 (**31**) <1206>			
Number of Elements	2(**2**)					4(**4**)						
Rated Voltage [Vdc]	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)		50 (**1H**)	25 (**1E**)	16 (**1C**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	6.3 (**0J**)
TC / Capacitance	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)
470pF(**471**)						**0.6**						
1000pF(**102**)	**0.6**					**0.6**						
2200pF(**222**)		**0.6**					**0.6**					
4700pF(**472**)		**0.6**					**0.6**					
10000pF(**103**)		**0.6**					**0.6**					
22000pF(**223**)			**0.6**	**0.6**				**0.85**				
47000pF(**473**)			**0.6**	**0.6**				**0.85**	**0.85**		**1.0**	
0.10µF(**104**)			**0.6**		**0.6**			**0.85**	**0.85**	**0.85**	**1.0**	
1.0µF(**105**)												**1.15**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

High Dielectric Constant Type X5R(R6) Characteristics

0.6 ex.0.6: T Dimension [mm]

LxW [mm]	0.9x0.6 (**0M**) <0302>				1.37x1.0 (**1M**) <0504>					2.0x1.25 (**21**) <0805>			2.0x1.25 (**21**) <0805>		3.2x1.6 (**31**) <1206>	
Number of Elements	2(**2**)												4(**4**)			
Rated Voltage [Vdc]	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)	16 (**1C**)	10 (**1A**)
TC / Capacitance	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**)
1000pF(**102**)					**0.6**											
2200pF(**222**)						**0.6**										
4700pF(**472**)						**0.6**										
10000pF(**103**)	**0.45**	**0.45**	**0.45**			**0.6**										
22000pF(**223**)	**0.45**	**0.45**	**0.45**				**0.6**	**0.6**								
47000pF(**473**)	**0.45**	**0.45**	**0.45**				**0.6**	**0.6**								
0.10µF(**104**)	**0.45**	**0.45**	**0.45**					**0.6**								
0.22µF(**224**)							**0.8**									
0.47µF(**474**)										**0.85**						
1.0µF(**105**)				**0.45**			**0.8**	**0.8**	**0.8**	**0.85**	**0.85**		**0.85**	**0.85**	**0.85**	**0.85**
2.2µF(**225**)								**0.8**	**0.8**		**0.85**	**0.85**		**0.85**		

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

High Dielectric Constant Type X7R(R7) Characteristics Low Profile

0.5 ex.0.5: T Dimension [mm]

LxW [mm]	1.37x1.0 (**1M**) <0504>	2.0x1.25 (**21**) <0805>
Number of Elements	2(**2**)	4(**4**)
Rated Voltage [Vdc]	16 (**1C**)	16 (**1C**)
TC / Capacitance	X7R (**R7**)	X7R (**R7**)
0.10µF(**104**)	**0.5**	**0.5**

The part number code is shown in ( ) and Unit is shown in [ ].
< >: EIA [inch] Code

High Dielectric Constant Type X5R(R6) Characteristics Low Profile

0.5 ex.0.5: T Dimension [mm]

LxW [mm]	1.37x1.0 (**1M**) <0504>		2.0x1.25 (**21**) <0805>
Number of Elements	2(**2**)		4(**4**)
Rated Voltage [Vdc]	16 (**1C**)	10 (**1A**)	16 (**1C**)
TC / Capacitance	X5R (**R6**)	X5R (**R6**)	X5R (**R6**)
1.0µF(**105**)	**0.5**	**0.5**	**0.5**

The part number code is shown in ( ) and Unit is shown in [ ].
< >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		1.37x1.0(1M)<0504>	2.0x1.25(21)<0805>	3.2x1.6(31)<1206>	
Rated Volt. [Vdc]		50(1H)	50(1H)	100(2A)	50(1H)
Capacitance	Tolerance	Part Number			
10pF(100)	±10% (K)	GNM1M25C1H100KD01D	GNM2145C1H100KD01D	GNM3145C2A100KD01D	GNM3145C1H100KD01D
15pF(150)	±10% (K)	GNM1M25C1H150KD01D	GNM2145C1H150KD01D	GNM3145C2A150KD01D	GNM3145C1H150KD01D
22pF(220)	±10% (K)	GNM1M25C1H220KD01D	GNM2145C1H220KD01D	GNM3145C2A220KD01D	GNM3145C1H220KD01D
33pF(330)	±10% (K)	GNM1M25C1H330KD01D	GNM2145C1H330KD01D	GNM3145C2A330KD01D	GNM3145C1H330KD01D
47pF(470)	±10% (K)	GNM1M25C1H470KD01D	GNM2145C1H470KD01D	GNM3145C2A470KD01D	GNM3145C1H470KD01D
68pF(680)	±10% (K)	GNM1M25C1H680KD01D	GNM2145C1H680KD01D	GNM3145C2A680KD01D	GNM3145C1H680KD01D
100pF(101)	±10% (K)	GNM1M25C1H101KD01D	GNM2145C1H101KD01D	GNM3145C2A101KD01D	GNM3145C1H101KD01D
150pF(151)	±10% (K)	GNM1M25C1H151KD01D	GNM2145C1H151KD01D	GNM3145C2A151KD01D	GNM3145C1H151KD01D
220pF(221)	±10% (K)	GNM1M25C1H221KD01D	GNM2145C1H221KD01D		GNM3145C1H221KD01D
330pF(331)	±10% (K)				GNM3145C1H331KD01D

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

High Dielectric Constant Type X7R(R7)/X7S(C7) Characteristics

LxW [mm]		1.37x1.0(1M)<0504>			
Number of Elements		2(2)			
Rated Volt. [Vdc]		50(1H)	25(1E)	16(1C)	10(1A)
Capacitance	Tolerance	Part Number			
1000pF(102)	±20% (M)	GNM1M2R71H102MA01D			
2200pF(222)	±20% (M)		GNM1M2R71E222MA01D		
4700pF(472)	±20% (M)		GNM1M2R71E472MA01D		
10000pF(103)	±20% (M)		GNM1M2R71E103MA01D		
22000pF(223)	±20% (M)			GNM1M2R71C223MA01D	GNM1M2R71A223MA01D
47000pF(473)	±20% (M)			GNM1M2R71C473MA01D	GNM1M2R71A473MA01D
0.10μF(104)	±20% (M)			GNM1M2R71C104MA01D	GNM1M2C71A104MA01D

LxW [mm]		2.0x1.25(21)<0805>		
Number of Elements		4(4)		
Rated Volt. [Vdc]		50(1H)	25(1E)	16(1C)
Capacitance	Tolerance	Part Number		
470pF(471)	±20% (M)	GNM214R71H471MA01D		
1000pF(102)	±20% (M)	GNM214R71H102MA01D		
2200pF(222)	±20% (M)		GNM214R71E222MA01D	
4700pF(472)	±20% (M)		GNM214R71E472MA01D	
10000pF(103)	±20% (M)		GNM214R71E103MA01D	
22000pF(223)	±20% (M)			GNM214R71C223MA01D
47000pF(473)	±20% (M)			GNM214R71C473MA01D
0.10μF(104)	±20% (M)			GNM214R71C104MA01D

LxW [mm]		3.2x1.6(31)<1206>			
Number of Elements		4(4)			
Rated Volt. [Vdc]		50(1H)	25(1E)	16(1C)	6.3(0J)
Capacitance	Tolerance	Part Number			
47000pF(473)	±20% (M)	GNM314R71H473MA11D		GNM314R71C473MA01L	
0.10μF(104)	±20% (M)	GNM314R71H104MA11D	GNM314R71E104MA11D	GNM314R71C104MA01L	
1.0μF(105)	±20% (M)				GNM314R70J105MA01L

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GNM series Specifications and Test Method(2).

(Part Number) GN | M | 1M | 2 | 5C | 1H | 100 | K | D01 | D
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Number of Elements
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		0.9x0.6(**0M**)<0302>			
Number of Elements		2(**2**)			
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**GNM0M2R61C103ME18D***	**GNM0M2R61A103ME17D***	**GNM0M2R60J103ME17D***	
22000pF (**223**)	±20% (**M**)	**GNM0M2R61C223ME18D***	**GNM0M2R61A223ME17D***	**GNM0M2R60J223ME17D***	
47000pF (**473**)	±20% (**M**)	**GNM0M2R61C473ME18D***	**GNM0M2R61A473ME17D***	**GNM0M2R60J473ME17D***	
0.1μF (**104**)	±20% (**M**)	**GNM0M2R61C104ME18D***	**GNM0M2R61A104ME17D***	**GNM0M2R60J104ME17D***	
1.0μF (**105**)	±20% (**M**)				**GNM0M2R60G105ME17D***

LxW [mm]		1.37x1.0(**1M**)<0504>		
Number of Elements		2(**2**)		
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number		
1000pF (**102**)	±20% (**M**)	**GNM1M2R61H102MA01D**		
2200pF (**222**)	±20% (**M**)		**GNM1M2R61E222MA01D**	
4700pF (**472**)	±20% (**M**)		**GNM1M2R61E472MA01D**	
10000pF (**103**)	±20% (**M**)		**GNM1M2R61E103MA01D**	
22000pF (**223**)	±20% (**M**)			**GNM1M2R61C223MA01D**
47000pF (**473**)	±20% (**M**)			**GNM1M2R61C473MA01D**
0.22μF (**224**)	±20% (**M**)			**GNM1M2R61C224ME18D***
1.0μF (**105**)	±20% (**M**)			**GNM1M2R61C105ME18D***

LxW [mm]		1.37x1.0(**1M**)<0504>	
Number of Elements		2(**2**)	
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number	
22000pF (**223**)	±20% (**M**)	**GNM1M2R61A223MA01D**	
47000pF (**473**)	±20% (**M**)	**GNM1M2R61A473MA01D**	
0.1μF (**104**)	±20% (**M**)	**GNM1M2R61A104MA01D**	
1.0μF (**105**)	±20% (**M**)	**GNM1M2R61A105ME17D***	**GNM1M2R60J105ME12D***
2.2μF (**225**)	±20% (**M**)	**GNM1M2R61A225ME18D***	**GNM1M2R60J225ME18D***

LxW [mm]		2.0x1.25(**21**)<0805>		
Number of Elements		2(**2**)		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number		
0.47μF (**474**)	±20% (**M**)	**GNM212R61C474MA16D**		
1.0μF (**105**)	±20% (**M**)	**GNM212R61C105MA16D**	**GNM212R61A105MA13D**	
2.2μF (**225**)	±20% (**M**)		**GNM212R61A225ME16D***	**GNM212R60J225ME16D***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GNM series Specifications and Test Method(2).

(Part Number) GN ❶ | M ❷ | 0M ❸ | 2 ❹ | R6 ❺ | 1C ❻ | 103 ❼ | M ❽ | E18 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Number of Elements
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD Tray.

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		2.0x1.25(**21**)<0805>	
Number of Elements		4(**4**)	
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number	
1.0µF(**105**)	±20% (**M**)	**GNM214R61A105ME17D***	**GNM214R60J105ME17D***
2.2µF(**225**)	±20% (**M**)		**GNM214R60J225ME18D***

LxW [mm]		3.2x1.6(**31**)<1206>	
Number of Elements		4(**4**)	
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number	
1.0µF(**105**)	±20% (**M**)	**GNM314R61C105MA15D**	**GNM314R61A105MA13D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GNM series Specifications and Test Method(2).

High Dielectric Constant Type X7R(R7) Characteristics Low Profile

LxW [mm]		1.37x1.0(**1M**)<0504>	2.0x1.25(**21**)<0805>
Number of Elements		2(**2**)	4(**4**)
Rated Volt. [Vdc]		16(**1C**)	16(**1C**)
Capacitance	Tolerance	Part Number	
0.10µF(**104**)	±20% (**M**)	**GNM1M2R71C104MAA1D**	**GNM214R71C104MAA1D**

High Dielectric Constant Type X5R(R6) Characteristics Low Profile

LxW [mm]		1.37x1.0(**1M**)<0504>	
Number of Elements		2(**2**)	
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number	
1.0µF(**105**)	±20% (**M**)	**GNM1M2R61C105MEA2D***	**GNM1M2R61A105MEA4D***

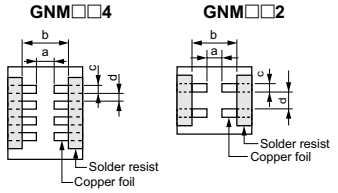
The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to GNM series Specifications and Test Method(2).

GNM Series Specifications and Test Methods (1)

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

<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>1</td><td colspan="2">Operating Temperature Range</td><td>5C: –55 to +125°C</td><td>R7, C7: –55 to +125°C
R6: –55 to +85°C</td><td></td></tr>
<tr><td>2</td><td colspan="2">Rated Voltage</td><td colspan="2">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 colspan="2">No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>4</td><td colspan="2">Dimensions</td><td colspan="2">Within the specified dimensions</td><td>Using calipers</td></tr>
<tr><td>5</td><td colspan="2">Dielectric Strength</td><td colspan="2">No defects or abnormalities</td><td>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.</td></tr>
<tr><td>6</td><td colspan="2">Insulation Resistance</td><td colspan="2">More than 10,000MΩ or 500Ω · F
(Whichever is smaller)</td><td>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.</td></tr>
<tr><td>7</td><td colspan="2">Capacitance</td><td colspan="2">Within the specified tolerance</td><td rowspan="2">The capacitance/Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
<table><tr><th>Item \ Char.</th><th>5C</th><th>R7</th></tr><tr><td>Frequency</td><td>1±0.1MHz</td><td>1±0.1kHz</td></tr><tr><td>Voltage</td><td>0.5 to 5Vrms</td><td>1.0±0.2Vrms</td></tr></table></td></tr>
<tr><td>8</td><td colspan="2">Q/
Dissipation Factor (D.F.)</td><td>30pF min.: Q≧1000
30pF max.:
Q≧400+20C

C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td rowspan="3">9</td><td rowspan="3">Capacitance Temperature Characteristics</td><td>Capacitance Change</td><td>Within the specified tolerance (Table A)</td><td><table><tr><th>Char.</th><th>Temp. Range</th><th>Reference Temp.</th><th>Cap. Change</th></tr><tr><td>R7</td><td>–55°C to +125°C</td><td rowspan="3">25°C</td><td rowspan="2">Within ±15%</td></tr><tr><td>R6</td><td>–55°C to +85°C</td></tr><tr><td>C7</td><td>–55°C to +125°C</td><td>Within ±22%</td></tr></table></td><td rowspan="3">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.
<table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>–55±3 (for 5C/R7/C7), –30±3 (for F5)</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>125±3 (for 5C/R7/C7), 85±3 (for F5)</td></tr><tr><td>5</td><td>25±2</td></tr></table>(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.

• 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>Temperature Coefficient</td><td>Within the specified tolerance (Table A)</td></tr>
<tr><td>Capacitance Drift</td><td>Within ±0.2% or ±0.05pF (Whichever is larger.)</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.
 
</td><td>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.
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>GNM1M2</td><td>0.5</td><td>1.6</td><td>0.32</td><td>0.32</td></tr><tr><td>GNM212</td><td>0.6</td><td>1.8</td><td>0.5</td><td>0.5</td></tr><tr><td>GNM214</td><td>0.6</td><td>2.0</td><td>0.25</td><td>0.25</td></tr><tr><td>GNM314</td><td>0.8</td><td>2.5</td><td>0.4</td><td>0.4</td></tr></table>(in mm)
Fig. 1</td></tr>
</table>

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GNM Series Specifications and Test Methods (1)

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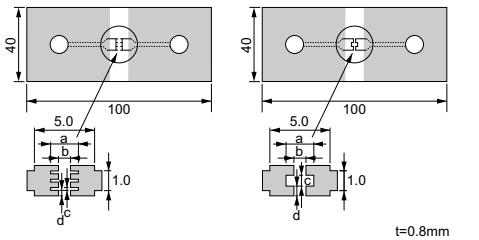
In case Non "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

<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="4">11</td><td rowspan="4">Vibration Resistance</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="4">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).</td></tr>
<tr><td>Capacitance</td><td colspan="2">Within the specified tolerance</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1000
30pF max.: Q≧400+20C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">12</td><td rowspan="3">Deflection</td><td>Appearance</td><td colspan="2">No marking defects</td><td rowspan="3">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.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (Whichever is larger)</td><td>Within ±10%</td></tr>
<tr><td colspan="3">•GNM□□4 •GNM□□2
 
t=0.8mm
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>GNM1M2</td><td>2.0±0.05</td><td>0.5±0.05</td><td>0.32±0.05</td><td>0.32±0.05</td></tr><tr><td>GNM212</td><td>2.0±0.05</td><td>0.6±0.05</td><td>0.5±0.05</td><td>0.5±0.05</td></tr><tr><td>GNM214</td><td>2.0±0.05</td><td>0.7±0.05</td><td>0.3±0.05</td><td>0.2±0.05</td></tr><tr><td>GNM314</td><td>2.5±0.05</td><td>0.8±0.05</td><td>0.4±0.05</td><td>0.4±0.05</td></tr></table>(in mm)
Fig. 2</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>13</td><td colspan="2">Solderability of Termination</td><td colspan="2">75% of the terminations are to be soldered evenly and continuously.</td><td>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.</td></tr>
<tr><td rowspan="5">14</td><td colspan="2" rowspan="5">Resistance to Soldering Heat</td><td colspan="2">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">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.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td><td>R7, R6, C7: Within ±7.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1000
30pF max.: Q≧400+20C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 10,000MΩ or 500Ω · F (Whichever is smaller)</td></tr>
<tr><td></td><td>Dielectric Strength</td><td colspan="2">No failure</td><td></td></tr>
</table>

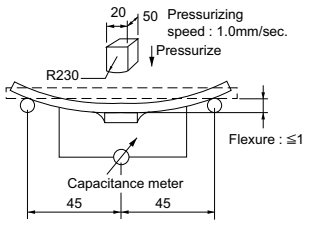


Fig. 3

Continued on the following page.

GNM Series Specifications and Test Methods (1)

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2

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
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 listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. Step 1: Temp. (°C): Min. Operating Temp.+0/–3; Time (min.): 30±3 Step 2: Temp.: Room Temp.; Time: 2 to 3 Step 3: Temp.: Max. Operating Temp. +3/–0; Time: 30±3 Step 4: Temp.: Room Temp.; Time: 2 to 3 • 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		
16	Humidity Steady State		The measured and observed characteristics should satisfy the specifications in the following table.		Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure.
		Appearance	No marking defects		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R7, R6, C7: Within ±12.5%	
		Q/D.F.	30pF and over: Q≧350 10pF and over, 30pF and below: Q≧275+5C/2 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	Char. / 25V min. / 16V / 10V/6.3V R7, R6, C7 / 0.05 max. / 0.05 max. / 0.05 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°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	R7, R6, C7: Within ±12.5%	
		Q/D.F.	30pF and over: Q≧200 30pF and below: Q≧100+10C/3 C: Nominal Capacitance (pF)	Char. / 25V min. / 16V / 10V/6.3V R7, R6, C7 / 0.05 max. / 0.05 max. / 0.05 max.	
		I.R.	More than 500MΩ or 25Ω · F (Whichever is smaller)		

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GNM Series Specifications and Test Methods (1)

Continued from the preceding page.

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In case "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

<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="5">18</td><td rowspan="5">High Temperature Load</td><td colspan="3">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit 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 for one hour at the maximum operating temperature ±3°C. Remove and let sit for 24±2 hours at room temperature. Perform initial measurement.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF (Whichever is larger)</td><td>R7, R6, C7: Within ±12.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF and over:
Q≧350
10pF and over, 30pF and below:
Q≧275+5C/2
10pF and below:
Q≧200+10C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V/6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.04 max.</td><td>0.05 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 1,000MΩ or 50Ω · F (Whichever is smaller)</td></tr>
</table>

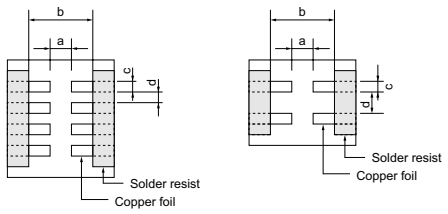
Table A

Char.	Nominal Values (ppm/°C) Note 1	Capacitance Change from 25°C (%)					
		−55°C		−30°C		−10°C	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	0±30	0.58	–0.24	0.40	–0.17	0.25	–0.11

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

GNM Series Specifications and Test Methods (2)

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

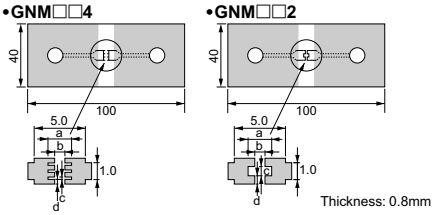
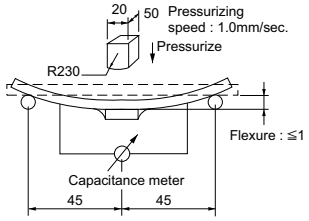
No.	Item	Specifications	Test Method
1	Operating Temperature Range	R6: –55°C to +85°C	
2	Rated Voltage	See the previous pages.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance	No defects or abnormalities	Visual inspection
4	Dimensions	Within the specified dimension	Using calipers
5	Dielectric Strength	No defects or abnormalities	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.
6	Insulation Resistance	50Ω · F min.	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 1 minute of charging.
7	Capacitance	Within the specified tolerance	The capacitance/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
8	Dissipation Factor (D.F.)	0.1 max.*3 Table 3 GNM0M2 R6 103/223/473/104 GNM1M2 R6 0J 105/225 GNM1M2 R6 1A 225 GNM212 R6 0J 225 GNM212 R6 1A 225 GNM214 R6 0J 225 *3 However 0.125 max. about Table 3 items.	Nominal Capacitance / Measuring Frequency / Measuring Voltage C≦10μF *1 (10V min.) 1±0.1kHz 1.0±0.2Vrms C≦10μF *2 (6.3V max.) 1±0.1kHz 0.5±0.1Vrms *1For items in Table1 1±0.1kHz 0.5±0.1Vrms *2For items in Table2 1±0.1kHz 1.0±0.1Vrms Table 1 GNM0M2 R6 1A 104 GNM0M2 R6 1C 104 GNM1M2 R6 1A 105/225 GNM1M2 R6 1C 224/105 Table 2 GNM0M2 R6 0J 103/223/473 GNM212 R6 0J 225 GNM214 R6 0J 105
9	Capacitance Temperature Characteristics	Char. / Temp. Range / Reference Temp. / Cap. Change R6 –55 to +85°C 25°C Within ±15%	The capacitance change should be measured after 5 min.at each specified temperature stage. Step / Temperature (°C) 1 25±2 2 –55±3 3 25±2 4 85±3 5 25±2 The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges. • 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.
10	Adhesive Strength of Termination	No removal of the terminations or other defects should occur. GNM□□4 GNM□□2  Fig. 1	Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder. Then apply 5N (GNM0M2: 2N) 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. Type / a / b / c / d GNM0M2 0.2 0.96 0.25 0.2 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)
11	Vibration	Appearance: No defects or abnormalities Capacitance: Within the specified tolerance D.F.: 0.1 max.*3 *3 However 0.125 max. about Table 3 items.	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).

Continued on the following page.

GNM Series Specifications and Test Methods (2)

Continued from the preceding page.

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

No.	Item		Specifications	Test Method
12	Deflection	Appearance	No marking defects	Solder the capacitor to 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. 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.
		Capacitance Change	Within ±10%	
			•GNM□□4 •GNM□□2  Thickness: 0.8mm Type / a / b / c / d GNM0M2: 2.0±0.05 / 0.2±0.05 / 0.2±0.05 / 0.25±0.05 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
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	Appearance	No marking defects	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 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.
		Capacitance Change	R6*4: Within ±7.5% *4 GNM0M2R60E105: Within +15/-7.5%	
		D.F.	0.1 max. *3 *3 However 0.125 max. about Table 3 items.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	
15	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. Step / 1 / 2 / 3 / 4 Temp. (°C) / Min. Operating Temp. / Room Temp. / Min. Operating Temp. / Room Temp. Time (min.) / 30±3 / 2 to 3 / 30±3 / 2 to 3 • Initial measurement 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.
		Capacitance Change	R6*5: Within ±12.5% *5 GNM0M2R60E105: Within ±15%	
		D.F.	0.1 max. *3 *3 However 0.125 max. about Table 3 items.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	
16	High Temperature High Humidity (Steady)	Appearance	No marking defects	Apply the rated voltage at 40±2°C 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°C 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°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6: Within ±12.5%	
		D.F.	0.2 max.	
		I.R.	12.5Ω · F min.	
17	Durability	Appearance	No marking defects	Apply 150% (GNM1M2R61A225/1C105: 125% of the rated voltage) of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. 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°C 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°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6: Within ±12.5%	
		D.F.	0.2 max.	
		I.R.	25Ω · F min.	

Chip Monolithic Ceramic Capacitors

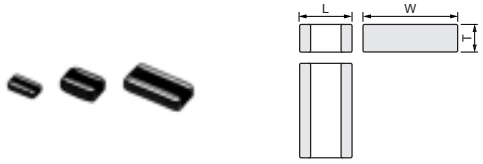
muRata

Low ESL LLL/LLA/LLM Series

Reversed Geometry Low ESL Type

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

■ Applications
1. High speed micro processor
2. High frequency digital equipment

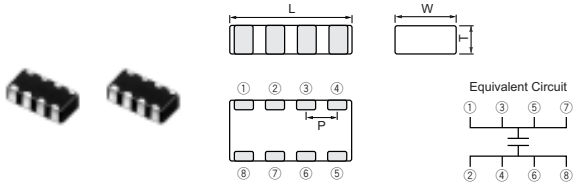


Part Number	Dimensions (mm)		
	L	W	T
LLL153	0.5±0.05	1.0±0.05	0.3±0.05
LLL185	0.8±0.1	1.6±0.1	0.6max.
LLL215	1.25±0.1	2.0±0.1	0.5+0/-0.15
LLL216			0.6±0.1
LLL219			0.85±0.1
LLL315	1.6±0.15	3.2±0.15	0.5+0/-0.15
LLL317			0.7±0.1
LLL31M			1.15±0.1

Eight Terminals Low ESL Type

■ Features
1. Low ESL (100pH) , suitable to decoupling capacitor for 1GHz clock speed IC.
2. Small, large cap

■ Applications
1. High speed micro processor
2. High frequency digital equipment

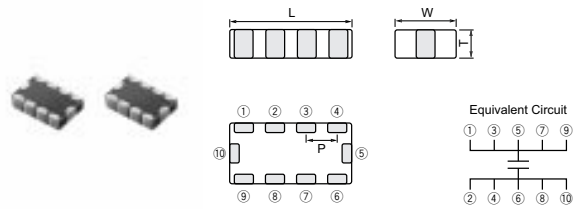


Part Number	Dimensions (mm)			
	L	W	T	P
LLA185	1.6±0.1	0.8±0.1	0.5+0.05/-0.1	0.4±0.1
LLA215	2.0±0.1	1.25±0.1	0.5+0.05/-0.1	0.5±0.05
LLA219	2.0±0.1	1.25±0.1	0.85±0.1	0.5±0.05
LLA315	3.2±0.15	1.6±0.15	0.5+0.05/-0.1	0.8±0.1
LLA319	3.2±0.15	1.6±0.15	0.85±0.1	0.8±0.1
LLA31M	3.2±0.15	1.6±0.15	1.15±0.1	0.8±0.1

Ten Terminals Low ESL Type

■ Features
1. Low ESL (45pH), suitable to decoupling capacitor for 2GHz clock speed IC.
2. Small, large cap

■ Applications
1. High speed micro processor
2. High frequency digital equipment



Part Number	Dimensions (mm)			
	L	W	T	P
LLM215	2.0±0.1	1.25±0.1	0.5+0.05/-0.1	0.5±0.05
LLM315	3.2±0.15	1.6±0.15	0.5+0.05/-0.1	0.8±0.1

muRata

Capacitance Table

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7)/X6S(C8)/X5R(R6) Characteristics

5 ex.5: T Dimension [mm]

LxW [mm]	0.5x1.0 (**15**) <0204>		0.8x1.6 (**18**) <0306>					1.25x2.0 (**21**) <0508>					1.6x3.2 (**31**) <0612>					
Rated Voltage [Vdc]	6.3 (**0J**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	
TC / Capacitance	X6S (**C8**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X5R (**R6**)
2200pF(**222**)			**5**															
4700pF(**472**)			**5**															
10000pF(**103**)				**5**				**6**					**7**					
22000pF(**223**)				**5**				**6**					**7**					
47000pF(**473**)					**5**				**6**				**7**					
0.10µF(**104**)	**3**					**5**			**6**				**M**	**7**				
0.22µF(**224**)	**3**					**5**				**9**	**6**			**M**	**7**			
0.47µF(**474**)		**3**					**5**				**9**			**M**	**7**			
1.0µF(**105**)							**5**				**9**				**M**	**7**		
2.2µF(**225**)							**5**					**9**				**M**	**7**	
4.7µF(**475**)																	**M**	
10µF(**106**)																		**M**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

5 ex.5: T Dimension [mm]

LxW [mm]	0.8x1.6 (**18**) <0306>				1.25x2.0 (**21**) <0508>						1.6x3.2 (**31**) <0612>			
Rated Voltage [Vdc]	25 (**1E**)	16 (**1C**)	10 (**1A**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)	4 (**0G**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)
TC / Capacitance	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7S (**C7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)	X7R (**R7**)
10000pF(**103**)	**5**				**5**						**5**			
22000pF(**223**)		**5**				**5**					**5**			
47000pF(**473**)		**5**					**5**					**5**		
0.10µF(**104**)			**5**				**5**					**5**		
0.22µF(**224**)				**5**				**5**					**5**	
0.47µF(**474**)									**5**					**5**
1.0µF(**105**)										**5**				

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Continued on the following page.

Capacitance Table

Continued from the preceding page.

Eight Terminals Low ESL Type X7S(C7)/X7R(R7) Characteristics

5 ex.5: T Dimension [mm]

LxW [mm]	1.6x0.8 (18) <0603>	2.0x1.25 (21) <0805>					3.2x1.6 (31) <1206>		
Rated Voltage [Vdc]	4 (0G)	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	16 (1C)	10 (1A)	4 (0G)
TC / Capacitance	X7S (C7)	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7S (C7)	X7R (R7)	X7R (R7)	X7R (R7)
10000pF(103)		9							
22000pF(223)		9							
47000pF(473)		9							
0.10µF(104)	5		9				9		
0.22µF(224)	5		9				9		
0.47µF(474)	5			9			9		
1.0µF(105)	5				9		M	9	
2.2µF(225)	5					9		M	9
4.7µF(475)						9			

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

5 ex.5: T Dimension [mm]

LxW [mm]	2.0x1.25 (21) <0805>					3.2x1.6 (31) <1206>		
Rated Voltage [Vdc]	25 (1E)	16 (1C)	10 (1A)	6.3 (0J)	4 (0G)	16 (1C)	10 (1A)	6.3 (0J)
TC / Capacitance	X7R (R7)	X7R (R7)	X7R (R7)	X7R (R7)	X7S (C7)	X7R (R7)	X7R (R7)	X7R (R7)
10000pF(103)	5							
22000pF(223)	5							
47000pF(473)		5						
0.10µF(104)		5						
0.22µF(224)			5			5		
0.47µF(474)				5			5	
1.0µF(105)					5			5
2.2µF(225)					5			5
4.7µF(475)					5			

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Ten Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

5 ex.5: T Dimension [mm]

LxW [mm]	2.0x1.25 (21) <0805>				3.2x1.6 (31) <1206>		
Rated Voltage [Vdc]	25 (1E)	16 (1C)	6.3 (0J)	4 (0G)	16 (1C)	10 (1A)	6.3 (0J)
TC / Capacitance	X7R (R7)	X7R (R7)	X7R (R7)	X7S (C7)	X7R (R7)	X7R (R7)	X7R (R7)
10000pF(103)	5						
22000pF(223)	5						
47000pF(473)		5					
0.10µF(104)		5			5		
0.22µF(224)			5		5		
0.47µF(474)			5			5	
1.0µF(105)				5			
2.2µF(225)				5			5

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7)/X6S(C8) Characteristics

LxW [mm]		0.5x1.0(**15**)<0204>	
Rated Volt. [Vdc]		6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number	
0.10μF(**104**)	±20% (**M**)	**LLL153C80J104ME01E***	
0.22μF(**224**)	±20% (**M**)	**LLL153C80J224ME14E***	
0.47μF(**474**)	±20% (**M**)		**LLL153C70G474ME17E***

LLL153 Series 4V/0.47μF(L: 0.5+0.07/-0.03mm)

LxW [mm]		0.8x1.6(**18**)<0306>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
2200pF(**222**)	±20% (**M**)	**LLL185R71H222MA01L**			
4700pF(**472**)	±20% (**M**)	**LLL185R71H472MA01L**			
10000pF(**103**)	±20% (**M**)		**LLL185R71E103MA01L**		
22000pF(**223**)	±20% (**M**)		**LLL185R71E223MA01L**		
47000pF(**473**)	±20% (**M**)			**LLL185R71C473MA01L**	
0.10μF(**104**)	±20% (**M**)				**LLL185R71A104MA01L**
0.22μF(**224**)	±20% (**M**)				**LLL185R71A224MA01L**

LxW [mm]		0.8x1.6(**18**)<0306>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
0.47μF(**474**)	±20% (**M**)	**LLL185C70G474MA01L**
1.0μF(**105**)	±20% (**M**)	**LLL185C70G105ME02L***
2.2μF(**225**)	±20% (**M**)	**LLL185C70G225ME01L***

LxW [mm]		1.25x2.0(**21**)<0508>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20% (**M**)	**LLL216R71H103MA01L**			
22000pF(**223**)	±20% (**M**)	**LLL216R71H223MA01L**			
47000pF(**473**)	±20% (**M**)		**LLL216R71E473MA01L**		
0.10μF(**104**)	±20% (**M**)		**LLL216R71E104MA01L**		
0.22μF(**224**)	±20% (**M**)			**LLL219R71C224MA01L**	**LLL216R71A224MA01L**
0.47μF(**474**)	±20% (**M**)				**LLL219R71A474MA01L**
1.0μF(**105**)	±20% (**M**)				**LLL219R71A105MA01L**

LxW [mm]		1.25x2.0(**21**)<0508>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
2.2μF(**225**)	±20% (**M**)	**LLL219C70G225MA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

(Part Number) **LL** **L** **15** **3** **C8** **0J** **104** **M** **E01** **E**
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Reversed Geometry Low ESL Type X7R(R7)/X5R(R6) Characteristics

LxW [mm]		1.6x3.2(**31**)<0612>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**LLL317R71H103MA01L**			
22000pF (**223**)	±20% (**M**)	**LLL317R71H223MA01L**			
47000pF (**473**)	±20% (**M**)	**LLL317R71H473MA01L**			
0.1μF (**104**)	±20% (**M**)	**LLL31MR71H104MA01L**	**LLL317R71E104MA01L**		
0.22μF (**224**)	±20% (**M**)		**LLL31MR71E224MA01L**	**LLL317R71C224MA01L**	
0.47μF (**474**)	±20% (**M**)		**LLL31MR71E474MA01L**	**LLL317R71C474MA01L**	
1.0μF (**105**)	±20% (**M**)			**LLL31MR71C105MA01L**	**LLL317R71A105MA01L**
2.2μF (**225**)	±20% (**M**)				**LLL31MR71A225MA01L**

LxW [mm]		1.6x3.2(**31**)<0612>
Rated Volt. [Vdc]		6.3(**0J**)
Capacitance	Tolerance	Part Number
2.2μF (**225**)	±20% (**M**)	**LLL317R70J225MA01L**
4.7μF (**475**)	±20% (**M**)	**LLL31MR70J475MA01L**
10μF (**106**)	±20% (**M**)	**LLL31MR60J106ME01L***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

Reversed Geometry Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

LxW [mm]		0.8x1.6(**18**)<0306>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**LLL185R71E103MA11L**			
22000pF (**223**)	±20% (**M**)		**LLL185R71C223MA11L**		
47000pF (**473**)	±20% (**M**)		**LLL185R71C473MA11L**		
0.1μF (**104**)	±20% (**M**)			**LLL185R71A104MA11L**	
0.22μF (**224**)	±20% (**M**)				**LLL185C70G224MA11L**

LxW [mm]		1.25x2.0(**21**)<0508>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**LLL215R71H103MA11L**			
22000pF (**223**)	±20% (**M**)		**LLL215R71E223MA11L**		
47000pF (**473**)	±20% (**M**)			**LLL215R71C473MA11L**	
0.1μF (**104**)	±20% (**M**)			**LLL215R71C104MA11L**	
0.22μF (**224**)	±20% (**M**)				**LLL215R71A224MA11L**

LxW [mm]		1.25x2.0(**21**)<0508>	
Rated Volt. [Vdc]		6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number	
0.47μF (**474**)	±20% (**M**)	**LLL215R70J474MA11L**	
1.0μF (**105**)	±20% (**M**)		**LLL215C70G105MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

(Part Number) | LL | L | 31 | 7 | R7 | 1H | 103 | M | A01 | L |
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Reversed Geometry Low ESL Type X7R(R7) Characteristics Low Profile

LxW [mm]		1.6x3.2(**31**)<0612>			
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20% (**M**)	**LLL315R71H103MA11L**			
22000pF(**223**)	±20% (**M**)	**LLL315R71H223MA11L**			
47000pF(**473**)	±20% (**M**)		**LLL315R71E473MA11L**		
0.1μF(**104**)	±20% (**M**)		**LLL315R71E104MA11L**		
0.22μF(**224**)	±20% (**M**)			**LLL315R71C224MA11L**	
0.47μF(**474**)	±20% (**M**)				**LLL315R71A474MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics

LxW [mm]		1.6x0.8(**18**)<0603>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
0.1μF(**104**)	±20% (**M**)	**LLA185C70G104MA01L**
0.22μF(**224**)	±20% (**M**)	**LLA185C70G224MA01L**
0.47μF(**474**)	±20% (**M**)	**LLA185C70G474MA01L**
1.0μF(**105**)	±20% (**M**)	**LLA185C70G105ME01L***
2.2μF(**225**)	±20% (**M**)	**LLA185C70G225ME16L***

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20% (**M**)	**LLA219R71E103MA01L**			
22000pF(**223**)	±20% (**M**)	**LLA219R71E223MA01L**			
47000pF(**473**)	±20% (**M**)	**LLA219R71E473MA01L**			
0.1μF(**104**)	±20% (**M**)		**LLA219R71C104MA01L**		
0.22μF(**224**)	±20% (**M**)		**LLA219R71C224MA01L**		
0.47μF(**474**)	±20% (**M**)			**LLA219R71A474MA01L**	
1.0μF(**105**)	±20% (**M**)				**LLA219R70J105MA01L**

LxW [mm]		2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
2.2μF(**225**)	±20% (**M**)	**LLA219C70G225MA01L**
4.7μF(**475**)	±20% (**M**)	**LLA219C70G475ME01L***

LxW [mm]		3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	4(**0G**)
Capacitance	Tolerance	Part Number		
0.1μF(**104**)	±20% (**M**)	**LLA319R71C104MA01L**		
0.22μF(**224**)	±20% (**M**)	**LLA319R71C224MA01L**		
0.47μF(**474**)	±20% (**M**)	**LLA319R71C474MA01L**		
1.0μF(**105**)	±20% (**M**)	**LLA31MR71C105MA01L**	**LLA319R71A105MA01L**	
2.2μF(**225**)	±20% (**M**)		**LLA31MR71A225MA01L**	**LLA319R70G225MA01L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

Eight Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**LLA215R71E103MA14L**			
22000pF (**223**)	±20% (**M**)	**LLA215R71E223MA14L**			
47000pF (**473**)	±20% (**M**)		**LLA215R71C473MA14L**		
0.10μF (**104**)	±20% (**M**)		**LLA215R71C104MA14L**		
0.22μF (**224**)	±20% (**M**)			**LLA215R71A224MA14L**	
0.47μF (**474**)	±20% (**M**)				**LLA215R70J474MA14L**

LxW [mm]		2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		4(**0G**)
Capacitance	Tolerance	Part Number
1.0μF (**105**)	±20% (**M**)	**LLA215C70G105MA14L**
2.2μF (**225**)	±20% (**M**)	**LLA215C70G225ME11L***
4.7μF (**475**)	±20% (**M**)	**LLA215C70G475ME19L***

LxW [mm]		3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number		
0.22μF (**224**)	±20% (**M**)	**LLA315R71C224MA14L**		
0.47μF (**474**)	±20% (**M**)		**LLA315R71A474MA14L**	
1.0μF (**105**)	±20% (**M**)			**LLA315R70J105MA14L**
2.2μF (**225**)	±20% (**M**)			**LLA315R70J225MA14L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

Ten Terminals Low ESL Type X7R(R7)/X7S(C7) Characteristics Low Profile

LxW [mm]		2.0x1.25(**21**)<0805>			
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF (**103**)	±20% (**M**)	**LLM215R71E103MA11L**			
22000pF (**223**)	±20% (**M**)	**LLM215R71E223MA11L**			
47000pF (**473**)	±20% (**M**)		**LLM215R71C473MA11L**		
0.10μF (**104**)	±20% (**M**)		**LLM215R71C104MA11L**		
0.22μF (**224**)	±20% (**M**)			**LLM215R70J224MA11L**	
0.47μF (**474**)	±20% (**M**)			**LLM215R70J474MA11L**	
1.0μF (**105**)	±20% (**M**)				**LLM215C70G105MA11L**
2.2μF (**225**)	±20% (**M**)				**LLM215C70G225ME11L***

LxW [mm]		3.2x1.6(**31**)<1206>		
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number		
0.10μF (**104**)	±20% (**M**)	**LLM315R71C104MA11L**		
0.22μF (**224**)	±20% (**M**)	**LLM315R71C224MA11L**		
0.47μF (**474**)	±20% (**M**)		**LLM315R71A474MA11L**	
2.2μF (**225**)	±20% (**M**)			**LLM315R70J225MA11L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code
*: Please refer to LLL/LLA/LLM Series Specifications and Test Method(2).

(Part Number) LL | A | 21 | 5 | R7 | 1E | 103 | M | A14 | L
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

LLL/LLA/LLM Series Specifications and Test Methods (1)

In case Non "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R7, C7: −55 to +125°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 dimension	Using calipers
5	Dielectric Strength		No defects or abnormalities	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.
6	Insulation Resistance		C≦0.047μF: More than 10,000MΩ C>0.047μF: More than 500Ω · F C: Normal Capacitance	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/D.F. should be measured at 25°C at the frequency and voltage shown in the table. Frequency: 1±0.1kHz Voltage: 1±0.2Vrms ∗For LLA185C70G474, the capacitance should be measured unsing a voltage of 0.5±0.1Vrms.
8	Dissipation Factor (D.F.)		W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max. W.V.: 6.3V max.; 0.05 max.	
9	Capacitance Temperature Characteristics		<table><tr><th>Char.</th><th>Temp. Range (°C)</th><th>Reference Temp.</th><th>Cap.Change</th></tr><tr><td>R7</td><td>−55 to +125</td><td>25°C</td><td>Within ±15%</td></tr><tr><td>C7</td><td>−55 to +125</td><td>25°C</td><td>Within ±22%</td></tr></table>	The capacitance change should be measured after 5 min. at each specified temperature stage. <table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>−55±3</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>125±3</td></tr><tr><td>5</td><td>25±2</td></tr></table> The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges. • Initial measurement. 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.
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) using a 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. ∗LLL18 and LLA/LLM Series: 5N
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	
		D.F.	W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max. W.V.: 6.3V max.; 0.05 max.	
12	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.
13	Resistance to Soldering Heat	Appearance	No marking defects	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. 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.
		Capacitance Change	Within ±7.5%	
		D.F.	W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max. W.V.: 6.3V max.; 0.05 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	
		Dielectric Strength	No failure	

Continued on the following page.

LLL/LLA/LLM Series Specifications and Test Methods (1)

Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. Step 1: Min. Operating Temp. $^{+0}_{-3}$ °C, 30±3 min. / Step 2: Room Temp., 2 to 3 min. / Step 3: Max. Operating Temp. $^{+3}_{-0}$ °C, 30±3 min. / Step 4: Room Temp., 2 to 3 min. • Initial measurement. 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.
		Capacitance Change	Within ±7.5%	
		D.F.	W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max. W.V.: 6.3V max.; 0.05 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	
		Dielectric Strength	No failure	
15	Humidity (Steady State)	Appearance	No marking defects	Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)	
16	Humidity Load	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 500MΩ or 25Ω · F (Whichever is smaller)	
17	High Temperature Load	Appearance	No marking defects	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 24±2 hours at room temperature. Perform initial measurement.
		Capacitance Change	Within ±12.5%	
		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)	

LLL/LLA/LLM Series Specifications and Test Methods (2)

In case Non "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (2).

No.	Item	Specifications	Test Method
1	Operating Temperature Range	R6: –55 to +85°C R7, C7: –55 to +125°C C8: –55 to +105°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 dimension	Using calipers
5	Dielectric Strength	No defects or abnormalities	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.
6	Insulation Resistance	50Ω · F min.	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 1 minute of charging.
7	Capacitance	Within the specified tolerance	The capacitance/D.F. should be measured at 25°C at the frequency and voltage shown in the table. Capacitance / Frequency / Voltage C≦10μF (10V min.) / 1±0.1kHz / 1.0±0.2Vrms C≦10μF (6.3V max.) / 1±0.1kHz / 0.5±0.1Vrms C>10μF / 120±24Hz / 0.5±0.1Vrms
8	Dissipation Factor (D.F.)	R6, R7, C7, C8: 0.120 max.	
9	Capacitance Temperature Characteristics	Char. / Temp. Range (°C) / Reference Temp. / Cap. Change R6 / –55 to +85 / 25°C / Within ±15% R7 / –55 to +125 / 25°C / Within ±15% C7 / –55 to +125 / 25°C / Within ±22% C8 / –55 to +105 / 25°C / Within ±22%	The capacitance change should be measured after 5 min. at each specified temperature stage. The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges. • Initial measurement. 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.
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) using a 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. *5N (LLL15, LLL18, LLA,LLM Series)
11	Vibration — 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).
	Vibration — Capacitance	Within the specified tolerance	
	Vibration — D.F.	R6, R7, C7, C8: 0.120 max.	
12	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.
13	Resistance to Soldering Heat — Appearance	No marking defects	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. 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.
	Resistance to Soldering Heat — Capacitance Change	R6, R7, C7, C8: Within ±7.5%	
	Resistance to Soldering Heat — D.F.	R6, R7, C7, C8: 0.120 max.	
	Resistance to Soldering Heat — I.R.	50Ω · F min.	
	Resistance to Soldering Heat — Dielectric Strength	No failure	

Continued on the following page.

LLL/LLA/LLM Series Specifications and Test Methods (2)

Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
14	Temperature Sudden Change	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10).Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. Step 1: Min. Operating Temp. +0/-3 °C, 30±3 min. Step 2: Room Temp., 2 to 3 min. Step 3: Min. Operating Temp. +0/-3 °C, 30±3 min. Step 4: Room Temp., 2 to 3 min. • Initial measurement 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.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	
		D.F.	R6, R7, C7, C8: 0.120 max.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	
15	High Temperature High Humidity (Steady State)	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. The charge/discharge current is less than 50mA. Apply the rated DC voltage. •Initial measurement 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. •Measurement after test Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	
		D.F.	R6, R7, C7, C8: 0.2 max.	
		I.R.	12.5Ω · F min.	
16	Durability	Appearance	No marking defects	Apply 150% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. The charge/discharge current is less than 50mA. •Initial measurement 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. •Measurement after test Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6, R7, C7, C8: Within ±12.5% * LLL153C70G474: Within ±20%	
		D.F.	R6, R7, C7, C8: 0.2 max.	
		I.R.	25Ω · F min.	

Chip Monolithic Ceramic Capacitors

muRata

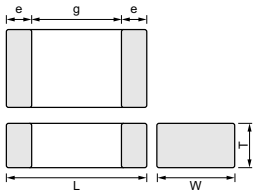
High-Q Type GJM Series

■ Features

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

■ Applications

VCO, PA, Mobile Telecommunication



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GJM03	0.6±0.03	0.3±0.03	0.3±0.03	0.1 to 0.2	0.2
GJM15	1.0±0.05	0.5±0.05	0.5±0.05	0.15 to 0.3	0.4

Capacitance Table

Temperature Compensating Type C0G (5C)/C0H (6C) Characteristics

3 ex.3: T Dimension [mm]

Capacitance \ L x W [mm]	0.6x0.3 (03) <0201>		1.0x0.5 (15) <0402>
Capacitance \ Rated Voltage [Vdc]	25 (1A)	6.3 (0J)	50 (1H)
0.1pF(**R10**)			5
0.2pF(**R20**)	3		5
0.3pF(**R30**)	3		5
0.4pF(**R40**)	3		5
0.5pF(**R50**)	3		5
0.6pF(**R60**)	3		5
0.7pF(**R70**)	3		5
0.8pF(**R80**)	3		5
0.9pF(**R90**)	3		5
1.0pF(**1R0**)	3		5
1.1pF(**1R1**)	3		5
1.2pF(**1R2**)	3		5
1.3pF(**1R3**)	3		5
1.4pF(**1R4**)	3		5
1.5pF(**1R5**)	3		5
1.6pF(**1R6**)	3		5
1.7pF(**1R7**)	3		5
1.8pF(**1R8**)	3		5
1.9pF(**1R9**)	3		5
2.0pF(**2R0**)	3		5
2.1pF(**2R1**)	3		5
2.2pF(**2R2**)	3		5
2.3pF(**2R3**)	3		5
2.4pF(**2R4**)	3		5
2.5pF(**2R5**)	3		5
2.6pF(**2R6**)	3		5
2.7pF(**2R7**)	3		5
2.8pF(**2R8**)	3		5
2.9pF(**2R9**)	3		5
3.0pF(**3R0**)	3		5
3.1pF(**3R1**)	3		5
3.2pF(**3R2**)	3		5
3.3pF(**3R3**)	3		5
3.4pF(**3R4**)	3		5
3.5pF(**3R5**)	3		5
3.6pF(**3R6**)	3		5
3.7pF(**3R7**)	3		5
3.8pF(**3R8**)	3		5
3.9pF(**3R9**)	3		5
4.0pF(**4R0**)	3		5
4.1pF(**4R1**)	3		5
4.2pF(**4R2**)	3		5
4.3pF(**4R3**)	3		5
4.4pF(**4R4**)	3		5
4.5pF(**4R5**)	3		5
4.6pF(**4R6**)	3		5
4.7pF(**4R7**)	3		5
4.8pF(**4R8**)	3		5
4.9pF(**4R9**)	3		5

Capacitance \ L x W [mm]	0.6x0.3 (03) <0201>		1.0x0.5 (15) <0402>
Capacitance \ Rated Voltage [Vdc]	25 (1A)	6.3 (0J)	50 (1H)
5.0pF(**5R0**)	3		5
5.1pF(**5R1**)	3		5
5.2pF(**5R2**)	3		5
5.3pF(**5R3**)	3		5
5.4pF(**5R4**)	3		5
5.5pF(**5R5**)	3		5
5.6pF(**5R6**)	3		5
5.7pF(**5R7**)	3		5
5.8pF(**5R8**)	3		5
5.9pF(**5R9**)	3		5
6.0pF(**6R0**)	3		5
6.1pF(**6R1**)	3		5
6.2pF(**6R2**)	3		5
6.3pF(**6R3**)	3		5
6.4pF(**6R4**)	3		5
6.5pF(**6R5**)	3		5
6.6pF(**6R6**)	3		5
6.7pF(**6R7**)	3		5
6.8pF(**6R8**)	3		5
6.9pF(**6R9**)	3		5
7.0pF(**7R0**)	3		5
7.1pF(**7R1**)	3		5
7.2pF(**7R2**)	3		5
7.3pF(**7R3**)	3		5
7.4pF(**7R4**)	3		5
7.5pF(**7R5**)	3		5
7.6pF(**7R6**)	3		5
7.7pF(**7R7**)	3		5
7.8pF(**7R8**)	3		5
7.9pF(**7R9**)	3		5
8.0pF(**8R0**)	3		5
8.1pF(**8R1**)	3		5
8.2pF(**8R2**)	3		5
8.3pF(**8R3**)	3		5
8.4pF(**8R4**)	3		5
8.5pF(**8R5**)	3		5
8.6pF(**8R6**)	3		5
8.7pF(**8R7**)	3		5
8.8pF(**8R8**)	3		5
8.9pF(**8R9**)	3		5
9.0pF(**9R0**)	3		5
9.1pF(**9R1**)	3		5
9.2pF(**9R2**)	3		5
9.3pF(**9R3**)	3		5
9.4pF(**9R4**)	3		5
9.5pF(**9R5**)	3		5
9.6pF(**9R6**)	3		5
9.7pF(**9R7**)	3		5
9.8pF(**9R8**)	3		5

Capacitance \ L x W [mm]	0.6x0.3 (03) <0201>		1.0x0.5 (15) <0402>
Capacitance \ Rated Voltage [Vdc]	25 (1A)	6.3 (0J)	50 (1H)
9.9pF(**9R9**)	3		5
10pF(**100**)	3		5
11pF(**110**)	3		5
12pF(**120**)	3		5
13pF(**130**)	3		5
15pF(**150**)	3		5
16pF(**160**)	3		5
18pF(**180**)	3		5
20pF(**200**)	3		5
22pF(**220**)		3	
24pF(**240**)		3	
27pF(**270**)		3	
30pF(**300**)		3	
33pF(**330**)		3	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
0.1pF (**R10**)	±0.05pF (**W**)		GJM1555C1HR10WB01D
	±0.1pF (**B**)		GJM1555C1HR10BB01D
0.2pF (**R20**)	±0.05pF (**W**)	GJM0335C1ER20WB01D	GJM1555C1HR20WB01D
	±0.1pF (**B**)	GJM0335C1ER20BB01D	GJM1555C1HR20BB01D
0.3pF (**R30**)	±0.05pF (**W**)	GJM0335C1ER30WB01D	GJM1555C1HR30WB01D
	±0.1pF (**B**)	GJM0335C1ER30BB01D	GJM1555C1HR30BB01D
0.4pF (**R40**)	±0.05pF (**W**)	GJM0335C1ER40WB01D	GJM1555C1HR40WB01D
	±0.1pF (**B**)	GJM0335C1ER40BB01D	GJM1555C1HR40BB01D
0.5pF (**R50**)	±0.05pF (**W**)	GJM0335C1ER50WB01D	GJM1555C1HR50WB01D
	±0.1pF (**B**)	GJM0335C1ER50BB01D	GJM1555C1HR50BB01D
0.6pF (**R60**)	±0.05pF (**W**)	GJM0335C1ER60WB01D	GJM1555C1HR60WB01D
	±0.1pF (**B**)	GJM0335C1ER60BB01D	GJM1555C1HR60BB01D
0.7pF (**R70**)	±0.05pF (**W**)	GJM0335C1ER70WB01D	GJM1555C1HR70WB01D
	±0.1pF (**B**)	GJM0335C1ER70BB01D	GJM1555C1HR70BB01D
0.8pF (**R80**)	±0.05pF (**W**)	GJM0335C1ER80WB01D	GJM1555C1HR80WB01D
	±0.1pF (**B**)	GJM0335C1ER80BB01D	GJM1555C1HR80BB01D
0.9pF (**R90**)	±0.05pF (**W**)	GJM0335C1ER90WB01D	GJM1555C1HR90WB01D
	±0.1pF (**B**)	GJM0335C1ER90BB01D	GJM1555C1HR90BB01D
1.0pF (**1R0**)	±0.05pF (**W**)	GJM0335C1E1R0WB01D	GJM1555C1H1R0WB01D
	±0.1pF (**B**)	GJM0335C1E1R0BB01D	GJM1555C1H1R0BB01D
	±0.25pF (**C**)	GJM0335C1E1R0CB01D	GJM1555C1H1R0CB01D
1.1pF (**1R1**)	±0.05pF (**W**)	GJM0335C1E1R1WB01D	GJM1555C1H1R1WB01D
	±0.1pF (**B**)	GJM0335C1E1R1BB01D	GJM1555C1H1R1BB01D
	±0.25pF (**C**)	GJM0335C1E1R1CB01D	GJM1555C1H1R1CB01D
1.2pF (**1R2**)	±0.05pF (**W**)	GJM0335C1E1R2WB01D	GJM1555C1H1R2WB01D
	±0.1pF (**B**)	GJM0335C1E1R2BB01D	GJM1555C1H1R2BB01D
	±0.25pF (**C**)	GJM0335C1E1R2CB01D	GJM1555C1H1R2CB01D
1.3pF (**1R3**)	±0.05pF (**W**)	GJM0335C1E1R3WB01D	GJM1555C1H1R3WB01D
	±0.1pF (**B**)	GJM0335C1E1R3BB01D	GJM1555C1H1R3BB01D
	±0.25pF (**C**)	GJM0335C1E1R3CB01D	GJM1555C1H1R3CB01D
1.4pF (**1R4**)	±0.05pF (**W**)	GJM0335C1E1R4WB01D	GJM1555C1H1R4WB01D
	±0.1pF (**B**)	GJM0335C1E1R4BB01D	GJM1555C1H1R4BB01D
	±0.25pF (**C**)	GJM0335C1E1R4CB01D	GJM1555C1H1R4CB01D
1.5pF (**1R5**)	±0.05pF (**W**)	GJM0335C1E1R5WB01D	GJM1555C1H1R5WB01D
	±0.1pF (**B**)	GJM0335C1E1R5BB01D	GJM1555C1H1R5BB01D
	±0.25pF (**C**)	GJM0335C1E1R5CB01D	GJM1555C1H1R5CB01D
1.6pF (**1R6**)	±0.05pF (**W**)	GJM0335C1E1R6WB01D	GJM1555C1H1R6WB01D
	±0.1pF (**B**)	GJM0335C1E1R6BB01D	GJM1555C1H1R6BB01D
	±0.25pF (**C**)	GJM0335C1E1R6CB01D	GJM1555C1H1R6CB01D
1.7pF (**1R7**)	±0.05pF (**W**)	GJM0335C1E1R7WB01D	GJM1555C1H1R7WB01D
	±0.1pF (**B**)	GJM0335C1E1R7BB01D	GJM1555C1H1R7BB01D
	±0.25pF (**C**)	GJM0335C1E1R7CB01D	GJM1555C1H1R7CB01D
1.8pF (**1R8**)	±0.05pF (**W**)	GJM0335C1E1R8WB01D	GJM1555C1H1R8WB01D
	±0.1pF (**B**)	GJM0335C1E1R8BB01D	GJM1555C1H1R8BB01D
	±0.25pF (**C**)	GJM0335C1E1R8CB01D	GJM1555C1H1R8CB01D
1.9pF (**1R9**)	±0.05pF (**W**)	GJM0335C1E1R9WB01D	GJM1555C1H1R9WB01D
	±0.1pF (**B**)	GJM0335C1E1R9BB01D	GJM1555C1H1R9BB01D
	±0.25pF (**C**)	GJM0335C1E1R9CB01D	GJM1555C1H1R9CB01D
2.0pF (**2R0**)	±0.05pF (**W**)	GJM0335C1E2R0WB01D	GJM1555C1H2R0WB01D
	±0.1pF (**B**)	GJM0335C1E2R0BB01D	GJM1555C1H2R0BB01D
	±0.25pF (**C**)	GJM0335C1E2R0CB01D	GJM1555C1H2R0CB01D

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GJ | M | 03 | 3 | 5C | 1E | R20 | W | B01 | D

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

4

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
2.1pF (**2R1**)	±0.05pF (**W**)	**GJM0335C1E2R1WB01D**	**GJM1555C1H2R1WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R1BB01D**	**GJM1555C1H2R1BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R1CB01D**	**GJM1555C1H2R1CB01D**
2.2pF (**2R2**)	±0.05pF (**W**)	**GJM0335C1E2R2WB01D**	**GJM1555C1H2R2WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R2BB01D**	**GJM1555C1H2R2BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R2CB01D**	**GJM1555C1H2R2CB01D**
2.3pF (**2R3**)	±0.05pF (**W**)	**GJM0335C1E2R3WB01D**	**GJM1555C1H2R3WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R3BB01D**	**GJM1555C1H2R3BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R3CB01D**	**GJM1555C1H2R3CB01D**
2.4pF (**2R4**)	±0.05pF (**W**)	**GJM0335C1E2R4WB01D**	**GJM1555C1H2R4WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R4BB01D**	**GJM1555C1H2R4BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R4CB01D**	**GJM1555C1H2R4CB01D**
2.5pF (**2R5**)	±0.05pF (**W**)	**GJM0335C1E2R5WB01D**	**GJM1555C1H2R5WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R5BB01D**	**GJM1555C1H2R5BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R5CB01D**	**GJM1555C1H2R5CB01D**
2.6pF (**2R6**)	±0.05pF (**W**)	**GJM0335C1E2R6WB01D**	**GJM1555C1H2R6WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R6BB01D**	**GJM1555C1H2R6BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R6CB01D**	**GJM1555C1H2R6CB01D**
2.7pF (**2R7**)	±0.05pF (**W**)	**GJM0335C1E2R7WB01D**	**GJM1555C1H2R7WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R7BB01D**	**GJM1555C1H2R7BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R7CB01D**	**GJM1555C1H2R7CB01D**
2.8pF (**2R8**)	±0.05pF (**W**)	**GJM0335C1E2R8WB01D**	**GJM1555C1H2R8WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R8BB01D**	**GJM1555C1H2R8BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R8CB01D**	**GJM1555C1H2R8CB01D**
2.9pF (**2R9**)	±0.05pF (**W**)	**GJM0335C1E2R9WB01D**	**GJM1555C1H2R9WB01D**
	±0.1pF (**B**)	**GJM0335C1E2R9BB01D**	**GJM1555C1H2R9BB01D**
	±0.25pF (**C**)	**GJM0335C1E2R9CB01D**	**GJM1555C1H2R9CB01D**
3.0pF (**3R0**)	±0.05pF (**W**)	**GJM0335C1E3R0WB01D**	**GJM1555C1H3R0WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R0BB01D**	**GJM1555C1H3R0BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R0CB01D**	**GJM1555C1H3R0CB01D**
3.1pF (**3R1**)	±0.05pF (**W**)	**GJM0335C1E3R1WB01D**	**GJM1555C1H3R1WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R1BB01D**	**GJM1555C1H3R1BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R1CB01D**	**GJM1555C1H3R1CB01D**
3.2pF (**3R2**)	±0.05pF (**W**)	**GJM0335C1E3R2WB01D**	**GJM1555C1H3R2WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R2BB01D**	**GJM1555C1H3R2BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R2CB01D**	**GJM1555C1H3R2CB01D**
3.3pF (**3R3**)	±0.05pF (**W**)	**GJM0335C1E3R3WB01D**	**GJM1555C1H3R3WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R3BB01D**	**GJM1555C1H3R3BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R3CB01D**	**GJM1555C1H3R3CB01D**
3.4pF (**3R4**)	±0.05pF (**W**)	**GJM0335C1E3R4WB01D**	**GJM1555C1H3R4WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R4BB01D**	**GJM1555C1H3R4BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R4CB01D**	**GJM1555C1H3R4CB01D**
3.5pF (**3R5**)	±0.05pF (**W**)	**GJM0335C1E3R5WB01D**	**GJM1555C1H3R5WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R5BB01D**	**GJM1555C1H3R5BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R5CB01D**	**GJM1555C1H3R5CB01D**
3.6pF (**3R6**)	±0.05pF (**W**)	**GJM0335C1E3R6WB01D**	**GJM1555C1H3R6WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R6BB01D**	**GJM1555C1H3R6BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R6CB01D**	**GJM1555C1H3R6CB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) **GJ** **M** **03** **3** **5C** **1E** **2R1** **W** **B01** **D**
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
3.7pF (**3R7**)	±0.05pF (**W**)	**GJM0335C1E3R7WB01D**	**GJM1555C1H3R7WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R7BB01D**	**GJM1555C1H3R7BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R7CB01D**	**GJM1555C1H3R7CB01D**
3.8pF (**3R8**)	±0.05pF (**W**)	**GJM0335C1E3R8WB01D**	**GJM1555C1H3R8WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R8BB01D**	**GJM1555C1H3R8BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R8CB01D**	**GJM1555C1H3R8CB01D**
3.9pF (**3R9**)	±0.05pF (**W**)	**GJM0335C1E3R9WB01D**	**GJM1555C1H3R9WB01D**
	±0.1pF (**B**)	**GJM0335C1E3R9BB01D**	**GJM1555C1H3R9BB01D**
	±0.25pF (**C**)	**GJM0335C1E3R9CB01D**	**GJM1555C1H3R9CB01D**
4.0pF (**4R0**)	±0.05pF (**W**)	**GJM0335C1E4R0WB01D**	**GJM1555C1H4R0WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R0BB01D**	**GJM1555C1H4R0BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R0CB01D**	**GJM1555C1H4R0CB01D**
4.1pF (**4R1**)	±0.05pF (**W**)	**GJM0335C1E4R1WB01D**	**GJM1555C1H4R1WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R1BB01D**	**GJM1555C1H4R1BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R1CB01D**	**GJM1555C1H4R1CB01D**
4.2pF (**4R2**)	±0.05pF (**W**)	**GJM0335C1E4R2WB01D**	**GJM1555C1H4R2WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R2BB01D**	**GJM1555C1H4R2BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R2CB01D**	**GJM1555C1H4R2CB01D**
4.3pF (**4R3**)	±0.05pF (**W**)	**GJM0335C1E4R3WB01D**	**GJM1555C1H4R3WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R3BB01D**	**GJM1555C1H4R3BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R3CB01D**	**GJM1555C1H4R3CB01D**
4.4pF (**4R4**)	±0.05pF (**W**)	**GJM0335C1E4R4WB01D**	**GJM1555C1H4R4WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R4BB01D**	**GJM1555C1H4R4BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R4CB01D**	**GJM1555C1H4R4CB01D**
4.5pF (**4R5**)	±0.05pF (**W**)	**GJM0335C1E4R5WB01D**	**GJM1555C1H4R5WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R5BB01D**	**GJM1555C1H4R5BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R5CB01D**	**GJM1555C1H4R5CB01D**
4.6pF (**4R6**)	±0.05pF (**W**)	**GJM0335C1E4R6WB01D**	**GJM1555C1H4R6WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R6BB01D**	**GJM1555C1H4R6BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R6CB01D**	**GJM1555C1H4R6CB01D**
4.7pF (**4R7**)	±0.05pF (**W**)	**GJM0335C1E4R7WB01D**	**GJM1555C1H4R7WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R7BB01D**	**GJM1555C1H4R7BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R7CB01D**	**GJM1555C1H4R7CB01D**
4.8pF (**4R8**)	±0.05pF (**W**)	**GJM0335C1E4R8WB01D**	**GJM1555C1H4R8WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R8BB01D**	**GJM1555C1H4R8BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R8CB01D**	**GJM1555C1H4R8CB01D**
4.9pF (**4R9**)	±0.05pF (**W**)	**GJM0335C1E4R9WB01D**	**GJM1555C1H4R9WB01D**
	±0.1pF (**B**)	**GJM0335C1E4R9BB01D**	**GJM1555C1H4R9BB01D**
	±0.25pF (**C**)	**GJM0335C1E4R9CB01D**	**GJM1555C1H4R9CB01D**
5.0pF (**5R0**)	±0.05pF (**W**)	**GJM0335C1E5R0WB01D**	**GJM1555C1H5R0WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R0BB01D**	**GJM1555C1H5R0BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R0CB01D**	**GJM1555C1H5R0CB01D**
5.1pF (**5R1**)	±0.05pF (**W**)	**GJM0335C1E5R1WB01D**	**GJM1555C1H5R1WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R1BB01D**	**GJM1555C1H5R1BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R1CB01D**	**GJM1555C1H5R1CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R1DB01D**	**GJM1555C1H5R1DB01D**
5.2pF (**5R2**)	±0.05pF (**W**)	**GJM0335C1E5R2WB01D**	**GJM1555C1H5R2WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R2BB01D**	**GJM1555C1H5R2BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R2CB01D**	**GJM1555C1H5R2CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R2DB01D**	**GJM1555C1H5R2DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
5.3pF (**5R3**)	±0.05pF (**W**)	**GJM0335C1E5R3WB01D**	**GJM1555C1H5R3WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R3BB01D**	**GJM1555C1H5R3BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R3CB01D**	**GJM1555C1H5R3CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R3DB01D**	**GJM1555C1H5R3DB01D**
5.4pF (**5R4**)	±0.05pF (**W**)	**GJM0335C1E5R4WB01D**	**GJM1555C1H5R4WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R4BB01D**	**GJM1555C1H5R4BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R4CB01D**	**GJM1555C1H5R4CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R4DB01D**	**GJM1555C1H5R4DB01D**
5.5pF (**5R5**)	±0.05pF (**W**)	**GJM0335C1E5R5WB01D**	**GJM1555C1H5R5WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R5BB01D**	**GJM1555C1H5R5BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R5CB01D**	**GJM1555C1H5R5CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R5DB01D**	**GJM1555C1H5R5DB01D**
5.6pF (**5R6**)	±0.05pF (**W**)	**GJM0335C1E5R6WB01D**	**GJM1555C1H5R6WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R6BB01D**	**GJM1555C1H5R6BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R6CB01D**	**GJM1555C1H5R6CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R6DB01D**	**GJM1555C1H5R6DB01D**
5.7pF (**5R7**)	±0.05pF (**W**)	**GJM0335C1E5R7WB01D**	**GJM1555C1H5R7WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R7BB01D**	**GJM1555C1H5R7BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R7CB01D**	**GJM1555C1H5R7CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R7DB01D**	**GJM1555C1H5R7DB01D**
5.8pF (**5R8**)	±0.05pF (**W**)	**GJM0335C1E5R8WB01D**	**GJM1555C1H5R8WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R8BB01D**	**GJM1555C1H5R8BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R8CB01D**	**GJM1555C1H5R8CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R8DB01D**	**GJM1555C1H5R8DB01D**
5.9pF (**5R9**)	±0.05pF (**W**)	**GJM0335C1E5R9WB01D**	**GJM1555C1H5R9WB01D**
	±0.1pF (**B**)	**GJM0335C1E5R9BB01D**	**GJM1555C1H5R9BB01D**
	±0.25pF (**C**)	**GJM0335C1E5R9CB01D**	**GJM1555C1H5R9CB01D**
	±0.5pF (**D**)	**GJM0335C1E5R9DB01D**	**GJM1555C1H5R9DB01D**
6.0pF (**6R0**)	±0.05pF (**W**)	**GJM0335C1E6R0WB01D**	**GJM1555C1H6R0WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R0BB01D**	**GJM1555C1H6R0BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R0CB01D**	**GJM1555C1H6R0CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R0DB01D**	**GJM1555C1H6R0DB01D**
6.1pF (**6R1**)	±0.05pF (**W**)	**GJM0335C1E6R1WB01D**	**GJM1555C1H6R1WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R1BB01D**	**GJM1555C1H6R1BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R1CB01D**	**GJM1555C1H6R1CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R1DB01D**	**GJM1555C1H6R1DB01D**
6.2pF (**6R2**)	±0.05pF (**W**)	**GJM0335C1E6R2WB01D**	**GJM1555C1H6R2WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R2BB01D**	**GJM1555C1H6R2BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R2CB01D**	**GJM1555C1H6R2CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R2DB01D**	**GJM1555C1H6R2DB01D**
6.3pF (**6R3**)	±0.05pF (**W**)	**GJM0335C1E6R3WB01D**	**GJM1555C1H6R3WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R3BB01D**	**GJM1555C1H6R3BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R3CB01D**	**GJM1555C1H6R3CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R3DB01D**	**GJM1555C1H6R3DB01D**
6.4pF (**6R4**)	±0.05pF (**W**)	**GJM0335C1E6R4WB01D**	**GJM1555C1H6R4WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R4BB01D**	**GJM1555C1H6R4BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R4CB01D**	**GJM1555C1H6R4CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R4DB01D**	**GJM1555C1H6R4DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GJ M 03 3 5C 1E 5R3 W B01 D

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C)/C0H(6C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
6.5pF (**6R5**)	±0.05pF (**W**)	**GJM0335C1E6R5WB01D**	**GJM1555C1H6R5WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R5BB01D**	**GJM1555C1H6R5BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R5CB01D**	**GJM1555C1H6R5CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R5DB01D**	**GJM1555C1H6R5DB01D**
6.6pF (**6R6**)	±0.05pF (**W**)	**GJM0335C1E6R6WB01D**	**GJM1555C1H6R6WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R6BB01D**	**GJM1555C1H6R6BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R6CB01D**	**GJM1555C1H6R6CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R6DB01D**	**GJM1555C1H6R6DB01D**
6.7pF (**6R7**)	±0.05pF (**W**)	**GJM0335C1E6R7WB01D**	**GJM1555C1H6R7WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R7BB01D**	**GJM1555C1H6R7BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R7CB01D**	**GJM1555C1H6R7CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R7DB01D**	**GJM1555C1H6R7DB01D**
6.8pF (**6R8**)	±0.05pF (**W**)	**GJM0335C1E6R8WB01D**	**GJM1555C1H6R8WB01D**
	±0.1pF (**B**)	**GJM0335C1E6R8BB01D**	**GJM1555C1H6R8BB01D**
	±0.25pF (**C**)	**GJM0335C1E6R8CB01D**	**GJM1555C1H6R8CB01D**
	±0.5pF (**D**)	**GJM0335C1E6R8DB01D**	**GJM1555C1H6R8DB01D**
6.9pF (**6R9**)	±0.05pF (**W**)	**GJM0336C1E6R9WB01D**	**GJM1555C1H6R9WB01D**
	±0.1pF (**B**)	**GJM0336C1E6R9BB01D**	**GJM1555C1H6R9BB01D**
	±0.25pF (**C**)	**GJM0336C1E6R9CB01D**	**GJM1555C1H6R9CB01D**
	±0.5pF (**D**)	**GJM0336C1E6R9DB01D**	**GJM1555C1H6R9DB01D**
7.0pF (**7R0**)	±0.05pF (**W**)	**GJM0336C1E7R0WB01D**	**GJM1555C1H7R0WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R0BB01D**	**GJM1555C1H7R0BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R0CB01D**	**GJM1555C1H7R0CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R0DB01D**	**GJM1555C1H7R0DB01D**
7.1pF (**7R1**)	±0.05pF (**W**)	**GJM0336C1E7R1WB01D**	**GJM1555C1H7R1WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R1BB01D**	**GJM1555C1H7R1BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R1CB01D**	**GJM1555C1H7R1CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R1DB01D**	**GJM1555C1H7R1DB01D**
7.2pF (**7R2**)	±0.05pF (**W**)	**GJM0336C1E7R2WB01D**	**GJM1555C1H7R2WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R2BB01D**	**GJM1555C1H7R2BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R2CB01D**	**GJM1555C1H7R2CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R2DB01D**	**GJM1555C1H7R2DB01D**
7.3pF (**7R3**)	±0.05pF (**W**)	**GJM0336C1E7R3WB01D**	**GJM1555C1H7R3WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R3BB01D**	**GJM1555C1H7R3BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R3CB01D**	**GJM1555C1H7R3CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R3DB01D**	**GJM1555C1H7R3DB01D**
7.4pF (**7R4**)	±0.05pF (**W**)	**GJM0336C1E7R4WB01D**	**GJM1555C1H7R4WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R4BB01D**	**GJM1555C1H7R4BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R4CB01D**	**GJM1555C1H7R4CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R4DB01D**	**GJM1555C1H7R4DB01D**
7.5pF (**7R5**)	±0.05pF (**W**)	**GJM0336C1E7R5WB01D**	**GJM1555C1H7R5WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R5BB01D**	**GJM1555C1H7R5BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R5CB01D**	**GJM1555C1H7R5CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R5DB01D**	**GJM1555C1H7R5DB01D**
7.6pF (**7R6**)	±0.05pF (**W**)	**GJM0336C1E7R6WB01D**	**GJM1555C1H7R6WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R6BB01D**	**GJM1555C1H7R6BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R6CB01D**	**GJM1555C1H7R6CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R6DB01D**	**GJM1555C1H7R6DB01D**
7.7pF (**7R7**)	±0.05pF (**W**)	**GJM0336C1E7R7WB01D**	**GJM1555C1H7R7WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R7BB01D**	**GJM1555C1H7R7BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R7CB01D**	**GJM1555C1H7R7CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R7DB01D**	**GJM1555C1H7R7DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C)/C0H(6C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
7.8pF (**7R8**)	±0.05pF (**W**)	**GJM0336C1E7R8WB01D**	**GJM1555C1H7R8WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R8BB01D**	**GJM1555C1H7R8BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R8CB01D**	**GJM1555C1H7R8CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R8DB01D**	**GJM1555C1H7R8DB01D**
7.9pF (**7R9**)	±0.05pF (**W**)	**GJM0336C1E7R9WB01D**	**GJM1555C1H7R9WB01D**
	±0.1pF (**B**)	**GJM0336C1E7R9BB01D**	**GJM1555C1H7R9BB01D**
	±0.25pF (**C**)	**GJM0336C1E7R9CB01D**	**GJM1555C1H7R9CB01D**
	±0.5pF (**D**)	**GJM0336C1E7R9DB01D**	**GJM1555C1H7R9DB01D**
8.0pF (**8R0**)	±0.05pF (**W**)	**GJM0336C1E8R0WB01D**	**GJM1555C1H8R0WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R0BB01D**	**GJM1555C1H8R0BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R0CB01D**	**GJM1555C1H8R0CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R0DB01D**	**GJM1555C1H8R0DB01D**
8.1pF (**8R1**)	±0.05pF (**W**)	**GJM0336C1E8R1WB01D**	**GJM1555C1H8R1WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R1BB01D**	**GJM1555C1H8R1BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R1CB01D**	**GJM1555C1H8R1CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R1DB01D**	**GJM1555C1H8R1DB01D**
8.2pF (**8R2**)	±0.05pF (**W**)	**GJM0336C1E8R2WB01D**	**GJM1555C1H8R2WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R2BB01D**	**GJM1555C1H8R2BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R2CB01D**	**GJM1555C1H8R2CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R2DB01D**	**GJM1555C1H8R2DB01D**
8.3pF (**8R3**)	±0.05pF (**W**)	**GJM0336C1E8R3WB01D**	**GJM1555C1H8R3WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R3BB01D**	**GJM1555C1H8R3BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R3CB01D**	**GJM1555C1H8R3CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R3DB01D**	**GJM1555C1H8R3DB01D**
8.4pF (**8R4**)	±0.05pF (**W**)	**GJM0336C1E8R4WB01D**	**GJM1555C1H8R4WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R4BB01D**	**GJM1555C1H8R4BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R4CB01D**	**GJM1555C1H8R4CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R4DB01D**	**GJM1555C1H8R4DB01D**
8.5pF (**8R5**)	±0.05pF (**W**)	**GJM0336C1E8R5WB01D**	**GJM1555C1H8R5WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R5BB01D**	**GJM1555C1H8R5BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R5CB01D**	**GJM1555C1H8R5CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R5DB01D**	**GJM1555C1H8R5DB01D**
8.6pF (**8R6**)	±0.05pF (**W**)	**GJM0336C1E8R6WB01D**	**GJM1555C1H8R6WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R6BB01D**	**GJM1555C1H8R6BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R6CB01D**	**GJM1555C1H8R6CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R6DB01D**	**GJM1555C1H8R6DB01D**
8.7pF (**8R7**)	±0.05pF (**W**)	**GJM0336C1E8R7WB01D**	**GJM1555C1H8R7WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R7BB01D**	**GJM1555C1H8R7BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R7CB01D**	**GJM1555C1H8R7CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R7DB01D**	**GJM1555C1H8R7DB01D**
8.8pF (**8R8**)	±0.05pF (**W**)	**GJM0336C1E8R8WB01D**	**GJM1555C1H8R8WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R8BB01D**	**GJM1555C1H8R8BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R8CB01D**	**GJM1555C1H8R8CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R8DB01D**	**GJM1555C1H8R8DB01D**
8.9pF (**8R9**)	±0.05pF (**W**)	**GJM0336C1E8R9WB01D**	**GJM1555C1H8R9WB01D**
	±0.1pF (**B**)	**GJM0336C1E8R9BB01D**	**GJM1555C1H8R9BB01D**
	±0.25pF (**C**)	**GJM0336C1E8R9CB01D**	**GJM1555C1H8R9CB01D**
	±0.5pF (**D**)	**GJM0336C1E8R9DB01D**	**GJM1555C1H8R9DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) **GJ** | **M** | **03** | **3** | **6C** | **1E** | **7R8** | **W** | **B01** | **D**
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C)/C0H(6C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	50(**1H**)
Capacitance	Tolerance	Part Number	
9.0pF (**9R0**)	±0.05pF (**W**)	**GJM0336C1E9R0WB01D**	**GJM1555C1H9R0WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R0BB01D**	**GJM1555C1H9R0BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R0CB01D**	**GJM1555C1H9R0CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R0DB01D**	**GJM1555C1H9R0DB01D**
9.1pF (**9R1**)	±0.05pF (**W**)	**GJM0336C1E9R1WB01D**	**GJM1555C1H9R1WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R1BB01D**	**GJM1555C1H9R1BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R1CB01D**	**GJM1555C1H9R1CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R1DB01D**	**GJM1555C1H9R1DB01D**
9.2pF (**9R2**)	±0.05pF (**W**)	**GJM0336C1E9R2WB01D**	**GJM1555C1H9R2WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R2BB01D**	**GJM1555C1H9R2BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R2CB01D**	**GJM1555C1H9R2CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R2DB01D**	**GJM1555C1H9R2DB01D**
9.3pF (**9R3**)	±0.05pF (**W**)	**GJM0336C1E9R3WB01D**	**GJM1555C1H9R3WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R3BB01D**	**GJM1555C1H9R3BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R3CB01D**	**GJM1555C1H9R3CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R3DB01D**	**GJM1555C1H9R3DB01D**
9.4pF (**9R4**)	±0.05pF (**W**)	**GJM0336C1E9R4WB01D**	**GJM1555C1H9R4WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R4BB01D**	**GJM1555C1H9R4BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R4CB01D**	**GJM1555C1H9R4CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R4DB01D**	**GJM1555C1H9R4DB01D**
9.5pF (**9R5**)	±0.05pF (**W**)	**GJM0336C1E9R5WB01D**	**GJM1555C1H9R5WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R5BB01D**	**GJM1555C1H9R5BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R5CB01D**	**GJM1555C1H9R5CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R5DB01D**	**GJM1555C1H9R5DB01D**
9.6pF (**9R6**)	±0.05pF (**W**)	**GJM0336C1E9R6WB01D**	**GJM1555C1H9R6WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R6BB01D**	**GJM1555C1H9R6BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R6CB01D**	**GJM1555C1H9R6CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R6DB01D**	**GJM1555C1H9R6DB01D**
9.7pF (**9R7**)	±0.05pF (**W**)	**GJM0336C1E9R7WB01D**	**GJM1555C1H9R7WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R7BB01D**	**GJM1555C1H9R7BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R7CB01D**	**GJM1555C1H9R7CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R7DB01D**	**GJM1555C1H9R7DB01D**
9.8pF (**9R8**)	±0.05pF (**W**)	**GJM0336C1E9R8WB01D**	**GJM1555C1H9R8WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R8BB01D**	**GJM1555C1H9R8BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R8CB01D**	**GJM1555C1H9R8CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R8DB01D**	**GJM1555C1H9R8DB01D**
9.9pF (**9R9**)	±0.05pF (**W**)	**GJM0336C1E9R9WB01D**	**GJM1555C1H9R9WB01D**
	±0.1pF (**B**)	**GJM0336C1E9R9BB01D**	**GJM1555C1H9R9BB01D**
	±0.25pF (**C**)	**GJM0336C1E9R9CB01D**	**GJM1555C1H9R9CB01D**
	±0.5pF (**D**)	**GJM0336C1E9R9DB01D**	**GJM1555C1H9R9DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C)/C0H(6C) Characteristics

L x W [mm]		0.6x0.3(**03**)<0201>		1.0x0.5(**15**)<0402>
Rated Volt. [Vdc]		25(**1E**)	6.3(**0J**)	50(**1H**)
Capacitance	Tolerance	Part Number		
10pF (**100**)	±2% (**G**)	**GJM0336C1E100GB01D**		**GJM1555C1H100GB01D**
	±5% (**J**)	**GJM0336C1E100JB01D**		**GJM1555C1H100JB01D**
11pF (**110**)	±2% (**G**)	**GJM0336C1E110GB01D**		**GJM1555C1H110GB01D**
	±5% (**J**)	**GJM0336C1E110JB01D**		**GJM1555C1H110JB01D**
12pF (**120**)	±2% (**G**)	**GJM0336C1E120GB01D**		**GJM1555C1H120GB01D**
	±5% (**J**)	**GJM0336C1E120JB01D**		**GJM1555C1H120JB01D**
13pF (**130**)	±2% (**G**)	**GJM0336C1E130GB01D**		**GJM1555C1H130GB01D**
	±5% (**J**)	**GJM0336C1E130JB01D**		**GJM1555C1H130JB01D**
15pF (**150**)	±2% (**G**)	**GJM0336C1E150GB01D**		**GJM1555C1H150GB01D**
	±5% (**J**)	**GJM0336C1E150JB01D**		**GJM1555C1H150JB01D**
16pF (**160**)	±2% (**G**)	**GJM0336C1E160GB01D**		**GJM1555C1H160GB01D**
	±5% (**J**)	**GJM0336C1E160JB01D**		**GJM1555C1H160JB01D**
18pF (**180**)	±2% (**G**)	**GJM0336C1E180GB01D**		**GJM1555C1H180GB01D**
	±5% (**J**)	**GJM0336C1E180JB01D**		**GJM1555C1H180JB01D**
20pF (**200**)	±2% (**G**)	**GJM0336C1E200GB01D**		**GJM1555C1H200GB01D**
	±5% (**J**)	**GJM0336C1E200JB01D**		**GJM1555C1H200JB01D**
22pF (**220**)	±2% (**G**)		**GJM0335C0J220GB01D**	
	±5% (**J**)		**GJM0335C0J220JB01D**	
24pF (**240**)	±2% (**G**)		**GJM0335C0J240GB01D**	
	±5% (**J**)		**GJM0335C0J240JB01D**	
27pF (**270**)	±2% (**G**)		**GJM0335C0J270GB01D**	
	±5% (**J**)		**GJM0335C0J270JB01D**	
30pF (**300**)	±2% (**G**)		**GJM0335C0J300GB01D**	
	±5% (**J**)		**GJM0335C0J300JB01D**	
33pF (**330**)	±2% (**G**)		**GJM0335C0J330GB01D**	
	±5% (**J**)		**GJM0335C0J330JB01D**	

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GJ ❶ | M ❷ | 03 ❸ | 3 ❹ | 6C ❺ | 1E ❻ | 100 ❼ | G ❽ | B01 ❾ | D ❿

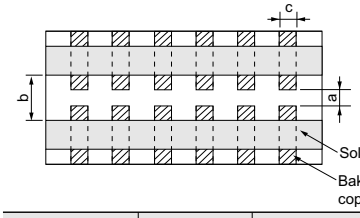
❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

GJM Series Specifications and Test Methods

No.	Item		Specifications Temperature Compensating Type	Test Method
1	Operating Temperature Range		−55 to +125℃	Reference Temperature: 25℃ (2C, 3C, 4C: 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
5	Dielectric Strength		No defects or abnormalities	No failure should be observed when 300% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance (I.R.)		10,000MΩ min. or 500Ω · F min. (Whichever is smaller)	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance	The capacitance/Q should be measured at 25℃ at the frequency and voltage shown in the table. Frequency: 1±0.1MHz Voltage: 0.5 to 5Vrms
8	Q		30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	
9	Capacitance Temperature Characteristics	Temperature Coefficient	Within the specified tolerance (Table A)	The capacitance change should be measured after 5 min. at each specified temperature stage. 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℃: other temp. coeffs.: +20 to 125℃) 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 steps 1, 3 and 5 by the capacitance value in step 3.
		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 a 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. *2N (GJM03)

Step	Temperature (℃)
1	Reference Temp. ±2
2	−55±3
3	Reference Temp. ±2
4	125±3
5	Reference Temp. ±2



Type	a	b	c
GJM03	0.3	0.9	0.3
GJM15	0.4	1.5	0.5

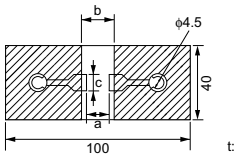
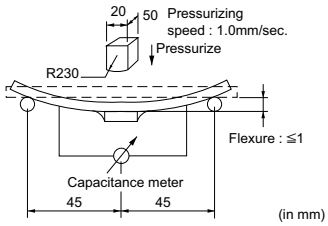
(in mm)

Fig. 1

Continued on the following page.

GJM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications Temperature Compensating 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	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	
12	Deflection	Appearance	No marking defects	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering 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.
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
			 Fig. 2	 Fig. 3
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 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.
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 a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.
		Appearance	No marking defects	
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	
		Q	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	
		Dielectric Strength	No failure	
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 listed in the following table. Let sit for 24±2 hours at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	
		Q	30pF and over: Q≧1000 30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	
		Dielectric Strength	No failure	
16	Humidity, Steady State		The measured and observed characteristics should satisfy the specifications in the following table.	Let the capacitor sit at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
		Q	30pF and below: Q≧350 10pF and over, 30pF and below: Q≧275+$\frac{5}{2}$C 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	

Step	1	2	3	4
Temp. (℃)	Min. Operating Temp. $^{+9}_{-3}$	Room Temp.	Max. Operating Temp. $^{+3}_{-0}$	Room Temp.
Time (min.)	30±3	2 to 3	30±3	2 to 3

Continued on the following page.

GJM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications Temperature Compensating Type	Test Method
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 let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects	
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	
		Q	30pF and over: Q≧200 30pF and below: Q≧100+$\frac{10}{3}$C C: Nominal Capacitance (pF)	
		I.R.	More than 500MΩ or 25Ω · F (Whichever is smaller)	
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects	
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	
		Q	30pF and over: Q≧350 10pF and over, 30pF and below: Q≧275+$\frac{5}{2}$C 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)	
19	ESR		0.1pF≦C≦1pF: 350mΩ · pF below 1pF<C≦5pF: 300mΩ below 5pF<C≦10pF: 250mΩ below	The ESR should be measured at room temperature, and frequency 1±0.2GHz with the equivalent of BOONTON Model 34A.
			10pF<C≦33pF: 400mΩ below	The ESR should be measured at room temperature, and frequency 500±50MHz with the equivalent of HP8753B.

Table A

(1)

Char. Code	Temp. Coeff. (ppm/℃)*1	Capacitance Change from 25℃ Value (%)					
		−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	0.60	−0.33	0.38	−0.21

*1: Nominal values denote the temperature coefficient within a range of 25 to 125℃.

(2)

Char.	Nominal Values (ppm/℃)*2	Capacitance Change from 20℃ Value (%)					
		−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

*2: Nominal values denote the temperature coefficient within a range of 20 to 125℃.

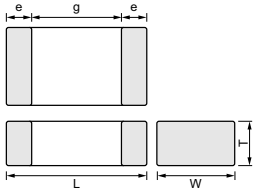
Chip Monolithic Ceramic Capacitors

muRata

High Frequency GQM Series

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

■ Applications
High frequency circuit (Mobile telecommunication, etc.)



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GQM187	1.6±0.15	0.8±0.15	0.7±0.1	0.2 to 0.5	0.5
GQM188	1.6±0.1	0.8±0.1	0.8±0.1	0.2 to 0.5	0.5
GQM219 (50,100V)	2.0±0.1	1.25±0.1	0.85±0.1	0.2 to 0.7	0.7
GQM219 (250V)	2.0±0.15	1.25±0.15	0.85±0.15	0.2 to 0.7	0.7

Capacitance Table

Temperature Compensating Type C0G (5C) Characteristics

7 ex.7: T Dimension [mm]

TC	C0G(**5C**)					
L x W [mm]	1.6x0.8 (**18**) <0603>			2.0x1.25 (**21**) <0805>		
Rated Voltage [Vdc] / Capacitance	250 (**2E**)	100 (**2A**)	50 (**1H**)	250 (**2E**)	100 (**2A**)	50 (**1H**)
0.10pF(**R10**)	7					
0.20pF(**R20**)	7					
0.30pF(**R30**)	7					
0.40pF(**R40**)	7					
0.50pF(**R50**)	7	8		9	9	
0.75pF(**R75**)	7	8		9	9	
1.0pF(**1R0**)	7	8		9	9	
1.1pF(**1R1**)	7	8		9	9	
1.2pF(**1R2**)	7	8		9	9	
1.3pF(**1R3**)	7	8		9	9	
1.5pF(**1R5**)	7	8		9	9	
1.6pF(**1R6**)	7	8		9	9	
1.8pF(**1R8**)	7	8		9	9	
2.0pF(**2R0**)	7	8		9	9	
2.2pF(**2R2**)	7	8		9	9	
2.4pF(**2R4**)	7	8		9	9	
2.7pF(**2R7**)	7	8		9	9	
3.0pF(**3R0**)	7	8		9	9	
3.3pF(**3R3**)	7	8		9	9	
3.6pF(**3R6**)	7	8		9	9	
3.9pF(**3R9**)	7	8		9	9	
4.0pF(**4R0**)	7	8		9	9	
4.3pF(**4R3**)	7	8		9	9	
4.7pF(**4R7**)	7	8		9	9	
5.0pF(**5R0**)	7	8		9	9	
5.1pF(**5R1**)	7	8		9	9	
5.6pF(**5R6**)	7	8		9	9	
6.0pF(**6R0**)	7	8		9	9	
6.2pF(**6R2**)	7	8		9	9	
6.8pF(**6R8**)	7	8		9	9	
7.0pF(**7R0**)	7		8	9	9	

TC	C0G(**5C**)					
L x W [mm]	1.6x0.8 (**18**) <0603>			2.0x1.25 (**21**) <0805>		
Rated Voltage [Vdc] / Capacitance	250 (**2E**)	100 (**2A**)	50 (**1H**)	250 (**2E**)	100 (**2A**)	50 (**1H**)
7.5pF(**7R5**)	7		8	9	9	
8.0pF(**8R0**)	7		8	9	9	
8.2pF(**8R2**)	7		8	9	9	
9.0pF(**9R0**)	7		8	9	9	
9.1pF(**9R1**)	7		8	9	9	
10pF(**100**)	7		8	9	9	
11pF(**110**)	7		8	9	9	
12pF(**120**)	7		8	9	9	
13pF(**130**)	7		8	9	9	
15pF(**150**)	7		8	9	9	
16pF(**160**)	7		8	9	9	
18pF(**180**)	7		8	9	9	
20pF(**200**)	7		8	9		9
22pF(**220**)	7		8	9		9
24pF(**240**)	7		8	9		9
27pF(**270**)	7		8	9		9
30pF(**300**)	7		8	9		9
33pF(**330**)	7		8	9		9
36pF(**360**)	7		8	9		9
39pF(**390**)	7		8	9		9
43pF(**430**)	7		8	9		9
47pF(**470**)	7		8	9		9
51pF(**510**)			8	9		9
56pF(**560**)			8	9		9
62pF(**620**)			8	9		9
68pF(**680**)			8	9		9
75pF(**750**)			8	9		9
82pF(**820**)			8	9		9
91pF(**910**)			8	9		9
100pF(**101**)			8	9		9

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6x0.8(**18**)<0603>	
Rated Volt. [Vdc]		250(**2E**)	100(**2A**)
Capacitance	Tolerance	Part Number	
0.10pF (**R10**)	±0.1pF (**B**)	**GQM1875C2ER10BB12D**	
0.20pF (**R20**)	±0.1pF (**B**)	**GQM1875C2ER20BB12D**	
0.30pF (**R30**)	±0.1pF (**B**)	**GQM1875C2ER30BB12D**	
	±0.25pF (**C**)	**GQM1875C2ER30CB12D**	
0.40pF (**R40**)	±0.1pF (**B**)	**GQM1875C2ER40BB12D**	
	±0.25pF (**C**)	**GQM1875C2ER40CB12D**	
0.50pF (**R50**)	±0.1pF (**B**)	**GQM1875C2ER50BB12D**	**GQM1885C2AR50BB01D**
	±0.25pF (**C**)	**GQM1875C2ER50CB12D**	**GQM1885C2AR50CB01D**
0.75pF (**R75**)	±0.1pF (**B**)	**GQM1875C2ER75BB12D**	**GQM1885C2AR75BB01D**
	±0.25pF (**C**)	**GQM1875C2ER75CB12D**	**GQM1885C2AR75CB01D**
1.0pF (**1R0**)	±0.1pF (**B**)	**GQM1875C2E1R0BB12D**	**GQM1885C2A1R0BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R0CB12D**	**GQM1885C2A1R0CB01D**
1.1pF (**1R1**)	±0.1pF (**B**)	**GQM1875C2E1R1BB12D**	**GQM1885C2A1R1BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R1CB12D**	**GQM1885C2A1R1CB01D**
1.2pF (**1R2**)	±0.1pF (**B**)	**GQM1875C2E1R2BB12D**	**GQM1885C2A1R2BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R2CB12D**	**GQM1885C2A1R2CB01D**
1.3pF (**1R3**)	±0.1pF (**B**)	**GQM1875C2E1R3BB12D**	**GQM1885C2A1R3BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R3CB12D**	**GQM1885C2A1R3CB01D**
1.5pF (**1R5**)	±0.1pF (**B**)	**GQM1875C2E1R5BB12D**	**GQM1885C2A1R5BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R5CB12D**	**GQM1885C2A1R5CB01D**
1.6pF (**1R6**)	±0.1pF (**B**)	**GQM1875C2E1R6BB12D**	**GQM1885C2A1R6BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R6CB12D**	**GQM1885C2A1R6CB01D**
1.8pF (**1R8**)	±0.1pF (**B**)	**GQM1875C2E1R8BB12D**	**GQM1885C2A1R8BB01D**
	±0.25pF (**C**)	**GQM1875C2E1R8CB12D**	**GQM1885C2A1R8CB01D**
2.0pF (**2R0**)	±0.1pF (**B**)	**GQM1875C2E2R0BB12D**	**GQM1885C2A2R0BB01D**
	±0.25pF (**C**)	**GQM1875C2E2R0CB12D**	**GQM1885C2A2R0CB01D**
2.2pF (**2R2**)	±0.1pF (**B**)	**GQM1875C2E2R2BB12D**	**GQM1885C2A2R2BB01D**
	±0.25pF (**C**)	**GQM1875C2E2R2CB12D**	**GQM1885C2A2R2CB01D**
2.4pF (**2R4**)	±0.1pF (**B**)	**GQM1875C2E2R4BB12D**	**GQM1885C2A2R4BB01D**
	±0.25pF (**C**)	**GQM1875C2E2R4CB12D**	**GQM1885C2A2R4CB01D**
2.7pF (**2R7**)	±0.1pF (**B**)	**GQM1875C2E2R7BB12D**	**GQM1885C2A2R7BB01D**
	±0.25pF (**C**)	**GQM1875C2E2R7CB12D**	**GQM1885C2A2R7CB01D**
3.0pF (**3R0**)	±0.1pF (**B**)	**GQM1875C2E3R0BB12D**	**GQM1885C2A3R0BB01D**
	±0.25pF (**C**)	**GQM1875C2E3R0CB12D**	**GQM1885C2A3R0CB01D**
3.3pF (**3R3**)	±0.1pF (**B**)	**GQM1875C2E3R3BB12D**	**GQM1885C2A3R3BB01D**
	±0.25pF (**C**)	**GQM1875C2E3R3CB12D**	**GQM1885C2A3R3CB01D**
3.6pF (**3R6**)	±0.1pF (**B**)	**GQM1875C2E3R6BB12D**	**GQM1885C2A3R6BB01D**
	±0.25pF (**C**)	**GQM1875C2E3R6CB12D**	**GQM1885C2A3R6CB01D**
3.9pF (**3R9**)	±0.1pF (**B**)	**GQM1875C2E3R9BB12D**	**GQM1885C2A3R9BB01D**
	±0.25pF (**C**)	**GQM1875C2E3R9CB12D**	**GQM1885C2A3R9CB01D**
4.0pF (**4R0**)	±0.1pF (**B**)	**GQM1875C2E4R0BB12D**	**GQM1885C2A4R0BB01D**
	±0.25pF (**C**)	**GQM1875C2E4R0CB12D**	**GQM1885C2A4R0CB01D**
4.3pF (**4R3**)	±0.1pF (**B**)	**GQM1875C2E4R3BB12D**	**GQM1885C2A4R3BB01D**
	±0.25pF (**C**)	**GQM1875C2E4R3CB12D**	**GQM1885C2A4R3CB01D**
4.7pF (**4R7**)	±0.1pF (**B**)	**GQM1875C2E4R7BB12D**	**GQM1885C2A4R7BB01D**
	±0.25pF (**C**)	**GQM1875C2E4R7CB12D**	**GQM1885C2A4R7CB01D**
5.0pF (**5R0**)	±0.1pF (**B**)	**GQM1875C2E5R0BB12D**	**GQM1885C2A5R0BB01D**
	±0.25pF (**C**)	**GQM1875C2E5R0CB12D**	**GQM1885C2A5R0CB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GQ | M | 18 | 7 | 5C | 2E | R10 | B | B12 | D
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6x0.8(**18**)<0603>		
Rated Volt. [Vdc]		250(**2E**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number		
5.1pF (**5R1**)	±0.25pF (**C**)	**GQM1875C2E5R1CB12D**	**GQM1885C2A5R1CB01D**	
	±0.5pF (**D**)	**GQM1875C2E5R1DB12D**	**GQM1885C2A5R1DB01D**	
5.6pF (**5R6**)	±0.25pF (**C**)	**GQM1875C2E5R6CB12D**	**GQM1885C2A5R6CB01D**	
	±0.5pF (**D**)	**GQM1875C2E5R6DB12D**	**GQM1885C2A5R6DB01D**	
6.0pF (**6R0**)	±0.25pF (**C**)	**GQM1875C2E6R0CB12D**	**GQM1885C2A6R0CB01D**	
	±0.5pF (**D**)	**GQM1875C2E6R0DB12D**	**GQM1885C2A6R0DB01D**	
6.2pF (**6R2**)	±0.25pF (**C**)	**GQM1875C2E6R2CB12D**	**GQM1885C2A6R2CB01D**	
	±0.5pF (**D**)	**GQM1875C2E6R2DB12D**	**GQM1885C2A6R2DB01D**	
6.8pF (**6R8**)	±0.25pF (**C**)	**GQM1875C2E6R8CB12D**	**GQM1885C2A6R8CB01D**	
	±0.5pF (**D**)	**GQM1875C2E6R8DB12D**	**GQM1885C2A6R8DB01D**	
7.0pF (**7R0**)	±0.25pF (**C**)	**GQM1875C2E7R0CB12D**		**GQM1885C1H7R0CB01D**
	±0.5pF (**D**)	**GQM1875C2E7R0DB12D**		**GQM1885C1H7R0DB01D**
7.5pF (**7R5**)	±0.25pF (**C**)	**GQM1875C2E7R5CB12D**		**GQM1885C1H7R5CB01D**
	±0.5pF (**D**)	**GQM1875C2E7R5DB12D**		**GQM1885C1H7R5DB01D**
8.0pF (**8R0**)	±0.25pF (**C**)	**GQM1875C2E8R0CB12D**		**GQM1885C1H8R0CB01D**
	±0.5pF (**D**)	**GQM1875C2E8R0DB12D**		**GQM1885C1H8R0DB01D**
8.2pF (**8R2**)	±0.25pF (**C**)	**GQM1875C2E8R2CB12D**		**GQM1885C1H8R2CB01D**
	±0.5pF (**D**)	**GQM1875C2E8R2DB12D**		**GQM1885C1H8R2DB01D**
9.0pF (**9R0**)	±0.25pF (**C**)	**GQM1875C2E9R0CB12D**		**GQM1885C1H9R0CB01D**
	±0.5pF (**D**)	**GQM1875C2E9R0DB12D**		**GQM1885C1H9R0DB01D**
9.1pF (**9R1**)	±0.25pF (**C**)	**GQM1875C2E9R1CB12D**		**GQM1885C1H9R1CB01D**
	±0.5pF (**D**)	**GQM1875C2E9R1DB12D**		**GQM1885C1H9R1DB01D**
10pF (**100**)	±2% (**G**)	**GQM1875C2E100GB12D**		**GQM1885C1H100GB01D**
	±5% (**J**)	**GQM1875C2E100JB12D**		**GQM1885C1H100JB01D**
11pF (**110**)	±2% (**G**)	**GQM1875C2E110GB12D**		**GQM1885C1H110GB01D**
	±5% (**J**)	**GQM1875C2E110JB12D**		**GQM1885C1H110JB01D**
12pF (**120**)	±2% (**G**)	**GQM1875C2E120GB12D**		**GQM1885C1H120GB01D**
	±5% (**J**)	**GQM1875C2E120JB12D**		**GQM1885C1H120JB01D**
13pF (**130**)	±2% (**G**)	**GQM1875C2E130GB12D**		**GQM1885C1H130GB01D**
	±5% (**J**)	**GQM1875C2E130JB12D**		**GQM1885C1H130JB01D**
15pF (**150**)	±2% (**G**)	**GQM1875C2E150GB12D**		**GQM1885C1H150GB01D**
	±5% (**J**)	**GQM1875C2E150JB12D**		**GQM1885C1H150JB01D**
16pF (**160**)	±2% (**G**)	**GQM1875C2E160GB12D**		**GQM1885C1H160GB01D**
	±5% (**J**)	**GQM1875C2E160JB12D**		**GQM1885C1H160JB01D**
18pF (**180**)	±2% (**G**)	**GQM1875C2E180GB12D**		**GQM1885C1H180GB01D**
	±5% (**J**)	**GQM1875C2E180JB12D**		**GQM1885C1H180JB01D**
20pF (**200**)	±2% (**G**)	**GQM1875C2E200GB12D**		**GQM1885C1H200GB01D**
	±5% (**J**)	**GQM1875C2E200JB12D**		**GQM1885C1H200JB01D**
22pF (**220**)	±2% (**G**)	**GQM1875C2E220GB12D**		**GQM1885C1H220GB01D**
	±5% (**J**)	**GQM1875C2E220JB12D**		**GQM1885C1H220JB01D**
24pF (**240**)	±2% (**G**)	**GQM1875C2E240GB12D**		**GQM1885C1H240GB01D**
	±5% (**J**)	**GQM1875C2E240JB12D**		**GQM1885C1H240JB01D**
27pF (**270**)	±2% (**G**)	**GQM1875C2E270GB12D**		**GQM1885C1H270GB01D**
	±5% (**J**)	**GQM1875C2E270JB12D**		**GQM1885C1H270JB01D**
30pF (**300**)	±2% (**G**)	**GQM1875C2E300GB12D**		**GQM1885C1H300GB01D**
	±5% (**J**)	**GQM1875C2E300JB12D**		**GQM1885C1H300JB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GQ | M | 18 | 7 | 5C | 2E | 5R1 | C | B12 | D
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6 x 0.8 (**18**) <0603>	
Rated Volt. [Vdc]		250 (**2E**)	50 (**1H**)
Capacitance	Tolerance	Part Number	
33pF (**330**)	±2% (**G**)	**GQM1875C2E330GB12D**	**GQM1885C1H330GB01D**
	±5% (**J**)	**GQM1875C2E330JB12D**	**GQM1885C1H330JB01D**
36pF (**360**)	±2% (**G**)	**GQM1875C2E360GB12D**	**GQM1885C1H360GB01D**
	±5% (**J**)	**GQM1875C2E360JB12D**	**GQM1885C1H360JB01D**
39pF (**390**)	±2% (**G**)	**GQM1875C2E390GB12D**	**GQM1885C1H390GB01D**
	±5% (**J**)	**GQM1875C2E390JB12D**	**GQM1885C1H390JB01D**
43pF (**430**)	±2% (**G**)	**GQM1875C2E430GB12D**	**GQM1885C1H430GB01D**
	±5% (**J**)	**GQM1875C2E430JB12D**	**GQM1885C1H430JB01D**
47pF (**470**)	±2% (**G**)	**GQM1875C2E470GB12D**	**GQM1885C1H470GB01D**
	±5% (**J**)	**GQM1875C2E470JB12D**	**GQM1885C1H470JB01D**
51pF (**510**)	±2% (**G**)		**GQM1885C1H510GB01D**
	±5% (**J**)		**GQM1885C1H510JB01D**
56pF (**560**)	±2% (**G**)		**GQM1885C1H560GB01D**
	±5% (**J**)		**GQM1885C1H560JB01D**
62pF (**620**)	±2% (**G**)		**GQM1885C1H620GB01D**
	±5% (**J**)		**GQM1885C1H620JB01D**
68pF (**680**)	±2% (**G**)		**GQM1885C1H680GB01D**
	±5% (**J**)		**GQM1885C1H680JB01D**
75pF (**750**)	±2% (**G**)		**GQM1885C1H750GB01D**
	±5% (**J**)		**GQM1885C1H750JB01D**
82pF (**820**)	±2% (**G**)		**GQM1885C1H820GB01D**
	±5% (**J**)		**GQM1885C1H820JB01D**
91pF (**910**)	±2% (**G**)		**GQM1885C1H910GB01D**
	±5% (**J**)		**GQM1885C1H910JB01D**
100pF (**101**)	±2% (**G**)		**GQM1885C1H101GB01D**
	±5% (**J**)		**GQM1885C1H101JB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		2.0 x 1.25 (**21**) <0805>	
Rated Volt. [Vdc]		250 (**2E**)	100 (**2A**)
Capacitance	Tolerance	Part Number	
0.50pF (**R50**)	±0.1pF (**B**)	**GQM2195C2ER50BB12D**	**GQM2195C2AR50BB01D**
	±0.25pF (**C**)	**GQM2195C2ER50CB12D**	**GQM2195C2AR50CB01D**
0.75pF (**R75**)	±0.1pF (**B**)	**GQM2195C2ER75BB12D**	**GQM2195C2AR75BB01D**
	±0.25pF (**C**)	**GQM2195C2ER75CB12D**	**GQM2195C2AR75CB01D**
1.0pF (**1R0**)	±0.1pF (**B**)	**GQM2195C2E1R0BB12D**	**GQM2195C2A1R0BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R0CB12D**	**GQM2195C2A1R0CB01D**
1.1pF (**1R1**)	±0.1pF (**B**)	**GQM2195C2E1R1BB12D**	**GQM2195C2A1R1BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R1CB12D**	**GQM2195C2A1R1CB01D**
1.2pF (**1R2**)	±0.1pF (**B**)	**GQM2195C2E1R2BB12D**	**GQM2195C2A1R2BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R2CB12D**	**GQM2195C2A1R2CB01D**
1.3pF (**1R3**)	±0.1pF (**B**)	**GQM2195C2E1R3BB12D**	**GQM2195C2A1R3BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R3CB12D**	**GQM2195C2A1R3CB01D**
1.5pF (**1R5**)	±0.1pF (**B**)	**GQM2195C2E1R5BB12D**	**GQM2195C2A1R5BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R5CB12D**	**GQM2195C2A1R5CB01D**
1.6pF (**1R6**)	±0.1pF (**B**)	**GQM2195C2E1R6BB12D**	**GQM2195C2A1R6BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R6CB12D**	**GQM2195C2A1R6CB01D**
1.8pF (**1R8**)	±0.1pF (**B**)	**GQM2195C2E1R8BB12D**	**GQM2195C2A1R8BB01D**
	±0.25pF (**C**)	**GQM2195C2E1R8CB12D**	**GQM2195C2A1R8CB01D**
2.0pF (**2R0**)	±0.1pF (**B**)	**GQM2195C2E2R0BB12D**	**GQM2195C2A2R0BB01D**
	±0.25pF (**C**)	**GQM2195C2E2R0CB12D**	**GQM2195C2A2R0CB01D**
2.2pF (**2R2**)	±0.1pF (**B**)	**GQM2195C2E2R2BB12D**	**GQM2195C2A2R2BB01D**
	±0.25pF (**C**)	**GQM2195C2E2R2CB12D**	**GQM2195C2A2R2CB01D**
2.4pF (**2R4**)	±0.1pF (**B**)	**GQM2195C2E2R4BB12D**	**GQM2195C2A2R4BB01D**
	±0.25pF (**C**)	**GQM2195C2E2R4CB12D**	**GQM2195C2A2R4CB01D**
2.7pF (**2R7**)	±0.1pF (**B**)	**GQM2195C2E2R7BB12D**	**GQM2195C2A2R7BB01D**
	±0.25pF (**C**)	**GQM2195C2E2R7CB12D**	**GQM2195C2A2R7CB01D**
3.0pF (**3R0**)	±0.1pF (**B**)	**GQM2195C2E3R0BB12D**	**GQM2195C2A3R0BB01D**
	±0.25pF (**C**)	**GQM2195C2E3R0CB12D**	**GQM2195C2A3R0CB01D**
3.3pF (**3R3**)	±0.1pF (**B**)	**GQM2195C2E3R3BB12D**	**GQM2195C2A3R3BB01D**
	±0.25pF (**C**)	**GQM2195C2E3R3CB12D**	**GQM2195C2A3R3CB01D**
3.6pF (**3R6**)	±0.1pF (**B**)	**GQM2195C2E3R6BB12D**	**GQM2195C2A3R6BB01D**
	±0.25pF (**C**)	**GQM2195C2E3R6CB12D**	**GQM2195C2A3R6CB01D**
3.9pF (**3R9**)	±0.1pF (**B**)	**GQM2195C2E3R9BB12D**	**GQM2195C2A3R9BB01D**
	±0.25pF (**C**)	**GQM2195C2E3R9CB12D**	**GQM2195C2A3R9CB01D**
4.0pF (**4R0**)	±0.1pF (**B**)	**GQM2195C2E4R0BB12D**	**GQM2195C2A4R0BB01D**
	±0.25pF (**C**)	**GQM2195C2E4R0CB12D**	**GQM2195C2A4R0CB01D**
4.3pF (**4R3**)	±0.1pF (**B**)	**GQM2195C2E4R3BB12D**	**GQM2195C2A4R3BB01D**
	±0.25pF (**C**)	**GQM2195C2E4R3CB12D**	**GQM2195C2A4R3CB01D**
4.7pF (**4R7**)	±0.1pF (**B**)	**GQM2195C2E4R7BB12D**	**GQM2195C2A4R7BB01D**
	±0.25pF (**C**)	**GQM2195C2E4R7CB12D**	**GQM2195C2A4R7CB01D**
5.0pF (**5R0**)	±0.1pF (**B**)	**GQM2195C2E5R0BB12D**	**GQM2195C2A5R0BB01D**
	±0.25pF (**C**)	**GQM2195C2E5R0CB12D**	**GQM2195C2A5R0CB01D**
5.1pF (**5R1**)	±0.25pF (**C**)	**GQM2195C2E5R1CB12D**	**GQM2195C2A5R1CB01D**
	±0.5pF (**D**)	**GQM2195C2E5R1DB12D**	**GQM2195C2A5R1DB01D**
5.6pF (**5R6**)	±0.25pF (**C**)	**GQM2195C2E5R6CB12D**	**GQM2195C2A5R6CB01D**
	±0.5pF (**D**)	**GQM2195C2E5R6DB12D**	**GQM2195C2A5R6DB01D**
6.0pF (**6R0**)	±0.25pF (**C**)	**GQM2195C2E6R0CB12D**	**GQM2195C2A6R0CB01D**
	±0.5pF (**D**)	**GQM2195C2E6R0DB12D**	**GQM2195C2A6R0DB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) GQ ❶ | M ❷ | 21 ❸ | 9 ❹ | 5C ❺ | 2E ❻ | R50 ❼ | B ❽ | B12 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (L x W) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		2.0x1.25(**21**)<0805>		
Rated Volt. [Vdc]		250(**2E**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number		
6.2pF (**6R2**)	±0.25pF (**C**)	**GQM2195C2E6R2CB12D**	**GQM2195C2A6R2CB01D**	
	±0.5pF (**D**)	**GQM2195C2E6R2DB12D**	**GQM2195C2A6R2DB01D**	
6.8pF (**6R8**)	±0.25pF (**C**)	**GQM2195C2E6R8CB12D**	**GQM2195C2A6R8CB01D**	
	±0.5pF (**D**)	**GQM2195C2E6R8DB12D**	**GQM2195C2A6R8DB01D**	
7.0pF (**7R0**)	±0.25pF (**C**)	**GQM2195C2E7R0CB12D**	**GQM2195C2A7R0CB01D**	
	±0.5pF (**D**)	**GQM2195C2E7R0DB12D**	**GQM2195C2A7R0DB01D**	
7.5pF (**7R5**)	±0.25pF (**C**)	**GQM2195C2E7R5CB12D**	**GQM2195C2A7R5CB01D**	
	±0.5pF (**D**)	**GQM2195C2E7R5DB12D**	**GQM2195C2A7R5DB01D**	
8.0pF (**8R0**)	±0.25pF (**C**)	**GQM2195C2E8R0CB12D**	**GQM2195C2A8R0CB01D**	
	±0.5pF (**D**)	**GQM2195C2E8R0DB12D**	**GQM2195C2A8R0DB01D**	
8.2pF (**8R2**)	±0.25pF (**C**)	**GQM2195C2E8R2CB12D**	**GQM2195C2A8R2CB01D**	
	±0.5pF (**D**)	**GQM2195C2E8R2DB12D**	**GQM2195C2A8R2DB01D**	
9.0pF (**9R0**)	±0.25pF (**C**)	**GQM2195C2E9R0CB12D**	**GQM2195C2A9R0CB01D**	
	±0.5pF (**D**)	**GQM2195C2E9R0DB12D**	**GQM2195C2A9R0DB01D**	
9.1pF (**9R1**)	±0.25pF (**C**)	**GQM2195C2E9R1CB12D**	**GQM2195C2A9R1CB01D**	
	±0.5pF (**D**)	**GQM2195C2E9R1DB12D**	**GQM2195C2A9R1DB01D**	
10pF (**100**)	±2% (**G**)	**GQM2195C2E100GB12D**	**GQM2195C2A100GB01D**	
	±5% (**J**)	**GQM2195C2E100JB12D**	**GQM2195C2A100JB01D**	
11pF (**110**)	±2% (**G**)	**GQM2195C2E110GB12D**	**GQM2195C2A110GB01D**	
	±5% (**J**)	**GQM2195C2E110JB12D**	**GQM2195C2A110JB01D**	
12pF (**120**)	±2% (**G**)	**GQM2195C2E120GB12D**	**GQM2195C2A120GB01D**	
	±5% (**J**)	**GQM2195C2E120JB12D**	**GQM2195C2A120JB01D**	
13pF (**130**)	±2% (**G**)	**GQM2195C2E130GB12D**	**GQM2195C2A130GB01D**	
	±5% (**J**)	**GQM2195C2E130JB12D**	**GQM2195C2A130JB01D**	
15pF (**150**)	±2% (**G**)	**GQM2195C2E150GB12D**	**GQM2195C2A150GB01D**	
	±5% (**J**)	**GQM2195C2E150JB12D**	**GQM2195C2A150JB01D**	
16pF (**160**)	±2% (**G**)	**GQM2195C2E160GB12D**	**GQM2195C2A160GB01D**	
	±5% (**J**)	**GQM2195C2E160JB12D**	**GQM2195C2A160JB01D**	
18pF (**180**)	±2% (**G**)	**GQM2195C2E180GB12D**	**GQM2195C2A180GB01D**	
	±5% (**J**)	**GQM2195C2E180JB12D**	**GQM2195C2A180JB01D**	
20pF (**200**)	±2% (**G**)	**GQM2195C2E200GB12D**		**GQM2195C1H200GB01D**
	±5% (**J**)	**GQM2195C2E200JB12D**		**GQM2195C1H200JB01D**
22pF (**220**)	±2% (**G**)	**GQM2195C2E220GB12D**		**GQM2195C1H220GB01D**
	±5% (**J**)	**GQM2195C2E220JB12D**		**GQM2195C1H220JB01D**
24pF (**240**)	±2% (**G**)	**GQM2195C2E240GB12D**		**GQM2195C1H240GB01D**
	±5% (**J**)	**GQM2195C2E240JB12D**		**GQM2195C1H240JB01D**
27pF (**270**)	±2% (**G**)	**GQM2195C2E270GB12D**		**GQM2195C1H270GB01D**
	±5% (**J**)	**GQM2195C2E270JB12D**		**GQM2195C1H270JB01D**
30pF (**300**)	±2% (**G**)	**GQM2195C2E300GB12D**		**GQM2195C1H300GB01D**
	±5% (**J**)	**GQM2195C2E300JB12D**		**GQM2195C1H300JB01D**
33pF (**330**)	±2% (**G**)	**GQM2195C2E330GB12D**		**GQM2195C1H330GB01D**
	±5% (**J**)	**GQM2195C2E330JB12D**		**GQM2195C1H330JB01D**
36pF (**360**)	±2% (**G**)	**GQM2195C2E360GB12D**		**GQM2195C1H360GB01D**
	±5% (**J**)	**GQM2195C2E360JB12D**		**GQM2195C1H360JB01D**
39pF (**390**)	±2% (**G**)	**GQM2195C2E390GB12D**		**GQM2195C1H390GB01D**
	±5% (**J**)	**GQM2195C2E390JB12D**		**GQM2195C1H390JB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		2.0 x 1.25 (**21**) <0805>	
Rated Volt. [Vdc]		250 (**2E**)	50 (**1H**)
Capacitance	Tolerance	Part Number	
43pF (**430**)	±2% (**G**)	**GQM2195C2E430GB12D**	**GQM2195C1H430GB01D**
	±5% (**J**)	**GQM2195C2E430JB12D**	**GQM2195C1H430JB01D**
47pF (**470**)	±2% (**G**)	**GQM2195C2E470GB12D**	**GQM2195C1H470GB01D**
	±5% (**J**)	**GQM2195C2E470JB12D**	**GQM2195C1H470JB01D**
51pF (**510**)	±2% (**G**)	**GQM2195C2E510GB12D**	**GQM2195C1H510GB01D**
	±5% (**J**)	**GQM2195C2E510JB12D**	**GQM2195C1H510JB01D**
56pF (**560**)	±2% (**G**)	**GQM2195C2E560GB12D**	**GQM2195C1H560GB01D**
	±5% (**J**)	**GQM2195C2E560JB12D**	**GQM2195C1H560JB01D**
62pF (**620**)	±2% (**G**)	**GQM2195C2E620GB12D**	**GQM2195C1H620GB01D**
	±5% (**J**)	**GQM2195C2E620JB12D**	**GQM2195C1H620JB01D**
68pF (**680**)	±2% (**G**)	**GQM2195C2E680GB12D**	**GQM2195C1H680GB01D**
	±5% (**J**)	**GQM2195C2E680JB12D**	**GQM2195C1H680JB01D**
75pF (**750**)	±2% (**G**)	**GQM2195C2E750GB12D**	**GQM2195C1H750GB01D**
	±5% (**J**)	**GQM2195C2E750JB12D**	**GQM2195C1H750JB01D**
82pF (**820**)	±2% (**G**)	**GQM2195C2E820GB12D**	**GQM2195C1H820GB01D**
	±5% (**J**)	**GQM2195C2E820JB12D**	**GQM2195C1H820JB01D**
91pF (**910**)	±2% (**G**)	**GQM2195C2E910GB12D**	**GQM2195C1H910GB01D**
	±5% (**J**)	**GQM2195C2E910JB12D**	**GQM2195C1H910JB01D**
100pF (**101**)	±2% (**G**)	**GQM2195C2E101GB12D**	**GQM2195C1H101GB01D**
	±5% (**J**)	**GQM2195C2E101JB12D**	**GQM2195C1H101JB01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

5

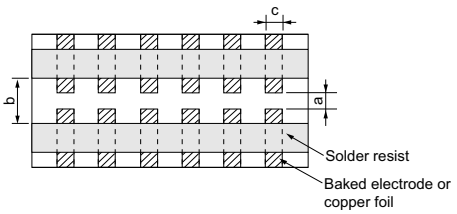
(Part Number) GQ M 21 9 5C 2E 430 G B12 D

❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (L x W) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

GQM Series Specifications and Test Methods

No.	Item		Specifications	Test Method
1	Operating Temperature		−55 to 125℃	Reference Temperature: 25℃
2	Rated Voltage		See the previous page.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities	Visual inspection
4	Dimension		Within the specified dimensions	Using calipers
5	Dielectric Strength		No defects or abnormalities	No failure should be observed when 300%* of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *250V only 250%
6	Insulation Resistance		More than 10,000MΩ	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance	The capacitance/Q should be measured at 25℃ at the frequency and voltage shown in the table. Frequency: 1±0.1MHz Voltage: 0.5 to 5Vrms
8	Q		30pF min.: Q≧1400 30pF max.: Q≧800+20C C: Nominal Capacitance (pF)	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A)	The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as in 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 capacitance value in step 3.
		Temperature Coefficient	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 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. *5N (GQM188)
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	30pF min.: Q≧1400 30pF max.: Q≧800+20C C: Nominal Capacitance (pF)	

Step	Temperature (℃)
1	Reference Temp. ±2
2	−55±3
3	Reference Temp. ±2
4	125±3
5	Reference Temp. ±2

Type	a	b	c
GQM18	1.0	3.0	1.2
GQM21	1.2	4.0	1.65

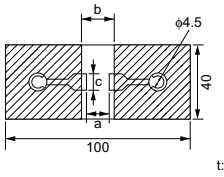
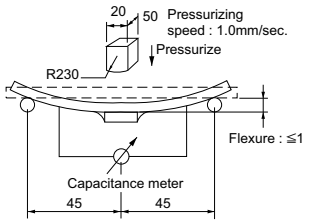
(in mm)

Fig. 1

Continued on the following page.

GQM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
12	Deflection	Appearance	No marking defects	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. 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.
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
			 Fig. 2	 Fig. 3
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 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.
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 a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.
		Appearance	No marking defects	
		Capacitance Change	Within ±2.5% or ±0.25 pF (Whichever is larger)	
		Q	30pF min.: Q≧1400 30pF max.: Q≧800+20C C: Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	No failure	
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 listed in the following table. Let sit for 24±2 hours at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	
		Q	30pF min.: Q≧1400 30pF max.: Q≧800+20C C: Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	No failure	
16	Humidity Steady State		The measured and observed characteristics should satisfy the specifications in the following table.	Let the capacitor sit at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.
		Appearance	No marking defects	
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
		Q	30pF min.: Q≧350 10pF and over, 30pF and below: Q≧275+5C/2 10pF max.: Q≧200+10C C: Nominal Capacitance (pF)	
		I.R.	More than 1,000MΩ	

Type	a	b	c
GQM18	1.0	3.0	1.2
GQM21	1.2	4.0	1.65

(in mm)

Step	1	2	3	4
Temp. (℃)	Min. Operating Temp. +0/−3	Room Temp.	Max. Operating Temp. +3/−0	Room Temp.
Time (min.)	30±3	2 to 3	30±3	2 to 3

Continued on the following page.

GQM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
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 let sit for 24±2 hours at room temperature then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects	
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	
		Q	30pF min.: Q≧200 30pF max.: Q≧100+10C/3 C: Nominal Capacitance (pF)	
		I.R.	More than 500MΩ	
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects	
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	
		Q	30pF min.: Q≧350 10pF and over, 30pF and below: Q≧275+5C/2 10pF max.: Q≧200+10C C: Nominal Capacitance (pF)	
		I.R.	More than 1,000MΩ	

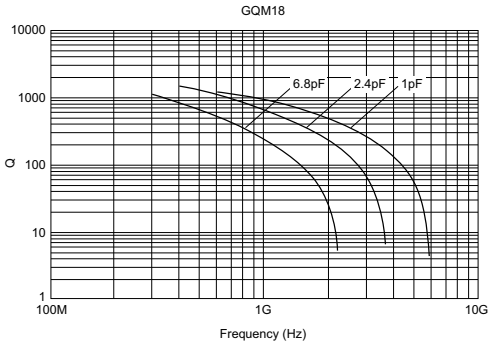
Table A

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

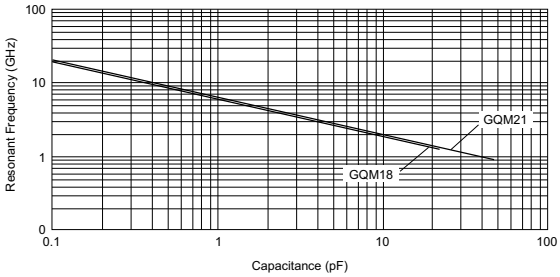
*1: Nominal values denote the temperature coefficient within a range of 25 to 125℃.

GQM Series Data

■ Q - Frequency Characteristics



■ Resonant Frequency - Capacitance



5

Chip Monolithic Ceramic Capacitors

muRata

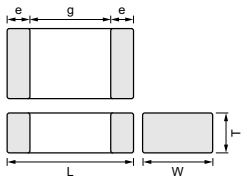
High Frequency Type ERB Series

■ Features (ERB Series)

1. Negligible inductance is achieved by its monolithic structure so the series can be used at frequencies above 1GHz.
2. Nickel barriered terminations of ERB series improve solderability and decrease solder leaching.
3. ERB18/21 series are designed for both flow and reflow soldering and ERB32 series are designed for reflow soldering.

■ Applications

High frequency and high-power circuits



Part Number	Dimensions (mm)				
	L	W	T max.	e min.	g min.
ERB188	1.6±0.1	0.8±0.1	0.9	0.2	0.5
ERB21B	2.0±0.3	1.25±0.3	1.35	0.25	0.7
ERB32Q	3.2±0.3	2.5±0.3	1.7	0.3	1.0

6

Capacitance Table

Temperature Compensating Type C0G (5C) Characteristics

8 ex.8: T Dimension [mm]

TC	C0G(**5C**)								
L x W [mm]	1.6x0.8 (**18**) <0603>	2.0x1.25 (**21**) <0805>			3.2x2.5 (**32**) <1210>				
Rated Voltage [Vdc] / Capacitance	250 (**2E**)	250 (**2E**)	100 (**2A**)	50 (**1H**)	500 (**2H**)	300 (**YD**)	250 (**2E**)	100 (**2A**)	50 (**1H**)
0.50pF(**R50**)	8	B							
0.75pF(**R75**)	8	B							
1.0pF(**1R0**)	8	B							
1.1pF(**1R1**)	8	B							
1.2pF(**1R2**)	8	B							
1.3pF(**1R3**)	8	B							
1.5pF(**1R5**)	8	B							
1.6pF(**1R6**)	8	B							
1.8pF(**1R8**)	8	B							
2.0pF(**2R0**)	8	B							
2.2pF(**2R2**)	8	B							
2.4pF(**2R4**)	8	B							
2.7pF(**2R7**)	8	B							
3.0pF(**3R0**)	8	B							
3.3pF(**3R3**)	8	B			Q				
3.6pF(**3R6**)	8	B			Q				
3.9pF(**3R9**)	8	B			Q				
4.0pF(**4R0**)	8	B			Q				
4.3pF(**4R3**)	8	B			Q				
4.7pF(**4R7**)	8	B			Q				
5.0pF(**5R0**)	8	B			Q				
5.1pF(**5R1**)	8	B			Q				
5.6pF(**5R6**)	8	B			Q				
6.0pF(**6R0**)	8	B			Q				
6.2pF(**6R2**)	8	B			Q				
6.8pF(**6R8**)	8	B			Q				
7.0pF(**7R0**)	8	B			Q				
7.5pF(**7R5**)	8	B			Q				
8.0pF(**8R0**)	8	B			Q				
8.2pF(**8R2**)	8	B			Q				
9.0pF(**9R0**)	8	B			Q				
9.1pF(**9R1**)	8	B			Q				
10pF(**100**)	8	B			Q				
11pF(**110**)	8	B			Q				
12pF(**120**)	8	B			Q				
13pF(**130**)	8	B			Q				
15pF(**150**)	8	B			Q				
16pF(**160**)	8	B			Q				
18pF(**180**)	8	B			Q				
20pF(**200**)	8	B			Q				
22pF(**220**)	8	B			Q				
24pF(**240**)	8	B			Q				
27pF(**270**)	8	B			Q				
30pF(**300**)	8	B			Q				
33pF(**330**)	8	B			Q				
36pF(**360**)	8	B			Q				
39pF(**390**)	8	B			Q				
43pF(**430**)	8	B			Q				

TC	C0G(**5C**)								
L x W [mm]	1.6x0.8 (**18**) <0603>	2.0x1.25 (**21**) <0805>			3.2x2.5 (**32**) <1210>				
Rated Voltage [Vdc] / Capacitance	250 (**2E**)	250 (**2E**)	100 (**2A**)	50 (**1H**)	500 (**2H**)	300 (**YD**)	250 (**2E**)	100 (**2A**)	50 (**1H**)
47pF(**470**)	8	B			Q				
51pF(**510**)	8	B			Q				
56pF(**560**)	8	B			Q				
62pF(**620**)	8	B			Q				
68pF(**680**)	8	B			Q				
75pF(**750**)	8	B			Q				
82pF(**820**)	8	B			Q				
91pF(**910**)	8	B			Q				
100pF(**101**)	8	B			Q				
110pF(**111**)			B		Q				
120pF(**121**)			B		Q				
130pF(**131**)			B			Q			
150pF(**151**)				B		Q			
160pF(**161**)				B			Q		
180pF(**181**)							Q		
200pF(**201**)							Q		
220pF(**221**)							Q		
240pF(**241**)								Q	
270pF(**271**)								Q	
300pF(**301**)								Q	
330pF(**331**)								Q	
360pF(**361**)								Q	
390pF(**391**)								Q	
430pF(**431**)								Q	
470pF(**471**)								Q	
510pF(**511**)									Q
560pF(**561**)									Q
620pF(**621**)									Q
680pF(**681**)									Q
750pF(**751**)									Q
820pF(**821**)									Q
910pF(**911**)									Q
1000pF(**102**)									Q

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6x0.8(**18**)<0603>	2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		250(**2E**)	250(**2E**)
Capacitance	Tolerance	Part Number	
0.50pF (**R50**)	±0.1pF (**B**)	**ERB1885C2ER50BDX1D**	**ERB21B5C2ER50BDX1L**
	±0.25pF (**C**)	**ERB1885C2ER50CDX1D**	**ERB21B5C2ER50CDX1L**
0.75pF (**R75**)	±0.1pF (**B**)	**ERB1885C2ER75BDX1D**	**ERB21B5C2ER75BDX1L**
	±0.25pF (**C**)	**ERB1885C2ER75CDX1D**	**ERB21B5C2ER75CDX1L**
1.0pF (**1R0**)	±0.1pF (**B**)	**ERB1885C2E1R0BDX1D**	**ERB21B5C2E1R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R0CDX1D**	**ERB21B5C2E1R0CDX1L**
1.1pF (**1R1**)	±0.1pF (**B**)	**ERB1885C2E1R1BDX1D**	**ERB21B5C2E1R1BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R1CDX1D**	**ERB21B5C2E1R1CDX1L**
1.2pF (**1R2**)	±0.1pF (**B**)	**ERB1885C2E1R2BDX1D**	**ERB21B5C2E1R2BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R2CDX1D**	**ERB21B5C2E1R2CDX1L**
1.3pF (**1R3**)	±0.1pF (**B**)	**ERB1885C2E1R3BDX1D**	**ERB21B5C2E1R3BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R3CDX1D**	**ERB21B5C2E1R3CDX1L**
1.5pF (**1R5**)	±0.1pF (**B**)	**ERB1885C2E1R5BDX1D**	**ERB21B5C2E1R5BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R5CDX1D**	**ERB21B5C2E1R5CDX1L**
1.6pF (**1R6**)	±0.1pF (**B**)	**ERB1885C2E1R6BDX1D**	**ERB21B5C2E1R6BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R6CDX1D**	**ERB21B5C2E1R6CDX1L**
1.8pF (**1R8**)	±0.1pF (**B**)	**ERB1885C2E1R8BDX1D**	**ERB21B5C2E1R8BDX1L**
	±0.25pF (**C**)	**ERB1885C2E1R8CDX1D**	**ERB21B5C2E1R8CDX1L**
2.0pF (**2R0**)	±0.1pF (**B**)	**ERB1885C2E2R0BDX1D**	**ERB21B5C2E2R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E2R0CDX1D**	**ERB21B5C2E2R0CDX1L**
2.2pF (**2R2**)	±0.1pF (**B**)	**ERB1885C2E2R2BDX1D**	**ERB21B5C2E2R2BDX1L**
	±0.25pF (**C**)	**ERB1885C2E2R2CDX1D**	**ERB21B5C2E2R2CDX1L**
2.4pF (**2R4**)	±0.1pF (**B**)	**ERB1885C2E2R4BDX1D**	**ERB21B5C2E2R4BDX1L**
	±0.25pF (**C**)	**ERB1885C2E2R4CDX1D**	**ERB21B5C2E2R4CDX1L**
2.7pF (**2R7**)	±0.1pF (**B**)	**ERB1885C2E2R7BDX1D**	**ERB21B5C2E2R7BDX1L**
	±0.25pF (**C**)	**ERB1885C2E2R7CDX1D**	**ERB21B5C2E2R7CDX1L**
3.0pF (**3R0**)	±0.1pF (**B**)	**ERB1885C2E3R0BDX1D**	**ERB21B5C2E3R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E3R0CDX1D**	**ERB21B5C2E3R0CDX1L**
3.3pF (**3R3**)	±0.1pF (**B**)	**ERB1885C2E3R3BDX1D**	**ERB21B5C2E3R3BDX1L**
	±0.25pF (**C**)	**ERB1885C2E3R3CDX1D**	**ERB21B5C2E3R3CDX1L**
3.6pF (**3R6**)	±0.1pF (**B**)	**ERB1885C2E3R6BDX1D**	**ERB21B5C2E3R6BDX1L**
	±0.25pF (**C**)	**ERB1885C2E3R6CDX1D**	**ERB21B5C2E3R6CDX1L**
3.9pF (**3R9**)	±0.1pF (**B**)	**ERB1885C2E3R9BDX1D**	**ERB21B5C2E3R9BDX1L**
	±0.25pF (**C**)	**ERB1885C2E3R9CDX1D**	**ERB21B5C2E3R9CDX1L**
4.0pF (**4R0**)	±0.1pF (**B**)	**ERB1885C2E4R0BDX1D**	**ERB21B5C2E4R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E4R0CDX1D**	**ERB21B5C2E4R0CDX1L**
4.3pF (**4R3**)	±0.1pF (**B**)	**ERB1885C2E4R3BDX1D**	**ERB21B5C2E4R3BDX1L**
	±0.25pF (**C**)	**ERB1885C2E4R3CDX1D**	**ERB21B5C2E4R3CDX1L**
4.7pF (**4R7**)	±0.1pF (**B**)	**ERB1885C2E4R7BDX1D**	**ERB21B5C2E4R7BDX1L**
	±0.25pF (**C**)	**ERB1885C2E4R7CDX1D**	**ERB21B5C2E4R7CDX1L**
5.0pF (**5R0**)	±0.1pF (**B**)	**ERB1885C2E5R0BDX1D**	**ERB21B5C2E5R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E5R0CDX1D**	**ERB21B5C2E5R0CDX1L**
5.1pF (**5R1**)	±0.1pF (**B**)	**ERB1885C2E5R1BDX1D**	**ERB21B5C2E5R1BDX1L**
	±0.25pF (**C**)	**ERB1885C2E5R1CDX1D**	**ERB21B5C2E5R1CDX1L**
	±0.5pF (**D**)	**ERB1885C2E5R1DDX1D**	**ERB21B5C2E5R1DDX1L**
5.6pF (**5R6**)	±0.1pF (**B**)	**ERB1885C2E5R6BDX1D**	**ERB21B5C2E5R6BDX1L**
	±0.25pF (**C**)	**ERB1885C2E5R6CDX1D**	**ERB21B5C2E5R6CDX1L**
	±0.5pF (**D**)	**ERB1885C2E5R6DDX1D**	**ERB21B5C2E5R6DDX1L**
6.0pF (**6R0**)	±0.1pF (**B**)	**ERB1885C2E6R0BDX1D**	**ERB21B5C2E6R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E6R0CDX1D**	**ERB21B5C2E6R0CDX1L**
	±0.5pF (**D**)	**ERB1885C2E6R0DDX1D**	**ERB21B5C2E6R0DDX1L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) | ER | B | 18 | 8 | 5C | 2E | R50 | B | DX1 | D |
❶ ❷ ❸ ❹ ❺ ❻ ❼ ❽ ❾ ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

6

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6x0.8(**18**)<0603>	2.0x1.25(**21**)<0805>
Rated Volt. [Vdc]		250(**2E**)	250(**2E**)
Capacitance	Tolerance	Part Number	
6.2pF (**6R2**)	±0.1pF (**B**)	**ERB1885C2E6R2BDX1D**	**ERB21B5C2E6R2BDX1L**
	±0.25pF (**C**)	**ERB1885C2E6R2CDX1D**	**ERB21B5C2E6R2CDX1L**
	±0.5pF (**D**)	**ERB1885C2E6R2DDX1D**	**ERB21B5C2E6R2DDX1L**
6.8pF (**6R8**)	±0.1pF (**B**)	**ERB1885C2E6R8BDX1D**	**ERB21B5C2E6R8BDX1L**
	±0.25pF (**C**)	**ERB1885C2E6R8CDX1D**	**ERB21B5C2E6R8CDX1L**
	±0.5pF (**D**)	**ERB1885C2E6R8DDX1D**	**ERB21B5C2E6R8DDX1L**
7.0pF (**7R0**)	±0.1pF (**B**)	**ERB1885C2E7R0BDX5D**	**ERB21B5C2E7R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E7R0CDX5D**	**ERB21B5C2E7R0CDX1L**
	±0.5pF (**D**)	**ERB1885C2E7R0DDX5D**	**ERB21B5C2E7R0DDX1L**
7.5pF (**7R5**)	±0.1pF (**B**)	**ERB1885C2E7R5BDX5D**	**ERB21B5C2E7R5BDX1L**
	±0.25pF (**C**)	**ERB1885C2E7R5CDX5D**	**ERB21B5C2E7R5CDX1L**
	±0.5pF (**D**)	**ERB1885C2E7R5DDX5D**	**ERB21B5C2E7R5DDX1L**
8.0pF (**8R0**)	±0.1pF (**B**)	**ERB1885C2E8R0BDX5D**	**ERB21B5C2E8R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E8R0CDX5D**	**ERB21B5C2E8R0CDX1L**
	±0.5pF (**D**)	**ERB1885C2E8R0DDX5D**	**ERB21B5C2E8R0DDX1L**
8.2pF (**8R2**)	±0.1pF (**B**)	**ERB1885C2E8R2BDX5D**	**ERB21B5C2E8R2BDX1L**
	±0.25pF (**C**)	**ERB1885C2E8R2CDX5D**	**ERB21B5C2E8R2CDX1L**
	±0.5pF (**D**)	**ERB1885C2E8R2DDX5D**	**ERB21B5C2E8R2DDX1L**
9.0pF (**9R0**)	±0.1pF (**B**)	**ERB1885C2E9R0BDX5D**	**ERB21B5C2E9R0BDX1L**
	±0.25pF (**C**)	**ERB1885C2E9R0CDX5D**	**ERB21B5C2E9R0CDX1L**
	±0.5pF (**D**)	**ERB1885C2E9R0DDX5D**	**ERB21B5C2E9R0DDX1L**
9.1pF (**9R1**)	±0.1pF (**B**)	**ERB1885C2E9R1BDX5D**	**ERB21B5C2E9R1BDX1L**
	±0.25pF (**C**)	**ERB1885C2E9R1CDX5D**	**ERB21B5C2E9R1CDX1L**
	±0.5pF (**D**)	**ERB1885C2E9R1DDX5D**	**ERB21B5C2E9R1DDX1L**
10pF (**100**)	±2% (**G**)	**ERB1885C2E100GDX5D**	**ERB21B5C2E100GDX1L**
	±5% (**J**)	**ERB1885C2E100JDX5D**	**ERB21B5C2E100JDX1L**
11pF (**110**)	±2% (**G**)	**ERB1885C2E110GDX5D**	**ERB21B5C2E110GDX1L**
	±5% (**J**)	**ERB1885C2E110JDX5D**	**ERB21B5C2E110JDX1L**
12pF (**120**)	±2% (**G**)	**ERB1885C2E120GDX5D**	**ERB21B5C2E120GDX1L**
	±5% (**J**)	**ERB1885C2E120JDX5D**	**ERB21B5C2E120JDX1L**
13pF (**130**)	±2% (**G**)	**ERB1885C2E130GDX5D**	**ERB21B5C2E130GDX1L**
	±5% (**J**)	**ERB1885C2E130JDX5D**	**ERB21B5C2E130JDX1L**
15pF (**150**)	±2% (**G**)	**ERB1885C2E150GDX5D**	**ERB21B5C2E150GDX1L**
	±5% (**J**)	**ERB1885C2E150JDX5D**	**ERB21B5C2E150JDX1L**
16pF (**160**)	±2% (**G**)	**ERB1885C2E160GDX5D**	**ERB21B5C2E160GDX1L**
	±5% (**J**)	**ERB1885C2E160JDX5D**	**ERB21B5C2E160JDX1L**
18pF (**180**)	±2% (**G**)	**ERB1885C2E180GDX5D**	**ERB21B5C2E180GDX1L**
	±5% (**J**)	**ERB1885C2E180JDX5D**	**ERB21B5C2E180JDX1L**
20pF (**200**)	±2% (**G**)	**ERB1885C2E200GDX5D**	**ERB21B5C2E200GDX1L**
	±5% (**J**)	**ERB1885C2E200JDX5D**	**ERB21B5C2E200JDX1L**
22pF (**220**)	±2% (**G**)	**ERB1885C2E220GDX5D**	**ERB21B5C2E220GDX1L**
	±5% (**J**)	**ERB1885C2E220JDX5D**	**ERB21B5C2E220JDX1L**
24pF (**240**)	±2% (**G**)	**ERB1885C2E240GDX5D**	**ERB21B5C2E240GDX1L**
	±5% (**J**)	**ERB1885C2E240JDX5D**	**ERB21B5C2E240JDX1L**
27pF (**270**)	±2% (**G**)	**ERB1885C2E270GDX5D**	**ERB21B5C2E270GDX1L**
	±5% (**J**)	**ERB1885C2E270JDX5D**	**ERB21B5C2E270JDX1L**
30pF (**300**)	±2% (**G**)	**ERB1885C2E300GDX5D**	**ERB21B5C2E300GDX1L**
	±5% (**J**)	**ERB1885C2E300JDX5D**	**ERB21B5C2E300JDX1L**
33pF (**330**)	±2% (**G**)	**ERB1885C2E330GDX5D**	**ERB21B5C2E330GDX1L**
	±5% (**J**)	**ERB1885C2E330JDX5D**	**ERB21B5C2E330JDX1L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number)	ER	B	18	8	5C	2E	6R2	B	DX1	D
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		1.6x0.8(**18**)<0603>	2.0x1.25(**21**)<0805>		
Rated Volt. [Vdc]		250(**2E**)	250(**2E**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number			
36pF (**360**)	±2% (**G**)	**ERB1885C2E360GDX5D**	**ERB21B5C2E360GDX1L**		
	±5% (**J**)	**ERB1885C2E360JDX5D**	**ERB21B5C2E360JDX1L**		
39pF (**390**)	±2% (**G**)	**ERB1885C2E390GDX5D**	**ERB21B5C2E390GDX1L**		
	±5% (**J**)	**ERB1885C2E390JDX5D**	**ERB21B5C2E390JDX1L**		
43pF (**430**)	±2% (**G**)	**ERB1885C2E430GDX5D**	**ERB21B5C2E430GDX1L**		
	±5% (**J**)	**ERB1885C2E430JDX5D**	**ERB21B5C2E430JDX1L**		
47pF (**470**)	±2% (**G**)	**ERB1885C2E470GDX5D**	**ERB21B5C2E470GDX1L**		
	±5% (**J**)	**ERB1885C2E470JDX5D**	**ERB21B5C2E470JDX1L**		
51pF (**510**)	±2% (**G**)	**ERB1885C2E510GDX5D**	**ERB21B5C2E510GDX1L**		
	±5% (**J**)	**ERB1885C2E510JDX5D**	**ERB21B5C2E510JDX1L**		
56pF (**560**)	±2% (**G**)	**ERB1885C2E560GDX5D**	**ERB21B5C2E560GDX1L**		
	±5% (**J**)	**ERB1885C2E560JDX5D**	**ERB21B5C2E560JDX1L**		
62pF (**620**)	±2% (**G**)	**ERB1885C2E620GDX5D**	**ERB21B5C2E620GDX1L**		
	±5% (**J**)	**ERB1885C2E620JDX5D**	**ERB21B5C2E620JDX1L**		
68pF (**680**)	±2% (**G**)	**ERB1885C2E680GDX5D**	**ERB21B5C2E680GDX1L**		
	±5% (**J**)	**ERB1885C2E680JDX5D**	**ERB21B5C2E680JDX1L**		
75pF (**750**)	±2% (**G**)	**ERB1885C2E750GDX5D**	**ERB21B5C2E750GDX1L**		
	±5% (**J**)	**ERB1885C2E750JDX5D**	**ERB21B5C2E750JDX1L**		
82pF (**820**)	±2% (**G**)	**ERB1885C2E820GDX5D**	**ERB21B5C2E820GDX1L**		
	±5% (**J**)	**ERB1885C2E820JDX5D**	**ERB21B5C2E820JDX1L**		
91pF (**910**)	±2% (**G**)	**ERB1885C2E910GDX5D**	**ERB21B5C2E910GDX1L**		
	±5% (**J**)	**ERB1885C2E910JDX5D**	**ERB21B5C2E910JDX1L**		
100pF (**101**)	±2% (**G**)	**ERB1885C2E101GDX5D**	**ERB21B5C2E101GDX1L**		
	±5% (**J**)	**ERB1885C2E101JDX5D**	**ERB21B5C2E101JDX1L**		
110pF (**111**)	±2% (**G**)			**ERB21B5C2A111GDX1L**	
	±5% (**J**)			**ERB21B5C2A111JDX1L**	
120pF (**121**)	±2% (**G**)			**ERB21B5C2A121GDX1L**	
	±5% (**J**)			**ERB21B5C2A121JDX1L**	
130pF (**131**)	±2% (**G**)			**ERB21B5C2A131GDX1L**	
	±5% (**J**)			**ERB21B5C2A131JDX1L**	
150pF (**151**)	±2% (**G**)				**ERB21B5C1H151GDX1L**
	±5% (**J**)				**ERB21B5C1H151JDX1L**
160pF (**161**)	±2% (**G**)				**ERB21B5C1H161GDX1L**
	±5% (**J**)				**ERB21B5C1H161JDX1L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		3.2x2.5(**32**)<1210>
Rated Volt. [Vdc]		500(**2H**)
Capacitance	Tolerance	Part Number
3.3pF (**3R3**)	±0.1pF (**B**)	**ERB32Q5C2H3R3BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H3R3CDX1L**
3.6pF (**3R6**)	±0.1pF (**B**)	**ERB32Q5C2H3R6BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H3R6CDX1L**
3.9pF (**3R9**)	±0.1pF (**B**)	**ERB32Q5C2H3R9BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H3R9CDX1L**
4.0pF (**4R0**)	±0.1pF (**B**)	**ERB32Q5C2H4R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H4R0CDX1L**
4.3pF (**4R3**)	±0.1pF (**B**)	**ERB32Q5C2H4R3BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H4R3CDX1L**
4.7pF (**4R7**)	±0.1pF (**B**)	**ERB32Q5C2H4R7BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H4R7CDX1L**
5.0pF (**5R0**)	±0.1pF (**B**)	**ERB32Q5C2H5R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H5R0CDX1L**
5.1pF (**5R1**)	±0.1pF (**B**)	**ERB32Q5C2H5R1BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H5R1CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H5R1DDX1L**
5.6pF (**5R6**)	±0.1pF (**B**)	**ERB32Q5C2H5R6BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H5R6CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H5R6DDX1L**
6.0pF (**6R0**)	±0.1pF (**B**)	**ERB32Q5C2H6R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H6R0CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H6R0DDX1L**
6.2pF (**6R2**)	±0.1pF (**B**)	**ERB32Q5C2H6R2BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H6R2CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H6R2DDX1L**
6.8pF (**6R8**)	±0.1pF (**B**)	**ERB32Q5C2H6R8BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H6R8CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H6R8DDX1L**
7.0pF (**7R0**)	±0.1pF (**B**)	**ERB32Q5C2H7R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H7R0CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H7R0DDX1L**
7.5pF (**7R5**)	±0.1pF (**B**)	**ERB32Q5C2H7R5BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H7R5CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H7R5DDX1L**
8.0pF (**8R0**)	±0.1pF (**B**)	**ERB32Q5C2H8R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H8R0CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H8R0DDX1L**
8.2pF (**8R2**)	±0.1pF (**B**)	**ERB32Q5C2H8R2BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H8R2CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H8R2DDX1L**
9.0pF (**9R0**)	±0.1pF (**B**)	**ERB32Q5C2H9R0BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H9R0CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H9R0DDX1L**
9.1pF (**9R1**)	±0.1pF (**B**)	**ERB32Q5C2H9R1BDX1L**
	±0.25pF (**C**)	**ERB32Q5C2H9R1CDX1L**
	±0.5pF (**D**)	**ERB32Q5C2H9R1DDX1L**
10pF (**100**)	±2% (**G**)	**ERB32Q5C2H100GDX1L**
	±5% (**J**)	**ERB32Q5C2H100JDX1L**

L x W [mm]		3.2x2.5(**32**)<1210>
Rated Volt. [Vdc]		500(**2H**)
Capacitance	Tolerance	Part Number
11pF (**110**)	±2% (**G**)	**ERB32Q5C2H110GDX1L**
	±5% (**J**)	**ERB32Q5C2H110JDX1L**
12pF (**120**)	±2% (**G**)	**ERB32Q5C2H120GDX1L**
	±5% (**J**)	**ERB32Q5C2H120JDX1L**
13pF (**130**)	±2% (**G**)	**ERB32Q5C2H130GDX1L**
	±5% (**J**)	**ERB32Q5C2H130JDX1L**
15pF (**150**)	±2% (**G**)	**ERB32Q5C2H150GDX1L**
	±5% (**J**)	**ERB32Q5C2H150JDX1L**
16pF (**160**)	±2% (**G**)	**ERB32Q5C2H160GDX1L**
	±5% (**J**)	**ERB32Q5C2H160JDX1L**
18pF (**180**)	±2% (**G**)	**ERB32Q5C2H180GDX1L**
	±5% (**J**)	**ERB32Q5C2H180JDX1L**
20pF (**200**)	±2% (**G**)	**ERB32Q5C2H200GDX1L**
	±5% (**J**)	**ERB32Q5C2H200JDX1L**
22pF (**220**)	±2% (**G**)	**ERB32Q5C2H220GDX1L**
	±5% (**J**)	**ERB32Q5C2H220JDX1L**
24pF (**240**)	±2% (**G**)	**ERB32Q5C2H240GDX1L**
	±5% (**J**)	**ERB32Q5C2H240JDX1L**
27pF (**270**)	±2% (**G**)	**ERB32Q5C2H270GDX1L**
	±5% (**J**)	**ERB32Q5C2H270JDX1L**
30pF (**300**)	±2% (**G**)	**ERB32Q5C2H300GDX1L**
	±5% (**J**)	**ERB32Q5C2H300JDX1L**
33pF (**330**)	±2% (**G**)	**ERB32Q5C2H330GDX1L**
	±5% (**J**)	**ERB32Q5C2H330JDX1L**
36pF (**360**)	±2% (**G**)	**ERB32Q5C2H360GDX1L**
	±5% (**J**)	**ERB32Q5C2H360JDX1L**
39pF (**390**)	±2% (**G**)	**ERB32Q5C2H390GDX1L**
	±5% (**J**)	**ERB32Q5C2H390JDX1L**
43pF (**430**)	±2% (**G**)	**ERB32Q5C2H430GDX1L**
	±5% (**J**)	**ERB32Q5C2H430JDX1L**
47pF (**470**)	±2% (**G**)	**ERB32Q5C2H470GDX1L**
	±5% (**J**)	**ERB32Q5C2H470JDX1L**
51pF (**510**)	±2% (**G**)	**ERB32Q5C2H510GDX1L**
	±5% (**J**)	**ERB32Q5C2H510JDX1L**
56pF (**560**)	±2% (**G**)	**ERB32Q5C2H560GDX1L**
	±5% (**J**)	**ERB32Q5C2H560JDX1L**
62pF (**620**)	±2% (**G**)	**ERB32Q5C2H620GDX1L**
	±5% (**J**)	**ERB32Q5C2H620JDX1L**
68pF (**680**)	±2% (**G**)	**ERB32Q5C2H680GDX1L**
	±5% (**J**)	**ERB32Q5C2H680JDX1L**
75pF (**750**)	±2% (**G**)	**ERB32Q5C2H750GDX1L**
	±5% (**J**)	**ERB32Q5C2H750JDX1L**
82pF (**820**)	±2% (**G**)	**ERB32Q5C2H820GDX1L**
	±5% (**J**)	**ERB32Q5C2H820JDX1L**
91pF (**910**)	±2% (**G**)	**ERB32Q5C2H910GDX1L**
	±5% (**J**)	**ERB32Q5C2H910JDX1L**
100pF (**101**)	±2% (**G**)	**ERB32Q5C2H101GDX1L**
	±5% (**J**)	**ERB32Q5C2H101JDX1L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

(Part Number) ER ❶ | B ❷ | 32 ❸ | Q ❹ | 5C ❺ | 2H ❻ | 3R3 ❼ | B ❽ | DX1 ❾ | L ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

Temperature Compensating Type C0G(5C) Characteristics

L x W [mm]		3.2x2.5(**32**)<1210>			
Rated Volt. [Vdc]		500(**2H**)	300(**YD**)	250(**2E**)	100(**2A**)
Capacitance	Tolerance	Part Number			
110pF (**111**)	±2% (**G**)	**ERB32Q5C2H111GDX1L**			
	±5% (**J**)	**ERB32Q5C2H111JDX1L**			
120pF (**121**)	±2% (**G**)	**ERB32Q5C2H121GDX1L**			
	±5% (**J**)	**ERB32Q5C2H121JDX1L**			
130pF (**131**)	±2% (**G**)		**ERB32Q5CYD131GDX1L**		
	±5% (**J**)		**ERB32Q5CYD131JDX1L**		
150pF (**151**)	±2% (**G**)		**ERB32Q5CYD151GDX1L**		
	±5% (**J**)		**ERB32Q5CYD151JDX1L**		
160pF (**161**)	±2% (**G**)			**ERB32Q5C2E161GDX1L**	
	±5% (**J**)			**ERB32Q5C2E161JDX1L**	
180pF (**181**)	±2% (**G**)			**ERB32Q5C2E181GDX1L**	
	±5% (**J**)			**ERB32Q5C2E181JDX1L**	
200pF (**201**)	±2% (**G**)			**ERB32Q5C2E201GDX1L**	
	±5% (**J**)			**ERB32Q5C2E201JDX1L**	
220pF (**221**)	±2% (**G**)			**ERB32Q5C2E221GDX1L**	
	±5% (**J**)			**ERB32Q5C2E221JDX1L**	
240pF (**241**)	±2% (**G**)				**ERB32Q5C2A241GDX1L**
	±5% (**J**)				**ERB32Q5C2A241JDX1L**
270pF (**271**)	±2% (**G**)				**ERB32Q5C2A271GDX1L**
	±5% (**J**)				**ERB32Q5C2A271JDX1L**
300pF (**301**)	±2% (**G**)				**ERB32Q5C2A301GDX1L**
	±5% (**J**)				**ERB32Q5C2A301JDX1L**
330pF (**331**)	±2% (**G**)				**ERB32Q5C2A331GDX1L**
	±5% (**J**)				**ERB32Q5C2A331JDX1L**
360pF (**361**)	±2% (**G**)				**ERB32Q5C2A361GDX1L**
	±5% (**J**)				**ERB32Q5C2A361JDX1L**
390pF (**391**)	±2% (**G**)				**ERB32Q5C2A391GDX1L**
	±5% (**J**)				**ERB32Q5C2A391JDX1L**
430pF (**431**)	±2% (**G**)				**ERB32Q5C2A431GDX1L**
	±5% (**J**)				**ERB32Q5C2A431JDX1L**
470pF (**471**)	±2% (**G**)				**ERB32Q5C2A471GDX1L**
	±5% (**J**)				**ERB32Q5C2A471JDX1L**

L x W [mm]		3.2x2.5(**32**)<1210>
Rated Volt. [Vdc]		50(**1H**)
Capacitance	Tolerance	Part Number
510pF (**511**)	±2% (**G**)	**ERB32Q5C1H511GDX1L**
	±5% (**J**)	**ERB32Q5C1H511JDX1L**
560pF (**561**)	±2% (**G**)	**ERB32Q5C1H561GDX1L**
	±5% (**J**)	**ERB32Q5C1H561JDX1L**
620pF (**621**)	±2% (**G**)	**ERB32Q5C1H621GDX1L**
	±5% (**J**)	**ERB32Q5C1H621JDX1L**
680pF (**681**)	±2% (**G**)	**ERB32Q5C1H681GDX1L**
	±5% (**J**)	**ERB32Q5C1H681JDX1L**
750pF (**751**)	±2% (**G**)	**ERB32Q5C1H751GDX1L**
	±5% (**J**)	**ERB32Q5C1H751JDX1L**
820pF (**821**)	±2% (**G**)	**ERB32Q5C1H821GDX1L**
	±5% (**J**)	**ERB32Q5C1H821JDX1L**
910pF (**911**)	±2% (**G**)	**ERB32Q5C1H911GDX1L**
	±5% (**J**)	**ERB32Q5C1H911JDX1L**
1000pF (**102**)	±2% (**G**)	**ERB32Q5C1H102GDX1L**
	±5% (**J**)	**ERB32Q5C1H102JDX1L**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

ERB Series Specifications and Test Methods

No.	Item		Specifications	Test Method
1	Operating Temperature Range		−55 to +125℃	Reference Temperature: 25°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 dimension	Using calipers
5	Dielectric Strength		No defects or abnormalities	No failure should be observed when 300%(*) of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. (*) 300V: 250%, 500V: 200%
6	Insulation Resistance (I.R.)		1,000,000MΩ min. (C≦470pF) 100,000MΩ min. (C>470pF)	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and standard humidity and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance	The capacitance/Q should be measured at 25℃ at the frequency and voltage shown in the table.
8	Q		C≦ 220pF : Q≧10,000 220pF<C≦ 470pF : Q≧ 5,000 470pF<C≦1,000pF : Q≧ 3,000 C: Nominal Capacitance (pF)	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A-6)	The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5, the capacitance 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 steps 1, 3 and 5 by the capacitance value in step 3.
		Temperature Coefficient	Within the specified tolerance (Table A-6)	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	
10	Adhesive Strength of Termination		No removal of the terminations or other defects should occur.	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1 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.

Frequency	1±0.1MHz
Voltage	1±0.2Vrms

Step	Temperature (℃)
1	25±2
2	−55±3
3	25±2
4	125±3
5	25±2

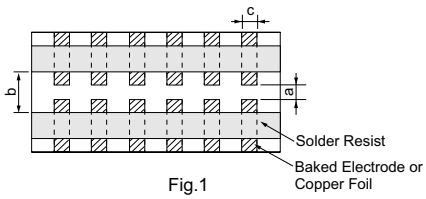


Fig.1

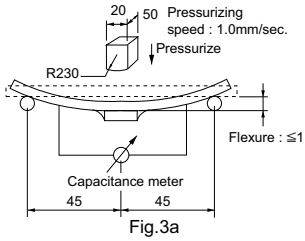
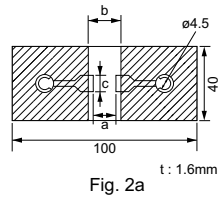
Type	a	b	c
ERB18	1.0	3.0	1.2
ERB21	1.2	4.0	1.65
ERB32	2.2	5.0	2.9

(in mm)
*5N (ERB188)

Continued on the following page.

ERB Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	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	Satisfies the initial value. C≦ 220pF : Q≧10,000 220pF<C≦ 470pF : Q≧ 5,000 470pF<C≦1,000pF : Q≧ 3,000 C: Nominal Capacitance (pF)	
12	Deflection	Appearance	No marking defects	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. 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.
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
			 Fig.3a  Fig. 2a	
13	Solderability of Termination		95% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of isopropyl alcohol and rosin (25% rosin in weight proportion). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution for 5±0.5 seconds at 245±5℃.
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.	Preheat according to the conditions listed in the table below. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.
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 listed in the following table. Let sit for 24±2 hours at room temperature, then measure.

Type	a	b	c
ERB18	1.0	3.0	1.2
ERB21	1.2	4.0	1.65
ERB32	2.2	5.0	2.9

(in mm)

Item	Specifications
Appearance	No marked defect
Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)
Q	C≦ 220pF : Q≧10,000 220pF<C≦ 470pF : Q≧ 5,000 470pF<C≦1,000pF : Q≧ 3,000
Dielectric Strength	No failure

C: Nominal Capacitance (pF)

Chip Size	Preheat Condition
2.0×1.25mm max.	1minute at 120 to 150℃
3.2×2.5mm	Each 1 minute at 100 to 120℃ and then 170 to 200℃

Item	Specifications
Appearance	No marked defect
Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)
Q	C≧30pF : Q≧350 10pF≦C<30pF : Q≧275+ $\frac{5}{2}$C C<10pF : Q≧200+10C
I.R.	1,000MΩ min.
Dielectric Strength	No failure

C: Nominal Capacitance (pF)

Step	1	2	3	4
Temp. (℃)	Min. Operating Temp. +0/−3	Room Temp.	Max. Operating Temp. +3/−0	Room Temp.
Time (min.)	30±3	5 max.	30±3	5 max.

Continued on the following page.

ERB Series Specifications and Test Methods

Continued from the preceding page.

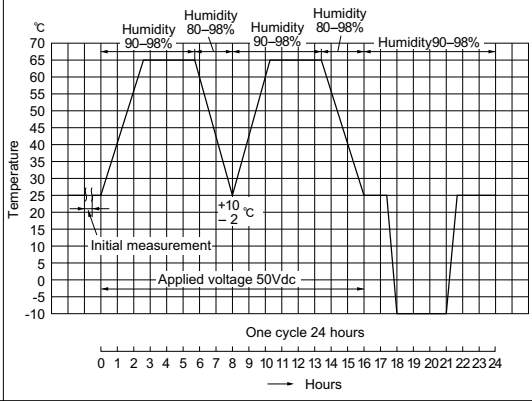
<table>
<tr><th>No.</th><th>Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>16</td><td>Humidity</td><td>The measured and observed characteristics should satisfy the specifications in the following table.
<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (Whichever is larger)</td></tr><tr><td>Q</td><td>C≧30pF : Q≧350
10pF≦C<30pF : Q≧275+$\frac{5}{2}$C
C<10pF : Q≧200+10C</td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr></table>C: Nominal Capacitance (pF)</td><td>Apply the 24-hour heat (−10 to +65℃) and humidity (80 to 100%) treatment shown below, 10 consecutive times. Remove, let sit for 24±2 hours at room temperature, and measure.
 
</td></tr>
<tr><td>17</td><td>High Temperature Load</td><td>The measured and observed characteristics should satisfy the specifications in the following table.
<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF (Whichever is larger)</td></tr><tr><td>Q</td><td>C≧30pF : Q≧350
10pF≦C<30pF : Q≧275+$\frac{5}{2}$C
C<10pF : Q≧200+10C</td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr></table>C: Nominal Capacitance (pF)</td><td>Apply 200% (500V only 150%) of the rated voltage for 1,000±12 hours at 125±3℃.
Remove and let sit for 24±2 hours at room temperature, then measure.
The charge/discharge current is less than 50mA.</td></tr>
</table>

Table A-6

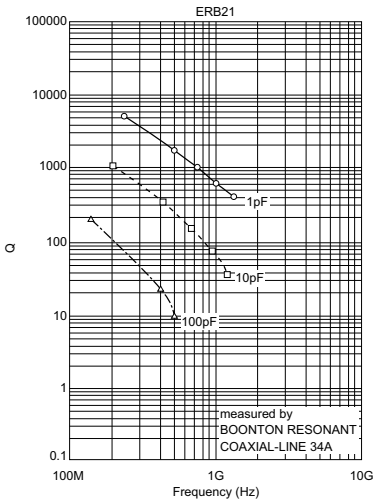
Char.	Nominal Values (ppm/℃) Note 1	Capacitance Change from 25℃ (%)					
		−55		−30		−10	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	0±30	0.58	−0.24	0.40	−0.17	0.25	−0.11

Note 1: Nominal values denote the temperature coefficient within a range of 25 to 125℃ (for 5C)

ERB Series Data

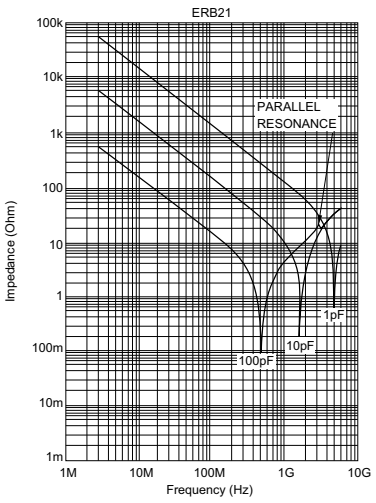
■ Q - Frequency Characteristics

ERB Series



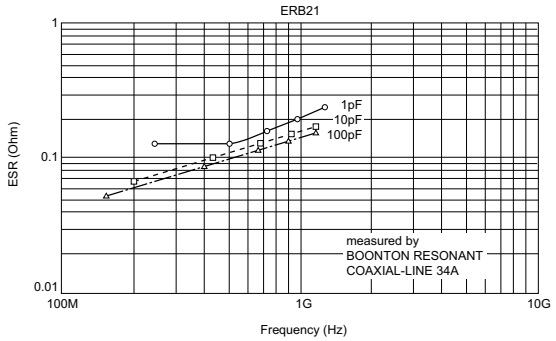
■ Impedance - Frequency Characteristics

ERB Series



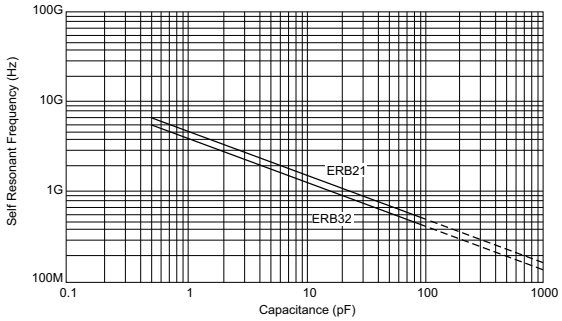
■ ESR - Frequency Characteristics

ERB Series

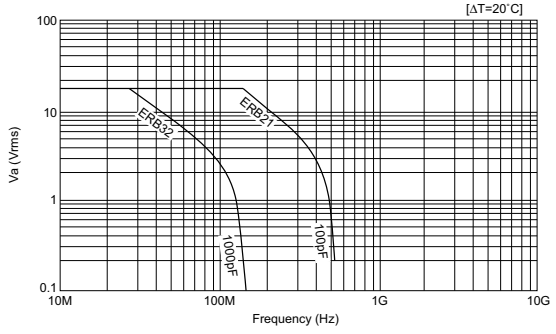


■ Self Resonant Frequency - Capacitance

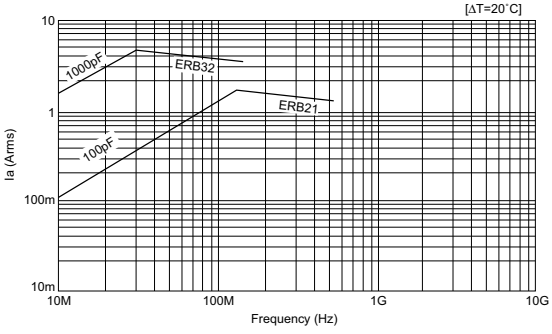
ERB Series



■ Allowable Voltage - Frequency



■ Allowable Current - Frequency



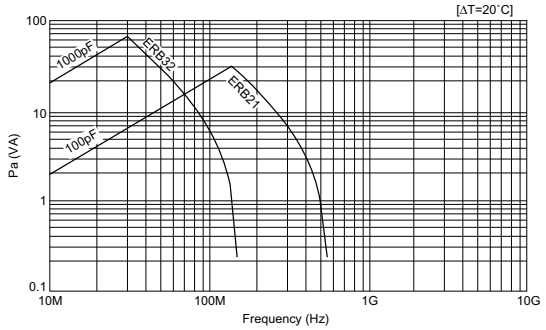
Continued on the following page.

6

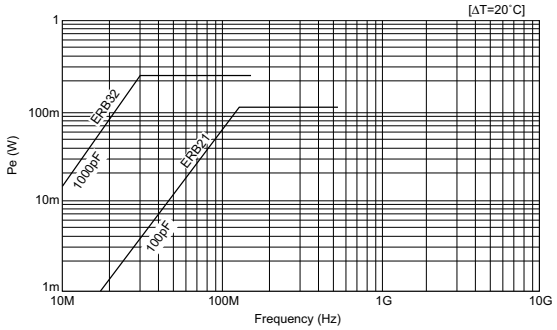
ERB Series Data

Continued from the preceding page.

■ Allowable Apparent Power - Frequency



■ Allowable Effective Power - Frequency



6

Chip Monolithic Ceramic Capacitors

muRata

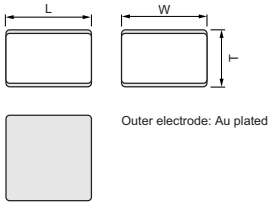
Monolithic Microchip GMA Series

■ Features

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

■ Applications

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



Part Number	Dimensions (mm)		
	L	W	T
GMA0D3	0.38±0.05	0.38±0.05	0.3±0.05
GMA05X	0.5±0.05	0.5±0.05	0.35±0.05
GMA085	0.8±0.05	0.8±0.05	0.5±0.1

7

Capacitance Table

High Dielectric Constant Type X7R (R7)/X5R (R6) Characteristics

X ex.X: T Dimension [mm]

LxW [mm]	0.38x0.38 (**0D**) <015015>	0.5x0.5 (**05**) <0202>				0.8x0.8 (**08**) <0303>			
Rated Voltage [Vdc]	10 (**1A**)	100 (**2A**)	25 (**1E**)	10 (**1A**)	6.3 (**0J**)	100 (**2A**)	25 (**1E**)	10 (**1A**)	6.3 (**0J**)
TC / Capacitance	X7R (**R7**)	X7R (**R7**)			X5R (**R6**)	X7R (**R7**)			X5R (**R6**)
100pF(**101**)		**X**							
150pF(**151**)		**X**							
220pF(**221**)		**X**							
330pF(**331**)		**X**							
470pF(**471**)		**X**							
680pF(**681**)		**X**							
1000pF(**102**)		**X**							
1500pF(**152**)			**X**			**5**			
2200pF(**222**)			**X**			**5**			
3300pF(**332**)			**X**			**5**			
4700pF(**472**)			**X**			**5**			
6800pF(**682**)				**X**		**5**			
10000pF(**103**)	**3**			**X**			**5**		
15000pF(**153**)				**X**			**5**		
22000pF(**223**)				**X**			**5**		
33000pF(**333**)								**5**	
47000pF(**473**)								**5**	
68000pF(**683**)								**5**	
0.10µF(**104**)					**X**			**5**	
0.47µF(**474**)									**5**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

High Dielectric Constant Type X7R(R7)/X5R(R6) Characteristics

LxW [mm]		0.38x0.38(**0D**)<0.15x0.15>
Rated Volt. [Vdc]		10(**1A**)
Capacitance	Tolerance	Part Number
10000pF(**103**)	±20% (**M**)	**GMA0D3R71A103MA01T**

LxW [mm]		0.5x0.5(**05**)<0202>			
Rated Volt. [Vdc]		100(**2A**)	25(**1E**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
100pF(**101**)	±20% (**M**)	**GMA05XR72A101MA01T**			
150pF(**151**)	±20% (**M**)	**GMA05XR72A151MA01T**			
220pF(**221**)	±20% (**M**)	**GMA05XR72A221MA01T**			
330pF(**331**)	±20% (**M**)	**GMA05XR72A331MA01T**			
470pF(**471**)	±20% (**M**)	**GMA05XR72A471MA01T**			
680pF(**681**)	±20% (**M**)	**GMA05XR72A681MA01T**			
1000pF(**102**)	±20% (**M**)	**GMA05XR72A102MA01T**			
1500pF(**152**)	±20% (**M**)		**GMA05XR71E152MA11T**		
2200pF(**222**)	±20% (**M**)		**GMA05XR71E222MA11T**		
3300pF(**332**)	±20% (**M**)		**GMA05XR71E332MA11T**		
4700pF(**472**)	±20% (**M**)		**GMA05XR71E472MA11T**		
6800pF(**682**)	±20% (**M**)			**GMA05XR71A682MA01T**	
10000pF(**103**)	±20% (**M**)			**GMA05XR71A103MA01T**	
15000pF(**153**)	±20% (**M**)			**GMA05XR71A153MA01T**	
22000pF(**223**)	±20% (**M**)			**GMA05XR71A223MA01T**	
33000pF(**333**)	±20% (**M**)				
47000pF(**473**)	±20% (**M**)				
68000pF(**683**)	±20% (**M**)				
0.10μF(**104**)	±20% (**M**)				**GMA05XR60J104ME12T***

LxW [mm]		0.8x0.8(**08**)<0303>			
Rated Volt. [Vdc]		100(**2A**)	25(**1E**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number			
1500pF(**152**)	±20% (**M**)	**GMA085R72A152MA01T**			
2200pF(**222**)	±20% (**M**)	**GMA085R72A222MA01T**			
3300pF(**332**)	±20% (**M**)	**GMA085R72A332MA01T**			
4700pF(**472**)	±20% (**M**)	**GMA085R72A472MA01T**			
6800pF(**682**)	±20% (**M**)	**GMA085R72A682MA01T**			
10000pF(**103**)	±20% (**M**)		**GMA085R71E103MA11T**		
15000pF(**153**)	±20% (**M**)		**GMA085R71E153MA11T**		
22000pF(**223**)	±20% (**M**)		**GMA085R71E223MA11T**		
33000pF(**333**)	±20% (**M**)			**GMA085R71A333MA01T**	
47000pF(**473**)	±20% (**M**)			**GMA085R71A473MA01T**	
68000pF(**683**)	±20% (**M**)			**GMA085R71A683MA01T**	
0.10μF(**104**)	±20% (**M**)			**GMA085R71A104MA01T**	
0.47μF(**474**)	±20% (**M**)				**GMA085R60J474ME12T***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

*: Please refer to GMA series Specifications and Test Method(2).

(Part Number) GM ❶ | A ❷ | 0D ❸ | 3 ❹ | R7 ❺ | 1A ❻ | 103 ❼ | M ❽ | A01 ❾ | T ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD Tray.

GMA Series Specifications and Test Methods(1)

In case Non "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R7: −55 to +125℃	Reference Temperature: 25℃
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 a voltage of 250% of the rated voltage is applied between the both terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance		More than 10,000MΩ or 500ΩF (Whichever is smaller)	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table. Frequency: 1±0.1kHz Voltage: 1±0.2Vrms
8	Dissipation Factor (D.F.)		R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	
9	Capacitance Temperature Characteristics	No bias	R7: Within +/–15% (–55 to +125°C)	The capacitance change should be measured after 5min. 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.* Step 1: 25±2; Step 2: –55±3; Step 3: 25±2; Step 4: 125±3 *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.
10	Mechanical Strength	Bond Strength	Pull force: 0.03N min.	MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 25μm (0.001 inch) gold wire to the capacitor terminal using an ultrasonic ball bond. Then, pull wire.
		Die Shear Strength	Die Shear force: 2N min.	MIL-STD-883 Method 2019 Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20). Apply the force parallel to the substrate.
11	Vibration Resistance	Appearance	No defects or abnormalities	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude: 1.5 mm (0.06 inch) max. total excursion. Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
		Capacitance	Within the specified tolerance	
		D.F.	R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	
12	Temperature Cycle	Appearance	No defects or abnormalities	The capacitor should be set for 24±2 hours at room temperature after one hour heat of treatment at 150+0/−10℃, then measure for the initial measurement. Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and time shown in the following table. Set it for 24±2 hours at room temperature, then measure. Step 1: Temp. (℃) Min. Operating Temp. +0/−3; Time (min.) 30±3 Step 2: Temp. (℃) Room Temp.; Time (min.) 2 to 3 Step 3: Temp. (℃) Max. Operating Temp. +3/−0; Time (min.) 30±3 Step 4: Temp. (℃) Room Temp.; Time (min.) 2 to 3
		Capacitance Change	R7: Within ±7.5%	
		D.F.	R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	
		I.R.	More than 10,000MΩ or 500ΩF (Whichever is smaller)	
		Dielectric Strength	No defects	

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

Continued on the following page.

7

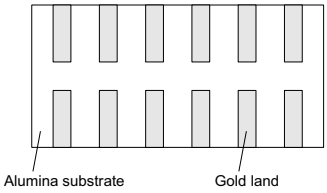
GMA Series Specifications and Test Methods(1)

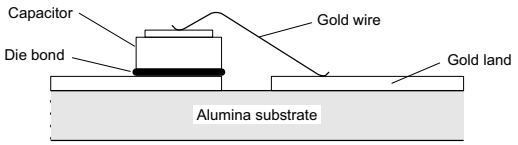
Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
13	Humidity (Steady State)	Appearance	No defects or abnormalities	Set the capacitor for 500±12 hours at 40±2℃, in 90 to 95% humidity. Take it out and set it for 24±2 hours at room temperature, then measure.
		Capacitance Change	R7: Within ±12.5%	
		D.F.	R7: W.V.: 10V min.; 0.05 max.	
		I.R.	More than 1,000MΩ or 50ΩF (Whichever is smaller)	
14	Humidity Load	Appearance	No defects or abnormalities	Apply the rated voltage for 500±12 hours at 40±2℃, in 90 to 95% humidity and set it for 24±2 hours at room temperature,then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	R7: Within ±12.5%	
		D.F.	R7: W.V.: 10V min.; 0.05 max.	
		I.R.	More than 500MΩ or 25ΩF (Whichever is smaller)	
15	High Temperature Load	Appearance	No defects or abnormalities	A voltage treatment should be given to the capacitor, in which a DC voltage of 200% the rated voltage is applied for one hour at the maximum operating temperature ±3℃ then it should be set for 24±2 hours at room temperature and the initial measurement should be conducted. Then apply the above mentioned voltage continuously for 1000±12 hours at the same temperature, remove it from the bath, and set it for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	R7: Within ±12.5%	
		D.F.	R7: W.V.: 10V min.; 0.05 max.	
		I.R.	More than 1,000MΩ or 50ΩF (Whichever is smaller)	

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





7

GMA Series Specifications and Test Methods(2)

In case Non "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R6 : –55°C to 85°C	Reference Temperature : 25°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 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance		More than 50Ω · F	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 1 minutes of charging.
7	Capacitance		Within the specified tolerance.	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table. Capacitance: C≦10μF (6.3Vmax.) / Frequency: 1±0.1kHz / Voltage: 0.5±0.1Vrms
8	Dissipation Factor (D.F.)		R6 : 0.1 max.	
9	Capacitance Temperature Characteristics	No bias	R6 : Within ±15% (–55°C to +85°C)	The capacitance change should be measured after 5min. 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.* Step 1: 25±2; Step 2: –55±3; Step 3: 25±2; Step 4: 85±3 *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.
10	Mechanical Strength	Bond Strength	Pull force : 0.03N min.	MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 25μm (0.001 inch) gold wire to the capacitor terminal using an ultrasonic ball bond. Then, pull wire.
		Die Shear Strength	Die Shear force : 2N min.	MIL-STD-883 Method 2019 Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20). Apply the force parallel to the substrate.
11	Vibration Resistance	Appearance	No defects or abnormalities.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion. Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
		Capacitance	Within the specified tolerance.	
		D.F.	R6 : 0.1 max.	
12	Temperature Sudden Change	Appearance	No defects or abnormalities.	The capacitor should be set for 24±2 hours at room temperature after one hour heat of treatment at 150+0/–10°C, then measure for the initial measurement. Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and time shown in the following table. Set it for 48±4 hours at room temperature, then measure. Step 1: Temp. (°C) Min. Operating Temp.+0/–3, Time (min.) 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
		Capacitance Change	R6 : Within ±7.5%	
		D.F.	R6 : 0.1 max.	
		I.R.	More than 50Ω · F	
		Dielectric Strength	No defects	

Mounting for testing : The capacitors should be mounted on the substrate as shown below using die bonding and wire bonding when tests No.11 to 14 are performed.

Continued on the following page.

7

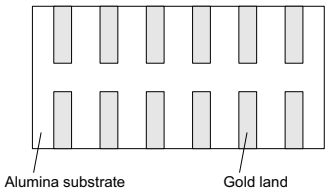
GMA Series Specifications and Test Methods(2)

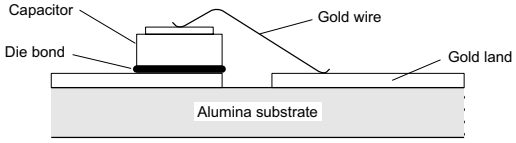
Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMA Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
13	High Temperature High Humidity (Steady)	Appearance	No defects or abnormalities.	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to 95% humidity and set it 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°C 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°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6 : Within ±12.5%	
		D.F.	R6 : 0.2 max.	
		I.R.	More than 12.5Ω · F	
14	Durability	Appearance	No defects or abnormalities.	Apply 150% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. 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°C 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°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6 : Within ±12.5%	
		D.F.	R6 : 0.2 max.	
		I.R.	More than 25Ω · F	

Mounting for testing : The capacitors should be mounted on the substrate as shown below using die bonding and wire bonding when tests No.11 to 14 are performed.





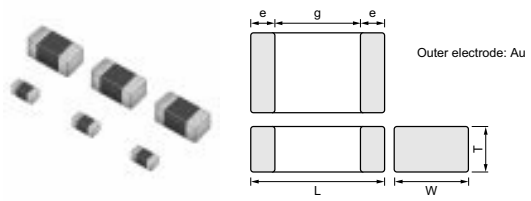
7

Chip Monolithic Ceramic Capacitors

for Bonding GMD Series

■ Features

1. Small chip size (LxWxT: 0.6x0.3x0.3, 1.0x0.5x0.5mm)
2. Available for Wire/Die bonding due to Gold termination.
3. Suitable for Optical device for telecommunication, IC packaging built-in.



■ Applications

1. Optical device for telecommunication
2. IC, IC packaging built-in

Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GMD033	0.6±0.03	0.3±0.03	0.3±0.03	0.12 to 0.22	0.16
GMD155	1.0±0.05	0.5±0.05	0.5±0.05	0.15 to 0.35	0.3

8

Capacitance Table

High Dielectric Constant Type X7R (R7)/X5R (R6) Characteristics

3 ex.3: T Dimension [mm]

LxW [mm]	0.6x0.3 (**03**) <0201>			1.0x0.5 (**15**) <0402>			0.6x0.3 (**03**) <0201>	1.0x0.5 (**15**) <0402>	
Rated Voltage [Vdc]	25 (**1E**)	16 (**1C**)	10 (**1A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)
TC / Capacitance	X7R (**R7**)						X5R (**R6**)		
100pF(**101**)	**3**								
120pF(**121**)	**3**								
150pF(**151**)	**3**								
180pF(**181**)	**3**								
220pF(**221**)	**3**			**5**					
270pF(**271**)	**3**			**5**					
330pF(**331**)	**3**			**5**					
390pF(**391**)	**3**			**5**					
470pF(**471**)	**3**			**5**					
560pF(**561**)	**3**			**5**					
680pF(**681**)	**3**			**5**					
820pF(**821**)	**3**			**5**					
1000pF(**102**)	**3**			**5**					
1200pF(**122**)	**3**			**5**					
1500pF(**152**)	**3**			**5**					
1800pF(**182**)		**3**		**5**					
2200pF(**222**)		**3**		**5**					
2700pF(**272**)		**3**		**5**					
3300pF(**332**)		**3**		**5**					
3900pF(**392**)			**3**	**5**					
4700pF(**472**)			**3**	**5**					
5600pF(**562**)			**3**		**5**				
6800pF(**682**)			**3**		**5**				
8200pF(**822**)			**3**		**5**				
10000pF(**103**)			**3**		**5**				
12000pF(**123**)					**5**				
15000pF(**153**)					**5**				
18000pF(**183**)					**5**				
22000pF(**223**)					**5**				
27000pF(**273**)					**5**				
33000pF(**333**)					**5**				
39000pF(**393**)					**5**				
47000pF(**473**)					**5**				
56000pF(**563**)						**5**	**3**		
68000pF(**683**)						**5**	**3**		
82000pF(**823**)						**5**	**3**		
0.10µF(**104**)						**5**	**3**		
0.12µF(**124**)								**5**	
0.15µF(**154**)								**5**	
0.18µF(**184**)								**5**	
0.22µF(**224**)								**5**	
0.27µF(**274**)								**5**	
0.33µF(**334**)								**5**	
0.39µF(**394**)								**5**	
0.47µF(**474**)								**5**	
1.0µF(**105**)									**5**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

High Dielectric Constant Type X7R(R7) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>		
Rated Volt. [Vdc]		25(**1E**)	16(**1C**)	10(**1A**)
Capacitance	Tolerance	Part Number		
100pF(**101**)	±10% (**K**)	**GMD033R71E101KA01D**		
120pF(**121**)	±10% (**K**)	**GMD033R71E121KA01D**		
150pF(**151**)	±10% (**K**)	**GMD033R71E151KA01D**		
180pF(**181**)	±10% (**K**)	**GMD033R71E181KA01D**		
220pF(**221**)	±10% (**K**)	**GMD033R71E221KA01D**		
270pF(**271**)	±10% (**K**)	**GMD033R71E271KA01D**		
330pF(**331**)	±10% (**K**)	**GMD033R71E331KA01D**		
390pF(**391**)	±10% (**K**)	**GMD033R71E391KA01D**		
470pF(**471**)	±10% (**K**)	**GMD033R71E471KA01D**		
560pF(**561**)	±10% (**K**)	**GMD033R71E561KA01D**		
680pF(**681**)	±10% (**K**)	**GMD033R71E681KA01D**		
820pF(**821**)	±10% (**K**)	**GMD033R71E821KA01D**		
1000pF(**102**)	±10% (**K**)	**GMD033R71E102KA01D**		
1200pF(**122**)	±10% (**K**)	**GMD033R71E122KA01D**		
1500pF(**152**)	±10% (**K**)	**GMD033R71E152KA01D**		
1800pF(**182**)	±10% (**K**)		**GMD033R71C182KA11D**	
2200pF(**222**)	±10% (**K**)		**GMD033R71C222KA11D**	
2700pF(**272**)	±10% (**K**)		**GMD033R71C272KA11D**	
3300pF(**332**)	±10% (**K**)		**GMD033R71C332KA11D**	
3900pF(**392**)	±10% (**K**)			**GMD033R71A392KA01D**
4700pF(**472**)	±10% (**K**)			**GMD033R71A472KA01D**
5600pF(**562**)	±10% (**K**)			**GMD033R71A562KA01D**
6800pF(**682**)	±10% (**K**)			**GMD033R71A682KA01D**
8200pF(**822**)	±10% (**K**)			**GMD033R71A822KA01D**
10000pF(**103**)	±10% (**K**)			**GMD033R71A103KA01D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

8

High Dielectric Constant Type X7R(R7) Characteristics

LxW [mm]		1.0x0.5(**15**)<0402>		
Rated Volt. [Vdc]		50(**1H**)	25(**1E**)	16(**1C**)
Capacitance	Tolerance	Part Number		
220pF(**221**)	±10% (**K**)	**GMD155R71H221KA01D**		
270pF(**271**)	±10% (**K**)	**GMD155R71H271KA01D**		
330pF(**331**)	±10% (**K**)	**GMD155R71H331KA01D**		
390pF(**391**)	±10% (**K**)	**GMD155R71H391KA01D**		
470pF(**471**)	±10% (**K**)	**GMD155R71H471KA01D**		
560pF(**561**)	±10% (**K**)	**GMD155R71H561KA01D**		
680pF(**681**)	±10% (**K**)	**GMD155R71H681KA01D**		
820pF(**821**)	±10% (**K**)	**GMD155R71H821KA01D**		
1000pF(**102**)	±10% (**K**)	**GMD155R71H102KA01D**		
1200pF(**122**)	±10% (**K**)	**GMD155R71H122KA01D**		
1500pF(**152**)	±10% (**K**)	**GMD155R71H152KA01D**		
1800pF(**182**)	±10% (**K**)	**GMD155R71H182KA01D**		
2200pF(**222**)	±10% (**K**)	**GMD155R71H222KA01D**		
2700pF(**272**)	±10% (**K**)	**GMD155R71H272KA01D**		
3300pF(**332**)	±10% (**K**)	**GMD155R71H332KA01D**		
3900pF(**392**)	±10% (**K**)	**GMD155R71H392KA01D**		
4700pF(**472**)	±10% (**K**)	**GMD155R71H472KA01D**		
5600pF(**562**)	±10% (**K**)		**GMD155R71E562KA01D**	
6800pF(**682**)	±10% (**K**)		**GMD155R71E682KA01D**	
8200pF(**822**)	±10% (**K**)		**GMD155R71E822KA01D**	
10000pF(**103**)	±10% (**K**)		**GMD155R71E103KA01D**	
12000pF(**123**)	±10% (**K**)		**GMD155R71E123KA01D**	
15000pF(**153**)	±10% (**K**)		**GMD155R71E153KA01D**	
18000pF(**183**)	±10% (**K**)		**GMD155R71E183KA01D**	
22000pF(**223**)	±10% (**K**)		**GMD155R71E223KA01D**	
27000pF(**273**)	±10% (**K**)		**GMD155R71E273KA11D**	
33000pF(**333**)	±10% (**K**)		**GMD155R71E333KA11D**	
39000pF(**393**)	±10% (**K**)		**GMD155R71E393KA11D**	
47000pF(**473**)	±10% (**K**)		**GMD155R71E473KA11D**	
56000pF(**563**)	±10% (**K**)			**GMD155R71C563KA11D**
68000pF(**683**)	±10% (**K**)			**GMD155R71C683KA11D**
82000pF(**823**)	±10% (**K**)			**GMD155R71C823KA11D**
0.10µF(**104**)	±10% (**K**)			**GMD155R71C104KA11D**

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

8

(Part Number) GM ❶ | D ❷ | 15 ❸ | 5 ❹ | R7 ❺ | 1H ❻ | 221 ❼ | K ❽ | A01 ❾ | D ❿

❶Product ID ❷Series ❸Dimension (LxW) ❹Dimension (T)
❺Temperature Characteristics ❻Rated Voltage ❼Capacitance
❽Capacitance Tolerance ❾Individual Specification Code ❿Packaging

Packaging Code in Part Number is a code shows STD 180mm Reel Taping.

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		0.6x0.3(**03**)<0201>	1.0x0.5(**15**)<0402>	
Rated Volt. [Vdc]		6.3(**0J**)	10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number		
56000pF(**563**)	±10% (**K**)	**GMD033R60J563KE11D***		
68000pF(**683**)	±10% (**K**)	**GMD033R60J683KE11D***		
82000pF(**823**)	±10% (**K**)	**GMD033R60J823KE11D***		
0.10μF(**104**)	±10% (**K**)	**GMD033R60J104KE11D***		
0.12μF(**124**)	±10% (**K**)		**GMD155R61A124KE12D***	
0.15μF(**154**)	±10% (**K**)		**GMD155R61A154KE12D***	
0.18μF(**184**)	±10% (**K**)		**GMD155R61A184KE12D***	
0.22μF(**224**)	±10% (**K**)		**GMD155R61A224KE12D***	
0.27μF(**274**)	±10% (**K**)		**GMD155R61A274KE11D***	
0.33μF(**334**)	±10% (**K**)		**GMD155R61A334KE11D***	
0.39μF(**394**)	±10% (**K**)		**GMD155R61A394KE11D***	
0.47μF(**474**)	±10% (**K**)		**GMD155R61A474KE11D***	
1.0μF(**105**)	±10% (**K**)			**GMD155R60J105KE11D***

The part number code is shown in ( ) and Unit is shown in [ ]. < >: EIA [inch] Code

*: Please refer to GMD series Specifications and Test Method(2).

8

GMD Series Specifications and Test Methods (1)

In case Non "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R7 : –55°C to 125°C	Reference Temperature : 25°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 abnormality.	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.
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 normal temperature and humidity and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance.	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table. Frequency: 1±0.1kHz Voltage: 1±0.2Vrms
8	Dissipation Factor (D.F.)		R7 : W.V. 25Vmin. : 0.025 max. W.V. 16/10V : 0.035 max.	
9	Capacitance Temperature Characteristics	No bias	R7 : Within ±15% (–55°C to +125°C)	The capacitance change should be measured after 5min. 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.* Step 1: 25±2 Step 2: –55±3 Step 3: 25±2 Step 4: 125±3 *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.
10	Mechanical Strength	Bond Strength	Pull force : 0.03N min.	MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 25mm (0.001 inch) gold wire to the capacitor terminal using an ultrasonic ball bond. Then, pull wire.
		Die Shear Strength	Die Shear force : 2N min.	MIL-STD-883 Method 2019 Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20). Apply the force parallel to the substrate.
11	Vibration Resistance	Appearance	No defects or abnormalities.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion. Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
		Capacitance	Within the specified tolerance.	
		D.F.	R7 : W.V. 25Vmin. : 0.025 max. W.V. 16/10V : 0.035 max.	
12	Temperature Cycle	Appearance	No defects or abnormalities.	The capacitor should be set for 24±2 hours at room temperature after one hour heat of treatment at 150+0/–10°C, then measure for the initial measurement. Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and time shown in the following table. Set it for 24±2 hours at room temperature, then measure. Step 1: Temp. (°C) Min. Operating Temp.+0/–3, Time (min.) 30+/–3 Step 2: Temp. (°C) Room Temp., Time (min.) 2 to 3 Step 3: Temp. (°C) Max. Operating Temp. +3/–0, Time (min.) 30+/–3 Step 4: Temp. (°C) Room Temp., Time (min.) 2 to 3
		Capacitance Change	R7 : Within ±7.5%	
		D.F.	R7 : W.V. 25Vmin. : 0.025 max. W.V. 16/10V : 0.035 max.	
		I.R.	More than 10,000MΩ or 500Ω · F (Whichever is smaller)	
		Dielectric Strength	No defects	

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

Continued on the following page.

8

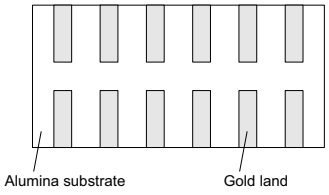
GMD Series Specifications and Test Methods (1)

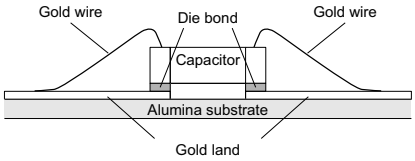
Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
13	Humidity (Steady State)	Appearance	No defects or abnormalities.	Set the capacitor for 500±12 hours at 40±2°C, in 90 to 95% humidity. Take it out and set it for 24±2 hours at room temperature, then measure.
		Capacitance Change	R7 : Within ±12.5%	
		D.F.	R7 : W.V. 25Vmin. : 0.05 max. W.V. 16/10V : 0.05 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)	
14	Humidity Load	Appearance	No defects or abnormalities.	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to 95% humidity and set it for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	R7 : Within ±12.5%	
		D.F.	R7 : W.V. 25Vmin. : 0.05 max. W.V. 16/10V : 0.05 max.	
		I.R.	More than 500MΩ or 25Ω · F (Whichever is smaller)	
15	High Temperature Load	Appearance	No defects or abnormalities.	A voltage treatment should be given to the capacitor, in which a DC voltage of 200% the rated voltage is applied for one hour at the maximum operating temperature ±3°C then it should be set for 24±2 hours at room temperature and the initial measurement should be conducted. Then apply the above mentioned voltage continuously for 1000±12 hours at the same temperature, remove it from the bath, and set it for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	R7 : Within ±12.5%	
		D.F.	R7 : W.V. 25Vmin. : 0.05 max. W.V. 16/10V : 0.05 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (Whichever is smaller)	

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





8

GMD Series Specifications and Test Methods (2)

In case Non "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
1	Operating Temperature Range		R6 : –55°C to 85°C	Reference Temperature : 25°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 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance		More than 50Ω · F	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 1 minutes of charging.
7	Capacitance		Within the specified tolerance.	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table. Capacitance / Frequency / Voltage C≦10μF (10Vmin.)*1 / 1±0.1kHz / 1.0±0.2Vrms C≦10μF (6.3Vmax.) / 1±0.1kHz / 0.5±0.1Vrms *1 GMD155 R6 1A 124 to 224 are applied to 0.5±0.1 Vrms.
8	Dissipation Factor (D.F.)		R6 : 0.1 max.	
9	Capacitance Temperature Characteristics	No bias	R6 : Within ±15% (–55°C to +85°C)	The capacitance change should be measured after 5min. 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.* Step / Temperature (°C) 1 / 25±2 2 / –55±3 3 / 25±2 4 / 85±3 *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.
10	Mechanical Strength	Bond Strength	Pull force : 0.03N min.	MIL-STD-883 Method 2011 Condition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20) and bond a 25μm (0.001 inch) gold wire to the capacitor terminal using an ultrasonic ball bond. Then, pull wire.
		Die Shear Strength	Die Shear force : 2N min.	MIL-STD-883 Method 2019 Mount the capacitor on a gold metallized alumina substrate with Au-Sn (80/20). Apply the force parallel to the substrate.
11	Vibration Resistance	Appearance	No defects or abnormalities.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion. Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
		Capacitance	Within the specified tolerance.	
		D.F.	R6 : 0.1 max.	
12	Temperature Sudden Change	Appearance	No defects or abnormalities.	The capacitor should be set for 24±2 hours at room temperature after one hour heat of treatment at 150+0/–10°C, then measure for the initial measurement. Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and time shown in the following table. Set it for 24±2 hours at room temperature, then measure. Step / 1 / 2 / 3 / 4 Temp. (°C) / Min. Operating Temp.+0/–3 / Room Temp. / Max. Operating Temp. +3/–0 / Room Temp. Time (min.) / 30±3 / 2 to 3 / 30±3 / 2 to 3
		Capacitance Change	R6 : Within ±7.5%	
		D.F.	R6 : 0.1 max.	
		I.R.	More than 50Ω · F	
		Dielectric Strength	No defects	

Mounting for testing : The capacitors should be mounted on the substrate as shown below using die bonding. when tests No.11 to 14 are performed.

Continued on the following page.

8

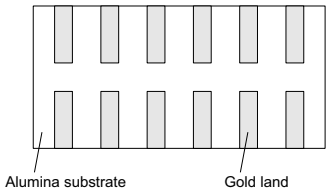
GMD Series Specifications and Test Methods (2)

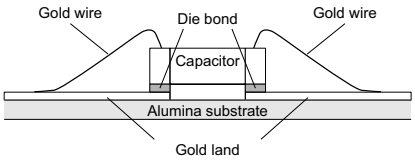
Continued from the preceding page.

In case Non "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (1).
In case "*" is added in PNs table, please refer to GMD Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
13	High Temperature High Humidity (Steady)	Appearance	No defects or abnormalities.	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to 95% humidity and set it 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°C 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°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6 : Within ±12.5%	
		D.F.	R6 : 0.2 max.	
		I.R.	More than 12.5Ω · F	
14	Durability	Appearance	No defects or abnormalities.	Apply 150%*2 of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/ discharge current is less than 50mA. *2 GMD155 R6 1A 274 to 474 are applied to 120%. • Initial measurement 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. • Measurement after test Perform a heat treatment at 150+0/–10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6 : Within ±12.5%	
		D.F.	R6 : 0.2 max.	
		I.R.	More than 25Ω · F	

Mounting for testing : The capacitors should be mounted on the substrate as shown below using die bonding. when tests No.11 to 14 are performed.





8

Package

■ Minimum Quantity Guide

Part Number		Dimensions (mm)			Quantity (pcs.)					
					ø180mm Reel		ø330mm Reel		Bulk Case	Bulk Bag
		L	W	T	Paper Tape	Embossed Tape	Paper Tape	Embossed Tape		
Packaging Code					D	L	J	K	C	Bulk : B Tray : T
For General Purpose	GRM02	0.4	0.2	0.2	20,000 1)	40,000 1)	-	-	-	1,000
	GRM03	0.6	0.3	0.3	15,000	-	50,000	-	-	1,000
	GRM15	1.0	0.5	0.25/0.3	10,000	-	50,000	-	-	1,000
				0.5	10,000	-	50,000	-	50,000	1,000
	GRM18	1.6	0.8	0.5	4,000	-	10,000	-	-	1,000
				0.8	4,000	-	10,000	-	15,000 2)	1,000
	GRM21	2.0	1.25	0.6	4,000	-	10,000	-	10,000	1,000
				0.85	4,000	-	10,000	-	-	1,000
				1.0/1.25	-	3,000	-	10,000	5,000 2)	1,000
	GRM31	3.2	1.6	0.6/0.85	4,000	-	10,000	-	-	1,000
				1.15	-	3,000	-	10,000	-	1,000
				1.6	-	2,000	-	6,000	-	1,000
	GRM32	3.2	2.5	0.85	4,000	-	10,000	-	-	1,000
				1.15	-	3,000	-	10,000	-	1,000
				1.35	-	2,000	-	8,000	-	1,000
				1.6	-	2,000	-	6,000	-	1,000
				1.8/2.0 2.5	-	1,000	-	4,000	-	1,000
	GRM43	4.5	3.2	1.15	-	1,000	-	5,000	-	1,000
				1.35/1.6 1.8/2.0	-	1,000	-	4,000	-	1,000
				2.5	-	500	-	2,000	-	1,000
				2.8	-	500	-	1,500	-	500
	GRM55	5.7	5.0	1.15	-	1,000	-	5,000	-	1,000
				1.35/1.6 1.8/2.0	-	1,000	-	4,000	-	1,000
				2.5	-	500	-	2,000	-	500
				3.2	-	300	-	1,500	-	500
High Power Type	GJM03	0.6	0.3	0.3	15,000	-	50,000	-	-	1,000
	GJM15	1.0	0.5	0.5	10,000	-	50,000	-	50,000	1,000
High Frequency	GQM18	1.6	0.8	0.7/0.8	4,000	-	10,000	-	-	1,000
	GQM21	2.0	1.25	0.85	4,000	-	10,000	-	-	1,000
	ERB18	1.6	0.8	0.9 max.	4,000	-	10,000	-	-	1,000
	ERB21	2.0	1.25	1.35 max.	-	3,000	-	10,000	-	1,000
	ERB32	3.2	2.5	1.7 max.	-	2,000	-	8,000	-	1,000
Microchip	GMA0D	0.38	0.38	0.3	-	-	-	-	-	400 3)
	GMA05	0.5	0.5	0.35	-	-	-	-	-	400 3)
	GMA08	0.8	0.8	0.5	-	-	-	-	-	400 3)
	GMD03	0.6	0.3	0.3	15,000	-	50,000	-	-	1,000
	GMD15	1.0	0.5	0.5	10,000	-	50,000	-	-	1,000
Array	GNM0M	0.9	0.6	0.45	10,000	-	50,000	-	-	1,000
	GNM1M	1.37	1.0	0.5/0.6/0.8	4,000	-	10,000	-	-	1,000
	GNM21	2.0	1.25	0.5/0.6/0.85	4,000	-	10,000	-	-	1,000
	GNM31	3.2	1.6	0.8/0.85	4,000	-	10,000	-	-	1,000
				1.0/1.15	-	3,000	-	10,000	-	1,000
Low ESL	LLL15	0.5	1.0	0.3	10,000 4)	-	50,000 4)	-	-	1,000
	LLL18	0.8	1.6	0.5	-	4,000	-	10,000	-	1,000
	LLL21	1.25	2.0	0.5/0.6	-	4,000	-	10,000	-	1,000
				0.85	-	3,000	-	10,000	-	1,000
	LLL31	1.6	3.2	0.5/0.7	-	4,000	-	10,000	-	1,000
				1.15	-	3,000	-	10,000	-	1,000
	LLA18	1.6	0.8	0.5	-	4,000	-	10,000	-	1,000
	LLA21	2.0	1.25	0.5	-	4,000	-	10,000	-	1,000
				0.85	-	3,000	-	10,000	-	1,000
	LLA31	3.2	1.6	0.5	-	4,000	-	10,000	-	1,000
				0.85	-	3,000	-	10,000	-	1,000
				1.15	-	3,000	-	10,000	-	1,000
	LLM21	2.0	1.25	0.5	-	4,000	-	10,000	-	1,000
	LLM31	3.2	1.6	0.5	-	4,000	-	10,000	-	1,000

1) 8mm width 2mm pitch Paper Taping. 4mm width 1mm pitch Embossed Taping.
2) There are parts number without bulk case.
3) Tray
4) LLL15: ø180mm Reel Paper Taping Packaging Code: E, ø330mm Reel Paper Taping Packaging Code: F

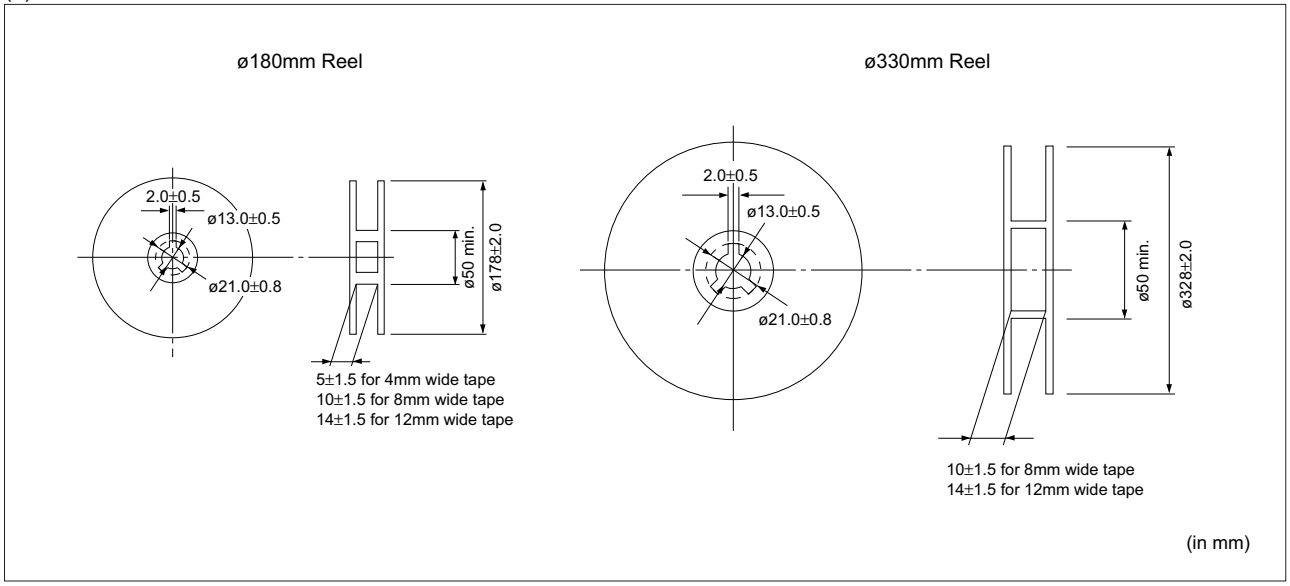
Continued on the following page.

Package

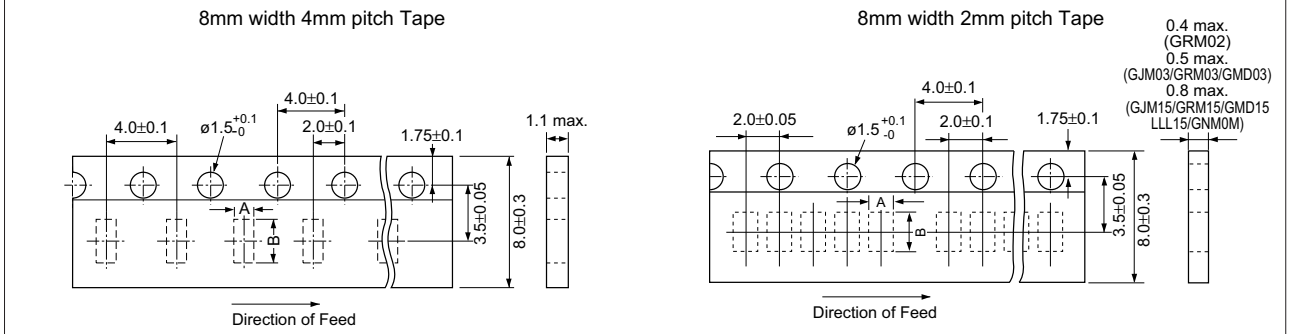
Continued from the preceding page.

■ Tape Carrier Packaging

(1) Dimensions of Reel



(2) Dimensions of Paper Tape



Part Number	A	B
GRM18 **GQM18** **ERB18**	1.05±0.1	1.85±0.1
GNM1M	1.17±0.05	1.55±0.05
GRM21 (T≦0.85mm) **GQM21** **GNM21**	1.55±0.15	2.3±0.15
GRM31 (T≦0.85mm) **GNM31** (T≦0.8mm)	2.0±0.2	3.6±0.2
GRM32 (T≦0.85mm)	2.8±0.2	3.6±0.2

Part Number	A*	B*
GRM02	0.25	0.45
GJM03 **GRM03** **GMD03**	0.37	0.67
GJM15 **GRM15** **GMD15** **LLL15**	0.65	1.15
GNM0M	0.72	1.02

*Nominal Value

(in mm)

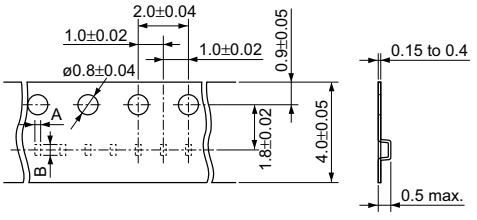
Continued on the following page.

Package

Continued from the preceding page.

(3) Dimensions of Embossed Tape

4mm width 1mm pitch Tape

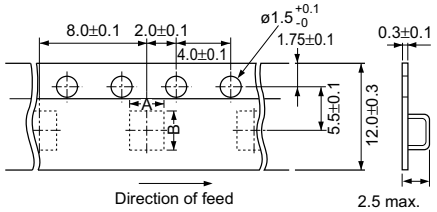


Part Number	A*	B*
GRM02	0.23	0.43

*Nominal Value

∗GRM03 is also available by 4mm width 1mm pitch Tape.

12mm width 8mm pitch Tape

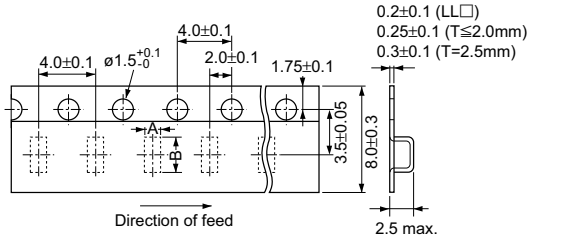


2.5 max.
for GRM43/55
(3.7 max. for T=2.5mm)
(4.7 max. for T≧3.0mm)

Part Number	A*	B*
GRM43	3.6	4.9
GRM55	5.2	6.1

*Nominal Value

8mm width 4mm pitch Tape



2.5 max.
(3.0 max. for T=1.8/2.0mm)
(3.7 max. for T≧2.5mm)

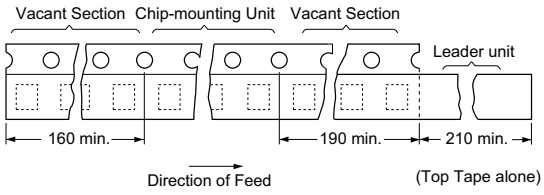
Part Number	A	B
LLL18, LLA18	1.05±0.1	1.85±0.1
GRM21 (T≧1.0mm) **LLL21 LLA21, LLM21**	1.45±0.2	2.25±0.2
ERB21	1.55±0.2	2.3±0.2
GRM31 (T≧1.15mm) **LLL31 LLA31, LLM31 GNM31** (T≧1.0mm)	1.9±0.2	3.5±0.2
GRM32, ERB32 (T≧1.0mm)	2.8±0.2	3.5±0.2

(in mm)

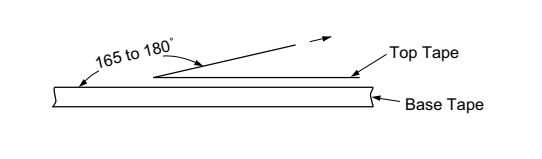
(4) Taping Method

① Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
② Part of the leader and part of the empty tape should be attached to the end of the tape as follows.
③ The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
④ Missing capacitors number within 0.1% of the number per reel or 1 pc, whichever is greater, and are not continuous.
⑤ The top tape and bottom tape should not protrude beyond the edges of the tape and should not cover sprocket holes.
⑥ Cumulative tolerance of sprocket holes, 10 pitches: ±0.3mm.
⑦ Peeling off force: 0.1 to 0.6N* in the direction shown below.

*GRM02
GRM03
GJM03
GMD03
: 0.05 to 0.5N



(in mm)



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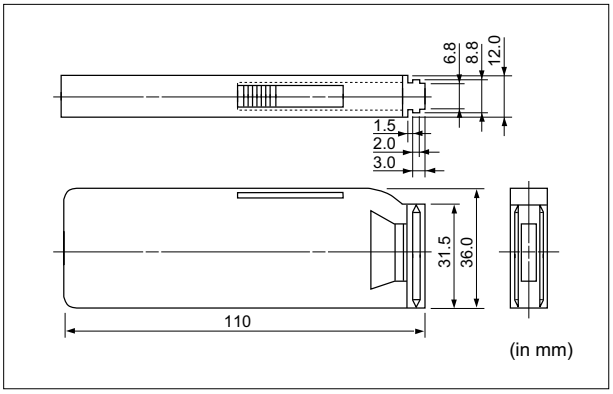
Package

Continued from the preceding page.

■ Dimensions of Bulk Case Packaging

The bulk case uses antistatic materials. Please contact Murata for details.



⚠Caution

■ Storage and Operation condition

1. The performance of chip monolithic ceramic capacitors may be affected by the storage conditions.
   1-1. Store capacitors in the following conditions: Temperature of +5°C to +40°C and a Relative Humidity of 20% to 70%.
   (1) Sunlight, dust, rapid temperature changes, corrosive gas atmosphere or high temperature and humidity conditions during storage may affect the solderability and the packaging performance. Please use product within six months of receipt.
   (2) Please confirm solderability before using after six months. Store the capacitors without opening the original bag. Even if the storage period is short, do not exceed the specified atmospheric conditions.

1-2. Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors, and result in poor solderability. Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.).

1-3. Due to moisture condensation caused by rapid humidity changes, or the photochemical change caused by direct sunlight on the terminal electrodes and/or the resin/epoxy coatings, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or in high humidity conditions.

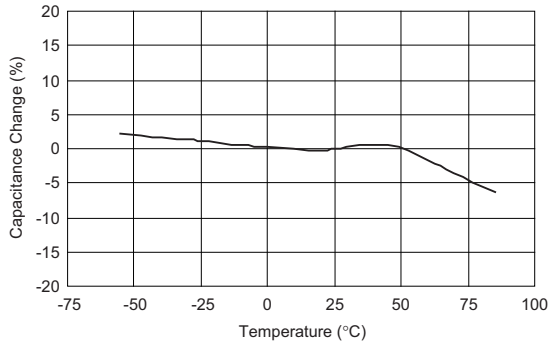
⚠Caution

■ Rating

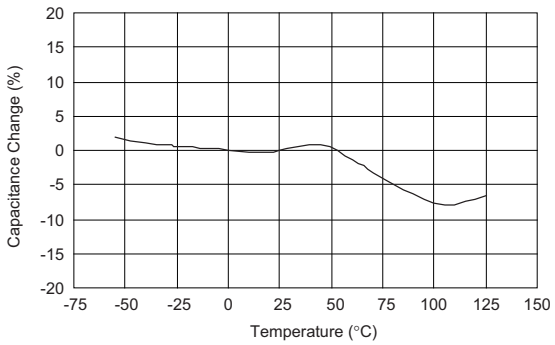
1. Temperature Dependent Characteristics

1. The electrical characteristics of the capacitor can change with temperature.
   1-1. For capacitors having larger temperature dependency, the capacitance may change with temperature changes.
   The following actions are recommended in order to insure suitable capacitance values.
   (1) Select a suitable capacitance for the operating temperature range.
   (2) The capacitance may change within the rated temperature.
   When you use a high dielectric constant type capacitors in a circuit that needs a tight (narrow) capacitance tolerance. Example: a time constant circuit., please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. And check capacitors using your actual appliances at the intended environment and operating conditions.

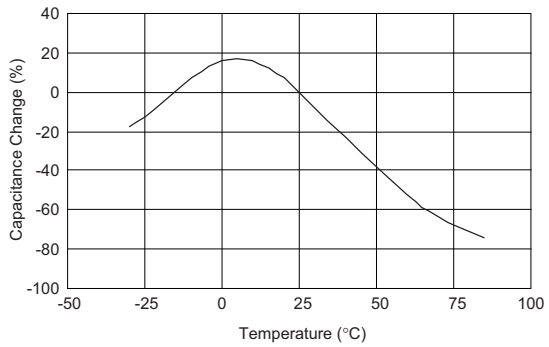
Typical Temperature Characteristics Char. R6(X5R)



Typical Temperature Characteristics Char. R7(X7R)



Typical Temperature Characteristics Char. F5(Y5V)



2. Measurement of Capacitance

1. Measure capacitance with the voltage and the frequency specified in the product specifications.
   1-1. The output voltage of the measuring equipment may decrease when capacitance is high occasionally. Please confirm whether a prescribed measured voltage is impressed to the capacitor.
   1-2. The capacitance values of high dielectric constant type capacitors change depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in a AC circuit.

Continued on the following page.

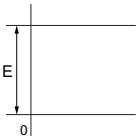
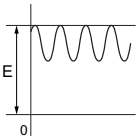
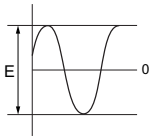
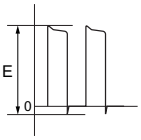
⚠Caution

Continued from the preceding page.

3. Applied Voltage

1. Do not apply a voltage to the capacitor that exceeds the rated voltage as called-out in the specifications.
   1-1. Applied voltage between the terminals of a capacitor shall be less than or equal to the rated voltage.
   (1) When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated DC voltage.
   When AC voltage or pulse voltage is applied, the peak-to-peak voltage shall not exceed the rated DC voltage.
   (2) Abnormal voltages (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated DC voltage.

Typical Voltage Applied to the DC Capacitor

DC Voltage	DC Voltage+AC	AC Voltage	Pulse Voltage
			

(E: Maximum possible applied voltage.)

   1-2. Influence of overvoltage
   Overvoltage that is applied to the capacitor may result in an electrical short circuit caused by the breakdown of the internal dielectric layers .
   The time duration until breakdown depends on the applied voltage and the ambient temperature.

4. Applied Voltage and Self-heating Temperature

1. When the capacitor is used in a high-frequency voltage, pulse voltage, application, be sure to take into account self-heating may be caused by resistant factors of the capacitor.
   1-1. The load should be contained to the level such that when measuring at atomospheric temperature of 25°C, the product's self-heating remains below 20°C and surface temperature of the capacitor in the actual circuit remains wiyhin the maximum operating temperature.

Continued on the following page.

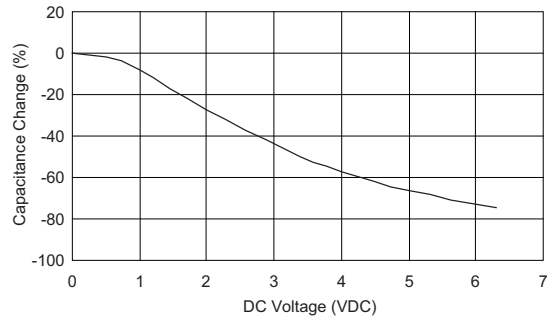
⚠Caution

Continued from the preceding page.

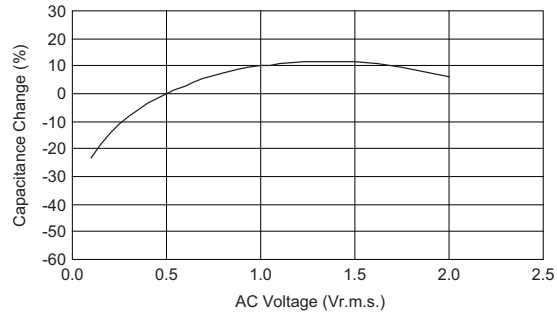
5. DC Voltage and AC Voltage Characteristic

1. The capacitance value of a high dielectric constant type capacitor changes depending on the DC voltage applied. Please consider the DC voltage characteristics when a capacitor is selected for use in a DC circuit.
   1-1. The capacitance of ceramic capacitors may change sharply depending on the applied voltage. (See figure)
   Please confirm the following in order to secure the capacitance.
   (1) Whether the capacitance change caused by the applied voltage is within the range allowed or not.
   (2) In the DC voltage characteristics, the rate of capacitance change becomes larger as voltage increases. Even if the applied voltage is below the rated voltage. When a high dielectric constant type capacitor is in a circuit that needs a tight (narrow) capacitance tolerance. Example: a time constant circuit., please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. And check capacitors using your actual appliances at the intended environment and operating conditions.
2. The capacitance values of high dielectric constant type capacitors change depending on the AC voltage applied.
   Please consider the AC voltage characteristics when selecting a capacitor to be used in a AC circuit.

[DC Voltage Characteristics]

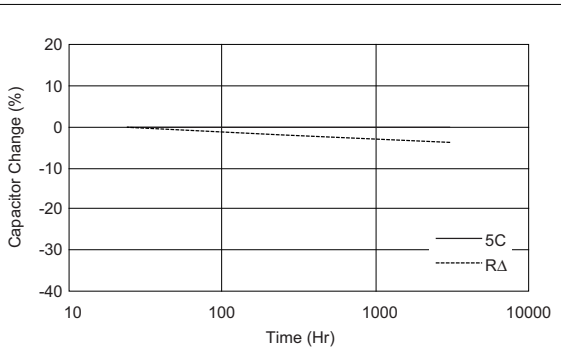


[AC Voltage Characteristics]



6. Capacitance Aging

1. The high dielectric constant type capacitors have the characteristic in which the capacitance value decreases with passage of time.
   When you use a high dielectric constant type capacitors in a circuit that needs a tight (narrow) capacitance tolerance. Example: a time constant circuit., please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. And check capacitors using your actual appliances at the intended environment and operating conditions.



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⚠Caution

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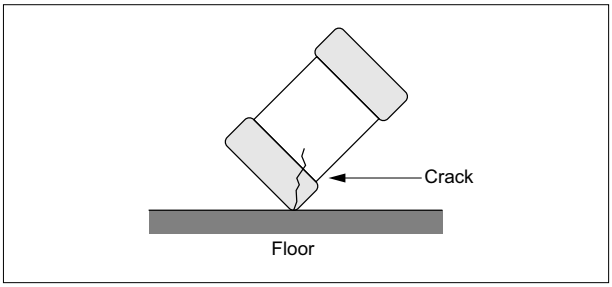
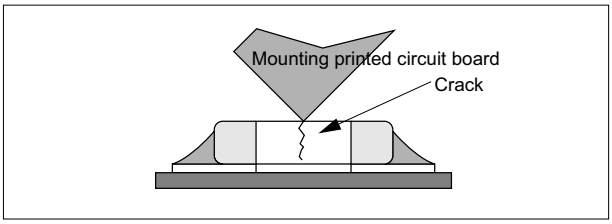
7. Vibration and Shock

1. The capacitors mechanical actress (vibration and shock) shall be specified for the use environment.
   Please confirm the kind of vibration and/or shock, its condition, and any generation of resonance.
   Please mount the capacitor so as not to generate resonance, and do not allow any impact on the terminals.
2. Mechanical shock due to falling may cause damage or a crack in the dielectric material of the capacitor.
   Do not use a fallen capacitor because the quality and reliability may be deteriorated.
3. When printed circuit boards are piled up or handled, the corners of another printed circuit board should not be allowed to hit the capacitor in order to avoid a crack or other damage to the capacitor.



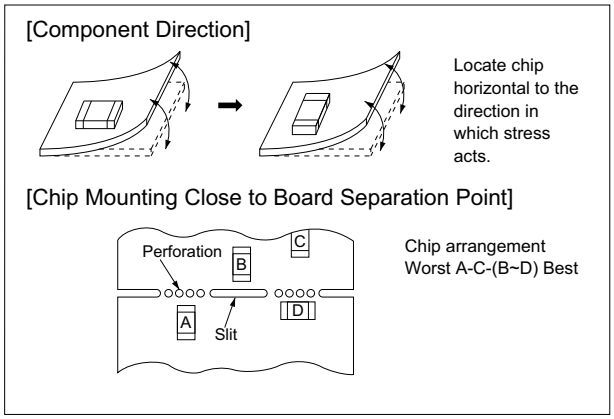


⚠Caution

■ Soldering and Mounting

1. Mounting Position

1. Confirm the best mounting position and direction that minimizes the stress imposed on the capacitor during flexing or bending the printed circuit board.
   1-1. Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

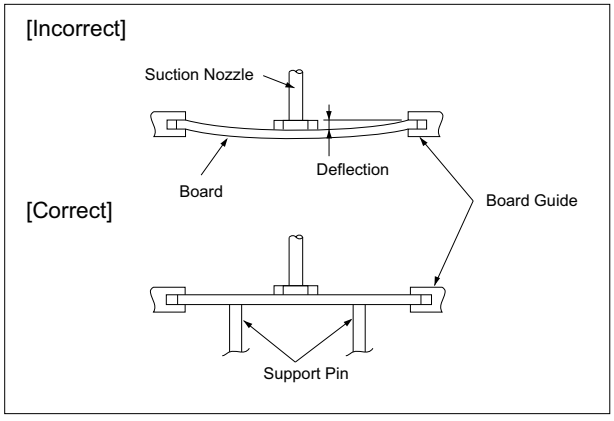


2. Information before Mounting

1. Do not re-use capacitors that were removed from the equipment.
2. Confirm capacitance characteristics under actual applied voltage.
3. Confirm the mechanical stress under actual process and equipment use.
4. Confirm the rated capacitance, rated voltage and other electrical characteristics before assembly.
5. Prior to use, confirm the Solderability for the capacitors that were in long-term storage.
6. Prior to measuring capacitance, carry out a heat treatment for capacitors that were in long-term storage.
7. The use of Sn-Zn based solder will deteriorate the reliability of the MLCC.
   Please contact our sales representative or product engineers on the use of Sn-Zn based solder in advance.

3. Maintenance of the Mounting (pick and place) Machine

1. Make sure that the following excessive forces are not applied to the capacitors.
   1-1. In mounting the capacitors on the printed circuit board, any bending force against them shall be kept to a minimum to prevent them from any bending damage or cracking. Please take into account the following precautions and recommendations for use in your process.
   (1) Adjust the lowest position of the pickup nozzle so as not to bend the printed circuit board.
   (2) Adjust the nozzle pressure within a static load of 1N to 3N during mounting.
2. Dirt particles and dust accumulated between the suction nozzle and the cylinder inner wall prevent the nozzle from moving smoothly. This imposes greater force upon the chip during mounting, causing cracked chips. Also the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips. The suction nozzle and the locating claw must be maintained, checked and replaced periodically.



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⚠Caution

Continued from the preceding page.

4-1. Reflow Soldering

1. When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB board. Preheating conditions are shown in table 1. It is required to keep the temperature differential between the solder and the components surface (ΔT) as small as possible.
2. Solderability of Tin plating termination chips might be deteriorated when a low temperature soldering profile where the peak solder temperature is below the melting point of Tin is used. Please confirm the Solderability of Tin plated termination chips before use.
3. When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and the solvent within the range shown in the table 1.

Table 1

Part Number	Temperature Differential
GRM02/03/15/18/21/31 **GJM03/15** **LLL15/18/21/31** **ERB18/21** **GQM18/21**	ΔT≦190°C
GRM32/43/55 **LLA18/21/31** **LLM21/31** **GNM** **ERB32**	ΔT≦130°C

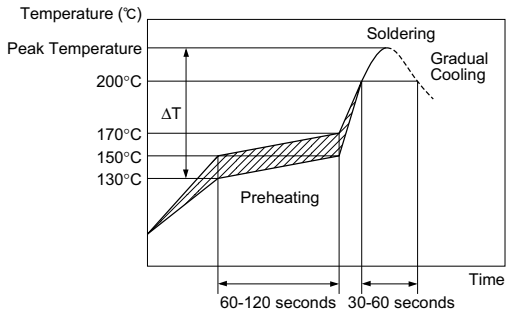
Recommended Conditions

	Pb-Sn Solder		Lead Free Solder
	Infrared Reflow	Vapor Reflow	
Peak Temperature	230 to 250°C	230 to 240°C	240 to 260°C
Atmosphere	Air	Air	Air or N_2

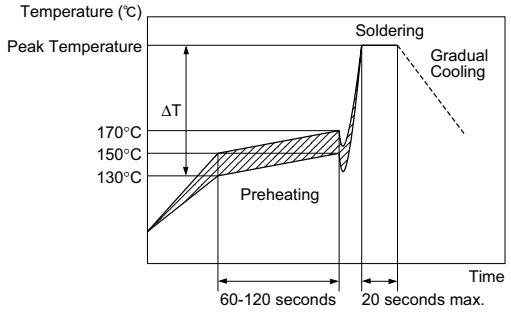
Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

[Standard Conditions for Reflow Soldering]

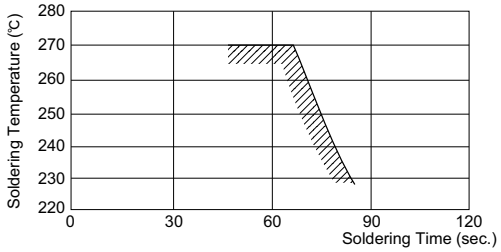
Infrared Reflow



Vapor Reflow

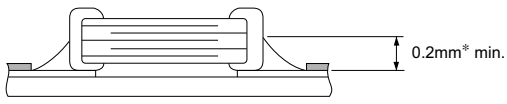


[Allowable Reflow Soldering Temperature and Time]



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

4. Optimum Solder Amount for Reflow Soldering
   4-1. Overly thick application of solder paste results in a excessive solder fillet height.
   This makes the chip more susceptible to mechanical and thermal stress on the board and may cause the chips to crack.
   4-2. Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
   4-3. Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm* min.



* GRM02/03: 1/3 of Chip Thickness min.

in section

Inverting the PCB

Make sure not to impose any abnormal mechanical shocks to the PCB.

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⚠Caution

Continued from the preceding page.

4-2 Flow Soldering

1. When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage in the components, preheating should be required for both of the components and the PCB board.
   Preheating conditions are shown in table 2. It is required to keep temperature differential between the solder and the components surface (ΔT) as small as possible.
2. Excessively long soldering time or high soldering temperature can result in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
3. When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and solvent within the range shown in the table 2.
4. Do not apply flow soldering to chips not listed in table 2.

Table 2

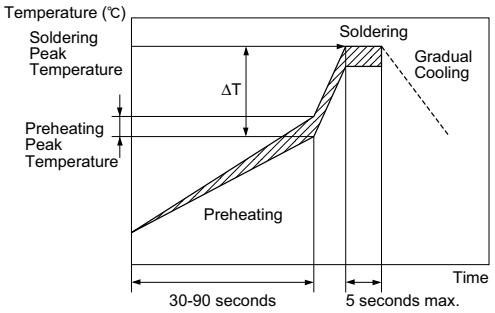
Part Number	Temperature Differential
GRM18/21/31 **LLL21/31** **ERB18/21** **GQM18/21**	ΔT≦150°C

Recommended Conditions

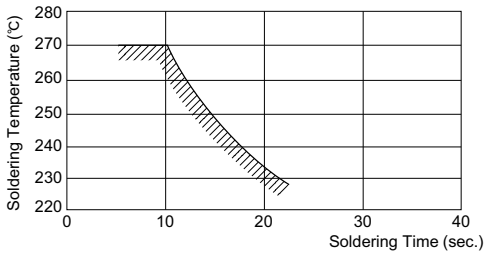
	Pb-Sn Solder	Lead Free Solder
Preheating Peak Temperature	90 to 110°C	100 to 120°C
Soldering Peak Temperature	240 to 250°C	250 to 260°C
Atmosphere	Air	N_2

Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

[Standard Conditions for Flow Soldering]

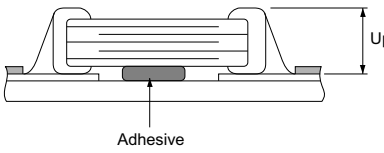


[Allowable Flow Soldering Temperature and Time]



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

5. Optimum Solder Amount for Flow Soldering
   5-1. The top of the solder fillet should be lower than the thickness of components. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.



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⚠Caution

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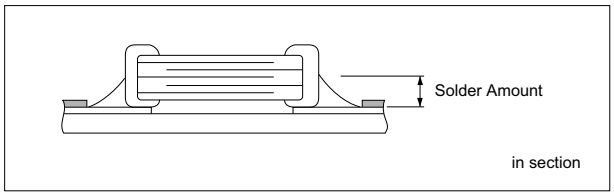
4-3. Correction with a Soldering Iron

1. When sudden heat is applied to the components when using a soldering iron, the mechanical strength of the components will decrease because the extreme temperature change can cause deformations inside the components. In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB board. Preheating conditions, (The "Temperature of the Soldering Iron Tip", "Preheating Temperature", "Temperature Differential" between the iron tip and the components and the PCB), should be within the conditions of table 3. It is required to keep the temperature differential between the soldering iron and the component surfaces (ΔT) as small as possible.
2. After soldering, do not allow the component/PCB to rapidly cool down.
3. The operating time for the re-working should be as short as possible. When re-working time is too long, it may cause solder leaching, and that will cause a reduction in the adhesive strength of the terminations.
4. Optimum Solder amount when re-working with a Soldering Iron
   4-1. In case of sizes smaller than 0603, (GRM03/15/18, GJM03/15, GQM18, ERB18), the top of the solder fillet should be lower than 2/3's of the thickness of the component or 0.5mm whichever is smaller. In case of 0805 and larger sizes, (GRM21/31/32/43/55, GQM21, ERB21/32), the top of the solder fillet should be lower than 2/3's of the thickness of the component. If the solder amount is excessive, the risk of cracking is higher during board bending or under any other stressful condition.
   4-2. A soldering iron with a tip of ø3mm or smaller should be used. It is also necessary to keep the soldering iron from touching the components during the re-work.
   4-3. Solder wire with ø0.5mm or smaller is required for soldering.

Table 3

Part Number	Temperature of Soldering Iron Tip	Preheating Temperature	Temperature Differential (ΔT)	Atmosphere
GRM03/15/18/21/31 **GJM03/15** **GQM18/21** **ERB18/21**	350°C max.	150°C min.	ΔT≦190°C	Air
GRM32/43/55 **ERB32**	280°C max.	150°C min.	ΔT≦130°C	Air

*Applicable for both Pb-Sn and Lead Free Solder.
Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu



4-4. Leaded Component Insertion

1. If the PCB is flexed when leaded components (such as transformers and ICs) are being mounted, chips may crack and solder joints may break.
   Before mounting leaded components, support the PCB using backup pins or special jigs to prevent warping.

5. Washing

Excessive ultrasonic oscillation during cleaning can cause the PCBs to resonate, resulting in cracked chips or broken solder joints. Take note not to vibrate PCBs.

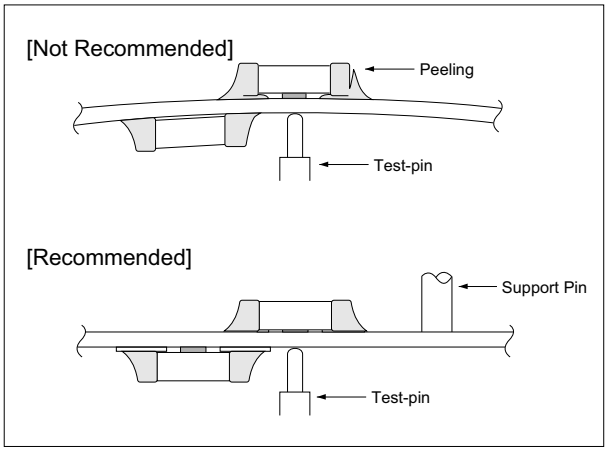
Continued on the following page.

⚠Caution

Continued from the preceding page.

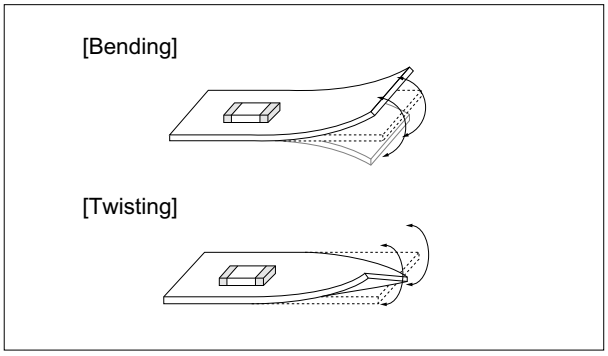
6. Electrical Test on Printed Circuit Board

1. Confirm position of the support pin or specific jig, when inspecting the electrical performance of a capacitor after mounting on the printed circuit board.
   1-1. Avoid bending printed circuit board by the pressure of a test pin, etc.
   The thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints.
   Provide support pins on the back side of the PCB to prevent warping or flexing.
   1-2. Avoid vibration of the board by shock when a test pin contacts a printed circuit board.

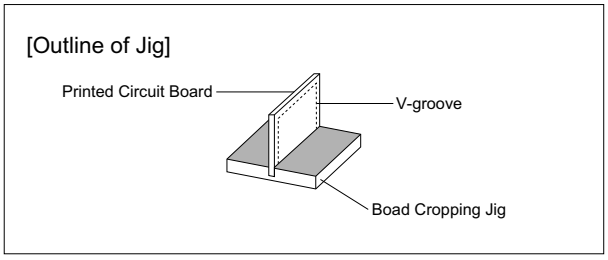


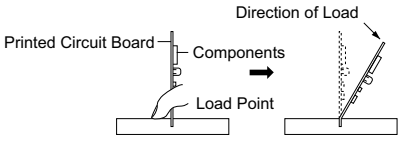
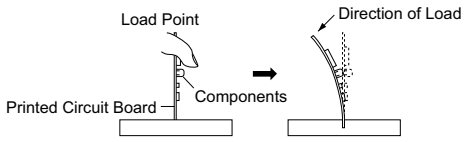
7. Printed Circuit Board Cropping

1. After mounting a capacitor on a printed circuit board, do not apply any stress to the capacitor that is caused by bending or twisting the board.
   1-1. In cropping the board, the stress as shown right may cause the capacitor to crack.
   Try not to apply this type of stress to a capacitor.



2. Check of the cropping method for the printed circuit board in advance.
   2-1. Printed circuit board cropping shall be carried out by using a jig or an apparatus to prevent the mechanical stress which can occur to the board.
   (1) Example of a suitable jig
   Recommended example: the board should be pushed as close to the near the cropping jig as possible and from the back side of board in order to minimize the compressive stress applied to capacitor.
   Not recommended example* when the board is pushed at a point far from the cropping jig and from the front side of board as below, the capacitor may form a crack caused by the tensile stress applied to capacitor.



Recommended	Not recommended
	

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⚠Caution

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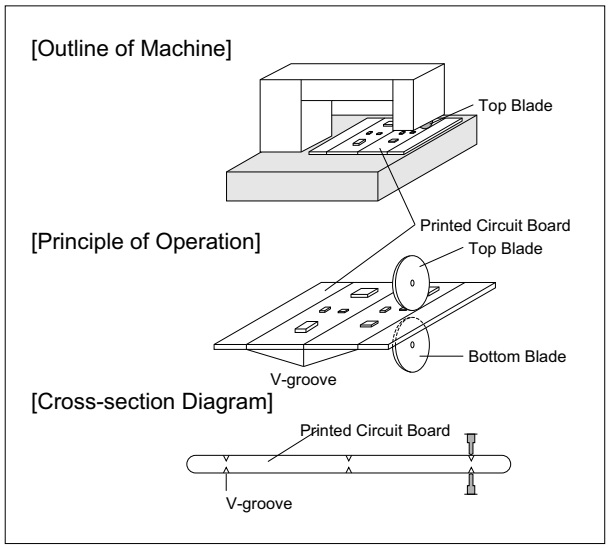
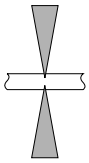
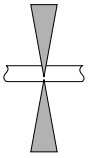
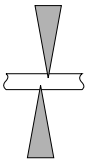
(2) Example of a suitable machine

An outline of a printed circuit board cropping machine is shown as follows. Along the lines with the V-grooves on printed circuit board, the top and bottom blades are aligned to one another when cropping the board.

The misalignment of the position between top and bottom blades may cause the capacitor to crack.



Recommended	Not Recommended		
	Top-bottom Misalignment	Left-right Misalignment	Front-rear Misalignment
 Top Blade / Bottom Blade	 Top Blade / Bottom Blade	 Top Blade / Bottom Blade	 Top Blade / Bottom Blade

⚠Caution

■ Others

1. Under Operation of Equipment
   1-1. Do not touch a capacitor directly with bare hands during operation in order to avoid the danger of a electric shock.
   1-2. Do not allow the terminals of a capacitor to come in contact with any conductive objects (short-circuit). Do not expose a capacitor to a conductive liquid, inducing any acid or alkali solutions.
   1-3. Confirm the environment in which the equipment will operation is under the specified conditions. Do not use the equipment under the following environment.
      (1) Being spattered with water or oil.
      (2) Being exposed to direct sunlight.
      (3) Being exposed to Ozone, ultraviolet rays or radiation.
      (4) Being exposed to toxic gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.)
      (5) Any vibrations or mechanical shocks exceeding the specified limits.
      (6) Moisture condensing environments.
   1-4. Use damp proof countermeasures if using under any conditions that can cause condensation.
2. Others
   2-1. In an Emergency
      (1) If the equipment should generate smoke, fire or smell, immediately turn off or unplug the equipment. If the equipment is not turned off or unplugged, the hazards may be worsened by supplying continuous power.
      (2) In this type of situation, do not allow face and hands to come in contact with the capacitor or burns may be caused by the capacitors high temperature.
   2-2. Disposal of Waste
      When capacitors are disposed, they must be burned or buried by the industrial waste vender with the appropriate licenses.
   2-3. Circuit Design
      GRM, GCM, GMA/D, LLL/A/M, ERB, GQM, GJM, GNM Series capacitors in this catalog are not safety recognized products.
   2-4. Remarks
      Failure to follow the cautions may result, worst case, in a short circuit and smoking when the product is used.
      The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions.
      Select optimum conditions for operation as they determine the reliability of the product after assembly.
      The data herein are given in typical values, not guaranteed ratings.

Notice

■ Rating

1. Operating Temperature
   1. The operating temperature limit depends on the capacitor.
      1-1. Do not apply temperatures exceeding the upper operating temperature.
      It is necessary to select a capacitor with a suitable rated temperature which will cover the operating temperature range.
      Also it is necessary to consider the temperature distribution in equipment and the seasonal temperature variable factor.
      1-2. Consider the self-heating of the capacitor
      The surface temperature of the capacitor shall be the upper operating temperature or less when including the self-heating factors.
2. Atmosphere Surroundings (gaseous and liquid)
   1. Restriction on the operating environment of capacitors.
      1-1. The capacitor, when used in the above, unsuitable, operating environments may deteriorate due to the corrosion of the terminations and the penetration of moisture into the capacitor.
      1-2. The same phenomenon as the above may occur when the electrodes or terminals of the capacitor are subject to moisture condensation.
      1-3. The deterioration of characteristics and insulation resistance due to the oxidization or corrosion of terminal electrodes may result in breakdown when the capacitor is exposed to corrosive or volatile gases or solvents for long periods of time.
3. Piezo-electric Phenomenon
   1. When using high dielectric constant type capacitors in AC or pulse circuits, the capacitor itself vibrates at specific frequencies and noise may be generated. Moreover, when the mechanical vibration or shock is added to capacitor, noise may occur.

Notice

■ Soldering and Mounting

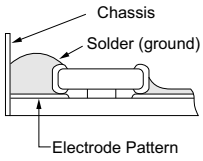
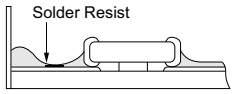
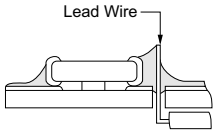
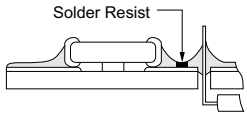
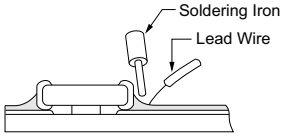
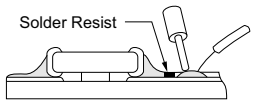
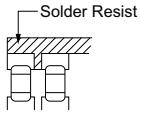
1. PCB Design

1. Notice for Pattern Forms

1-1. Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.
They are also more sensitive to mechanical and thermal stresses than leaded components.
Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

1-2. It is possible for the chip to crack by the expansion and shrinkage of a metal board. Please contact us if you want to use our ceramic capacitors on a metal board such as Aluminum.

Pattern Forms

	Prohibited	Correct
Placing Close to Chassis		
Placing of Chip Components and Leaded Components		
Placing of Leaded Components after Chip Component		
Lateral Mounting		

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Notice

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2. Land Dimensions

2-1. Chip capacitor can be cracked due to the stress of PCB bending / etc if the land area is larger than needed and has an excess amount of solder.
Please refer to the land dimensions in table 1 for flow soldering, table 2 for reflow soldering, table 3 for GNM & LLA, and table 4 for LLM.
Please confirm the suitable land dimension by evaluating of the actual SET / PCB.

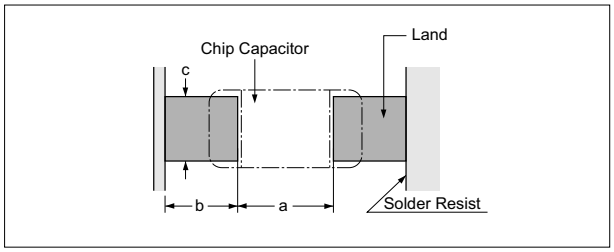


Table 1 Flow Soldering Method

Dimensions / Part Number	Chip (L×W)	a	b	c
GRM18 GQM18	1.6×0.8	0.6 to 1.0	0.8 to 0.9	0.6 to 0.8
GRM21 GQM21	2.0×1.25	1.0 to 1.2	0.9 to 1.0	0.8 to 1.1
GRM31	3.2×1.6	2.2 to 2.6	1.0 to 1.1	1.0 to 1.4
LLL21	1.25×2.0	0.4 to 0.7	0.5 to 0.7	1.4 to 1.8
LLL31	1.6×3.2	0.6 to 1.0	0.8 to 0.9	2.6 to 2.8
ERB11	1.25×1.0	0.4 to 0.6	0.6 to 0.8	0.8 to 1.0
ERB21	2.0×1.25	1.0 to 1.2	0.9 to 1.0	0.8 to 1.0
ERF1D	1.4×1.4	0.5 to 0.8	0.8 to 0.9	1.0 to 1.2

(in mm)

Table 2 Reflow Soldering Method

Dimensions / Part Number	Chip (L×W)	a	b	c
GRM02	0.4×0.2	0.16 to 0.2	0.12 to 0.18	0.2 to 0.23
GRM03 GJM03	0.6×0.3	0.2 to 0.3	0.2 to 0.35	0.2 to 0.4
GRM15 GJM15	1.0×0.5	0.3 to 0.5	0.35 to 0.45	0.4 to 0.6
GRM18 GQM18	1.6×0.8	0.6 to 0.8	0.6 to 0.7	0.6 to 0.8
GRM21 GQM21	2.0×1.25	1.0 to 1.2	0.6 to 0.7	0.8 to 1.1
GRM31	3.2×1.6	2.2 to 2.4	0.8 to 0.9	1.0 to 1.4
GRM32	3.2×2.5	2.0 to 2.4	1.0 to 1.2	1.8 to 2.3
GRM43	4.5×3.2	3.0 to 3.5	1.2 to 1.4	2.3 to 3.0
GRM55	5.7×5.0	4.0 to 4.6	1.4 to 1.6	3.5 to 4.8
LLL15	0.5×1.0	0.15 to 0.2	0.2 to 0.25	0.7 to 1.0
LLL18	0.8×1.6	0.2 to 0.3	0.3 to 0.4	1.4 to 1.6
LLL21	1.25×2.0	0.4 to 0.6	0.4 to 0.5	1.4 to 1.8
LLL31	1.6×3.2	0.6 to 0.8	0.6 to 0.7	2.6 to 2.8
ERB11	1.25×1.0	0.4 to 0.6	0.6 to 0.8	0.8 to 1.0
ERB21	2.0×1.25	1.0 to 1.2	0.6 to 0.8	0.8 to 1.0
ERB32	3.2×2.5	2.2 to 2.5	0.8 to 1.0	1.9 to 2.3
ERF1D	1.4×1.4	0.4 to 0.8	0.6 to 0.8	1.0 to 1.2
ERF22	2.8×2.8	1.8 to 2.1	0.7 to 0.9	2.2 to 2.6

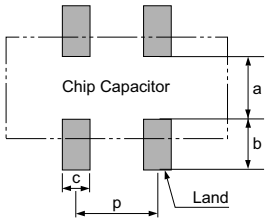
(in mm)

Continued on the following page.

Notice

Continued from the preceding page.

GNM□□2



GNM□□4
LLA

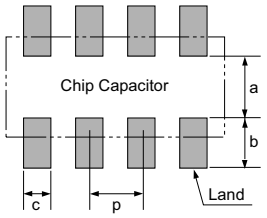


Table 3 GNM, LLA Series for Reflow Soldering Land Dimensions

Part Number	Dimensions (mm)					
	L	W	a	b	c	p
GNM0M2	0.9	0.6	0.12 to 0.20*	0.35 to 0.40*	0.3	0.45
GNM1M2	1.37	1.0	0.4 to 0.5	0.35 to 0.45	0.3 to 0.35	0.64
GNM212	2.0	1.25	0.6 to 0.7	0.5 to 0.7	0.4 to 0.5	1.0
GNM214	2.0	1.25	0.6 to 0.7	0.5 to 0.7	0.25 to 0.35	0.5
GNM314	3.2	1.6	0.8 to 1.0	0.7 to 0.9	0.3 to 0.4	0.8
LLA18	1.6	0.8	0.3 to 0.4	0.25 to 0.35	0.15 to 0.25	0.4
LLA21	2.0	1.25	0.5 to 0.7	0.35 to 0.6	0.2 to 0.3	0.5
LLA31	3.2	1.6	0.7 to 0.9	0.4 to 0.7	0.3 to 0.4	0.8

* 0.82≦a+2b≦1.00

LLM

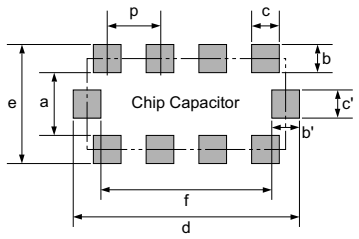


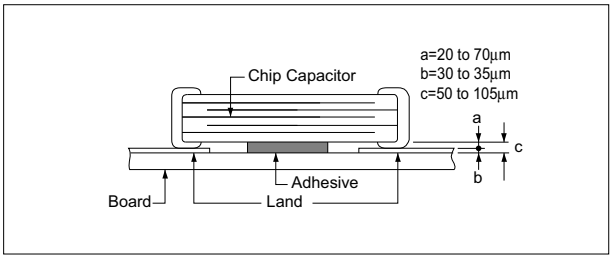
Table 4 LLM Series for Reflow Soldering Land Dimensions

Part Number	Dimensions (mm)						
	a	b, b'	c, c'	d	e	f	p
LLM21	0.6 to 0.8	(0.3 to 0.5)	0.3	2.0 to 2.6	1.3 to 1.8	1.4 to 1.6	0.5
LLM31	1.0	(0.3 to 0.5)	0.4	3.2 to 3.6	1.6 to 2.0	2.6	0.8

b=(c-e)/2, b'=(d-f)/2

2. Adhesive Application

1. Thin or insufficient adhesive can cause the chips to loosen or become disconnected during flow soldering. The amount of adhesive must be more than dimension c, shown in the drawing at right, to obtain the correct bonding strength.
   The chip's electrode thickness and land thickness must also be taken into consideration.
2. Low viscosity adhesive can cause chips to slip after mounting. The adhesive must have a viscosity of 5000Pa・s (500ps) min. (at 25°C).
3. Adhesive Coverage



Part Number	Adhesive Coverage*
GRM18, GQM18	0.05mg min.
GRM21, LLL21, GQM21	0.1mg min.
GRM31, LLL31	0.15mg min.

*Nominal Value

Continued on the following page.

Notice

Continued from the preceding page.

3. Adhesive Curing

1. Insufficient curing of the adhesive can cause chips to disconnect during flow soldering and causes deterioration in the insulation resistance between the outer electrodes due to moisture absorption.
   Control curing temperature and time in order to prevent insufficient hardening.

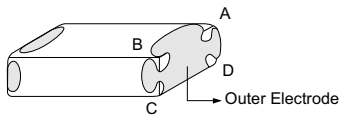
4. Flux Application

1. An excessive amount of flux generates a large quantity of flux gas, which can cause a deterioration of Solderability. So apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering).
2. Flux containing too a high percentage of halide may cause corrosion of the outer electrodes unless there is sufficient cleaning. Use flux with a halide content of 0.2% max.
3. Do not use strong acidic flux.
4. Do not use water-soluble flux.
   (*Water-soluble flux can be defined as non rosin type flux including wash-type flux and non-wash-type flux.)

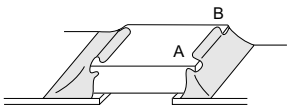
5. Flow Soldering

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

[As a Single Chip]



[As Mounted on Substrate]



6. Washing

1. Please evaluate a capacitor by actual cleaning equipment and condition surely for confirming the quality and select the applicable solvent.
2. Unsuitable cleaning solvent may leave residual flux, other foreign substances, causing deterioration of electrical characteristics and the reliability of the capacitors.
3. Select the proper cleaning conditions.
   3-1. Improper cleaning conditions (excessive or insufficient) may result in the deterioration of the performance of the capacitors.

Continued on the following page.

Notice

Continued from the preceding page.

7. Coating

1. A crack may be caused in the capacitor due to the stress of the thermal contraction of the resin during curing process.
   The stress is affected by the amount of resin and curing contraction.
   Select a resin with small curing contraction.
   The difference in the thermal expansion coefficient between a coating resin or a molding resin and capacitor may cause the destruction and deterioration of the capacitor such as a crack or peeling, and lead to the deterioration of insulation resistance or dielectric breakdown.
   Select a resin for which the thermal expansion coefficient is as close to that of capacitor as possible.
   A silicone resin can be used as an under-coating to buffer against the stress.
2. Select a resin that is less hygroscopic.
   Using hygroscopic resins under high humidity conditions may cause the deterioration of the insulation resistance of a capacitor.
   An epoxy resin can be used as a less hygroscopic resin.

8. Die Bonding/Wire Bonding (GMA or GMD Series)

1. Die Bonding of Capacitors
   - Use the following materials for the Brazing alloys:
     Au-Sn (80/20) 300 to 320 degree C in N_2 atmosphere
   - Mounting
     (1) Control the temperature of the substrate so it matches the temperature of the brazing alloy.
     (2) Place the brazing alloy on the substrate and place the capacitor on the alloy. Hold the capacitor and gently apply the load. Be sure to complete the operation within 1 minute.
2. Wire Bonding
   - Wire
     Gold wire: 25 micro m (0.001 inch) diameter
   - Bonding
     (1) Thermo compression, ultrasonic ball bonding.
     (2) Required stage temperature: 150 to 200 degree C
     (3) Required wedge or capillary weight: 0.2N to 0.5N
     (4) Bond the capacitor and base substrate or other devices with gold wire.

Notice

■ Others

1. Transportation
   1. The performance of a capacitor may be affected by the conditions during transportation.
      1-1. The capacitors shall be protected against excessive temperature, humidity and mechanical force during transportation.
      (1) Climatic condition
      • low air temperature: -40°C
      • change of temperature air/air: -25°C/+25°C
      • low air pressure: 30 kPa
      • change of air pressure: 6 kPa/min.
      (2) Mechanical condition
      Transportation shall be done in such a way that the boxes are not deformed and forces are not directly passed on to the inner packaging.

      1-2. Do not apply excessive vibration, shock, and pressure to the capacitor.
      (1) When excessive mechanical shock or pressure is applied to a capacitor, chipping or cracking may occur in the ceramic body of the capacitor.
      (2) When a sharp edge of an air driver, a soldering iron, tweezers, a chassis, etc. impacts strongly on the surface of capacitor, the capacitor may crack and short-circuit.

      1-3. Do not use a capacitor to which excessive shock was applied by dropping, etc.
      The capacitor dropped accidentally during processing may be damaged.

Reference Data

1. Solderability

(1) Test Method

Subject the chip capacitor to the following conditions. Then apply flux (an ethanol solution of 25% rosin) to the chip and dip it in 230℃ eutectic solder for 2 seconds.
Conditions:
Expose prepared at room temperature (for 6 months and 12 months, respectively)
Prepared at high temperature (for 100 hours at 85℃)
Prepared left at high humidity (for 100 hours under 90%RH to 95%RH at 40℃)

(2) Test Samples

GRM21 : Products for flow/reflow soldering.

(3) Acceptance Criteria

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

(4) Results

Refer to Table 1.

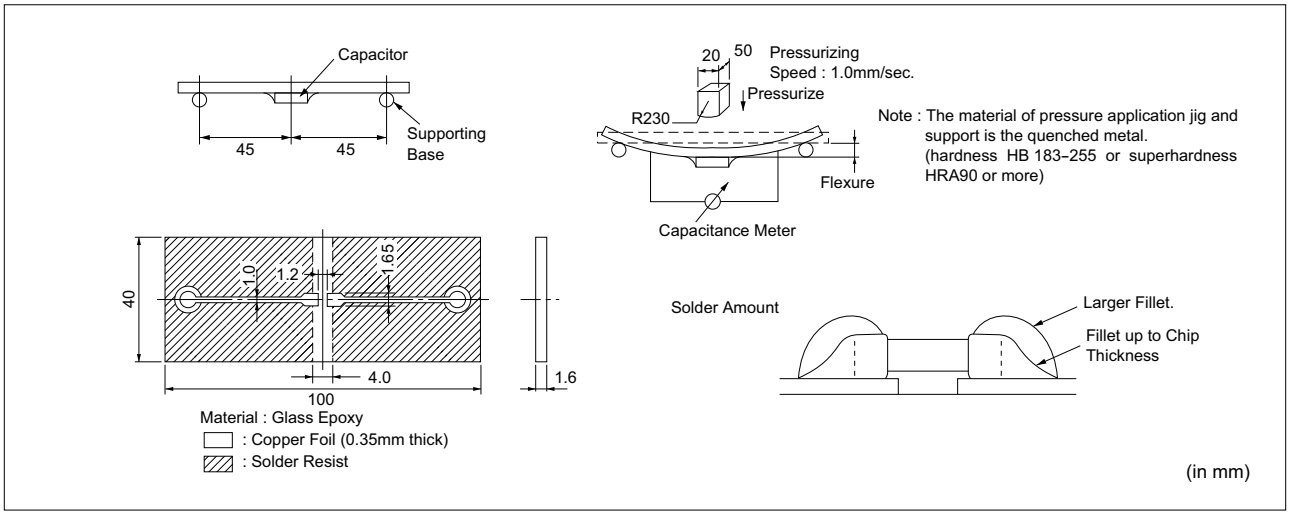
Table 1

Sample	Initial State	Prepared at Room Temperature		Prepared at High Temperature for 100 Hours at 85℃	Prepared at High Humidity for 100 Hours at 90 to 95% RH and 40℃
		6 months	12 months		
GRM21 for flow/reflow soldering	95 to 100%	95 to 100%	95%	90 to 95%	95%

2 Board Bending Strength for Solder Fillet Height

(1) Test Method

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



(2) Test Samples

GRM21: 5C/R7/F5 Characteristics T=0.6mm

(3) Acceptance Criteria

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

Table 2

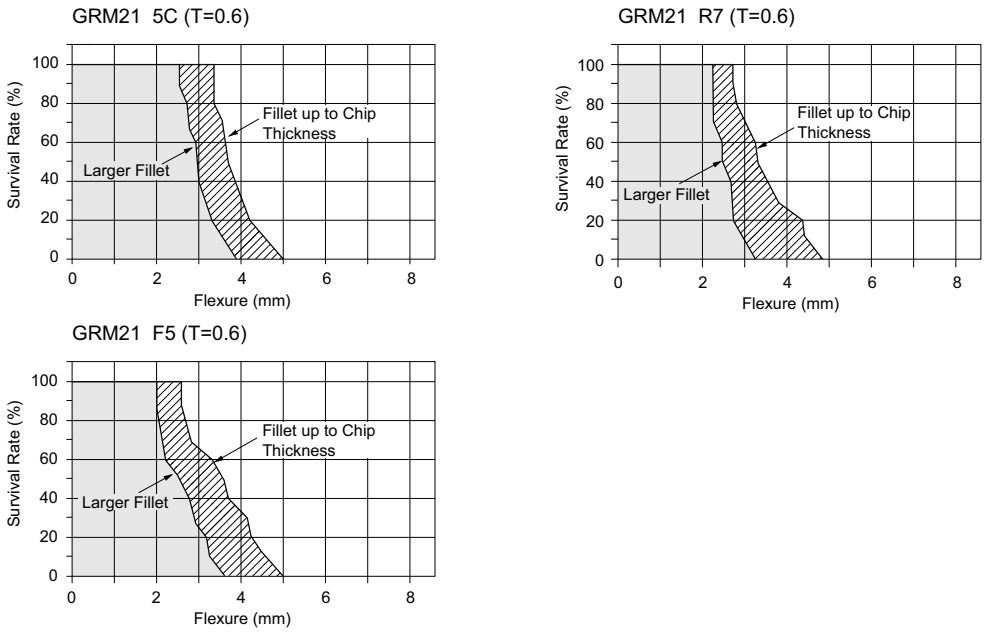
Characteristics	Change in Capacitance
5C	Within ±5% or ±0.5pF, whichever is greater
R7	Within ±12.5%
F5	Within ±20%

Continued on the following page.

Reference Data

Continued from the preceding page.

(4) Results

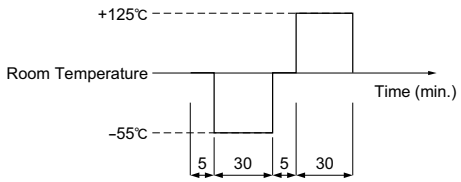


3. Temperature Cycling for Solder Fillet Height

(1) Test Method

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

[Temperature Cycling]



① Solder Amount

Alumina substrates are typically designed for reflow soldering.

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

② Material

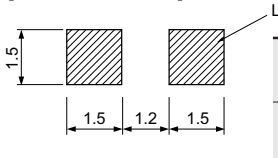
Alumina (Thickness: 0.64mm)
Glass epoxy (Thickness: 1.64mm)
Paper phenol (Thickness: 1.64mm)

[Solder Amount]

Substrate		Alumina	Glass Epoxy or Paper Phenol
Solder Amount	❶	0.5T	T
	❷	0.7T	1.3T
	❸	T	1.6T
Solder to be used		6×4 Eutectic solder	

③ Land Dimension

[Land Dimension]



Alumina Substrate	Ag/Pd=72/28 Thickness: 10 to 12μm
Glass Epoxy Substrate	Cu Thickness: 35μm
Paper Phenol Substrate	

Continued on the following page.

Reference Data

Continued from the preceding page.

(2) Test Samples

GRM21 5C/R7/F5 Characteristics T=0.6mm

(3) Acceptance Criteria

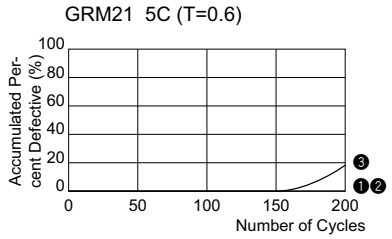
Products are determined to be defective if the change in capacitance has exceeded the values specified in Table 3.

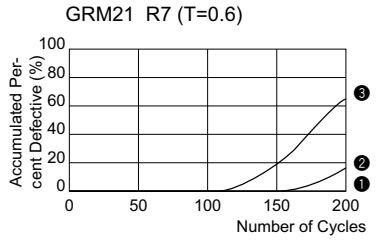
Table 3

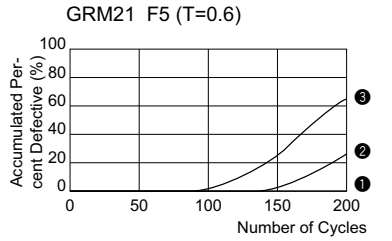
Characteristics	Change in Capacitance
5C	Within ±2.5% or ±0.25pF, whichever is greater
R7	Within ±7.5%
F5	Within ±20%

(4) Results

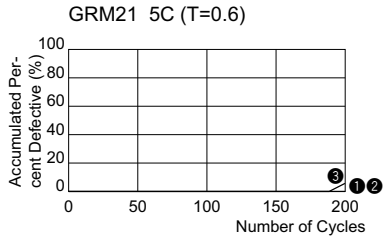
Alumina Substrate (Thickness 0.64mm)

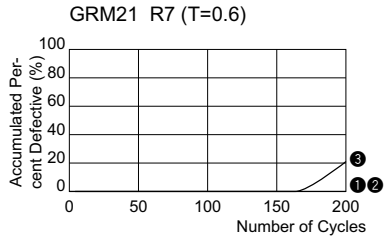


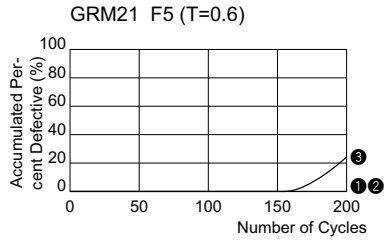




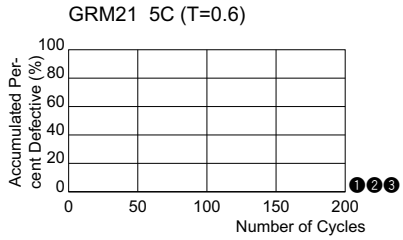
Glass Epoxy Substrate (Thickness 1.6mm)

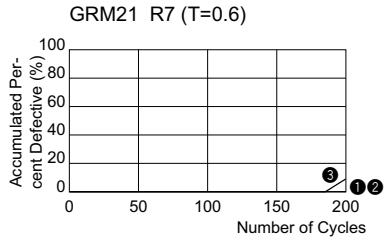


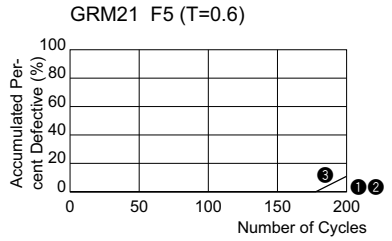




Paper Phenol Substrate (Thickness 1.6mm)







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Reference Data

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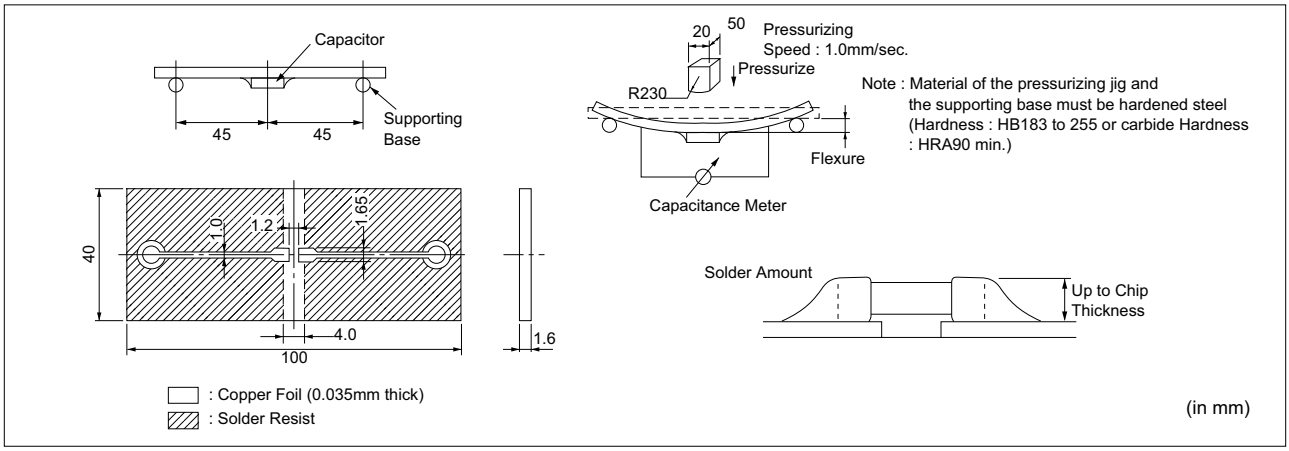
4. Board Bending Strength for Board Material

(1) Test Method

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



(2) Test Samples

GRM21 5C/R7/F5 Characteristics T=0.6mm typical

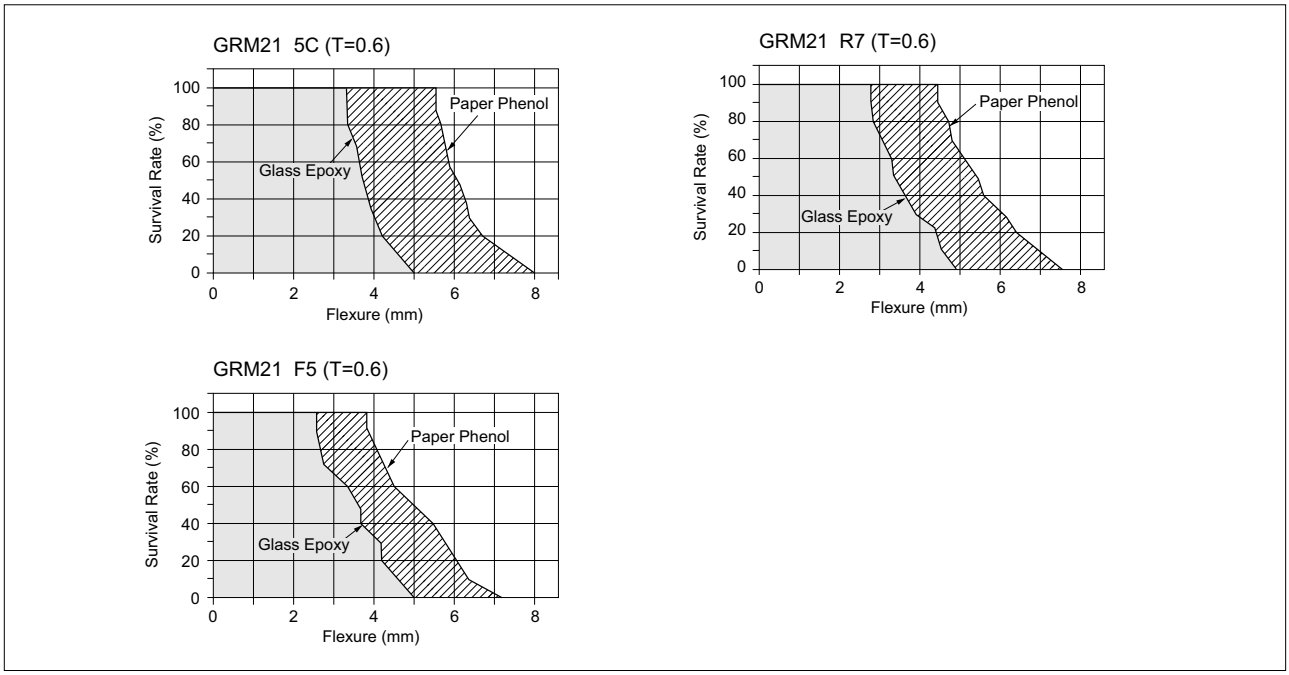
(3) Acceptance Criteria

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

Table 4

Characteristics	Change in Capacitance
5C	Within ±5% or ±0.5pF, whichever is greater
R7	Within ±12.5%
F5	Within ±20%

(4) Results



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Reference Data

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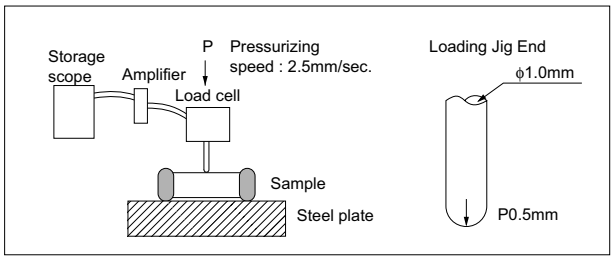
5. Break Strength

(1) Test Method

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

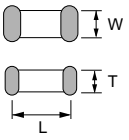


(2) Test Samples

GRM21 5C/R7/F5 Characteristics
GRM31 5C/R7/F5 Characteristics

(3) Acceptance Criteria

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



Chip Size	L	W	γ		
			5C Charac-teristics	R7 Charac-teristics	F5 Charac-teristics
GRM21	1.5	1.2	300	180	160
GRM31	2.7	1.5			

(in mm)

(4) Explanation

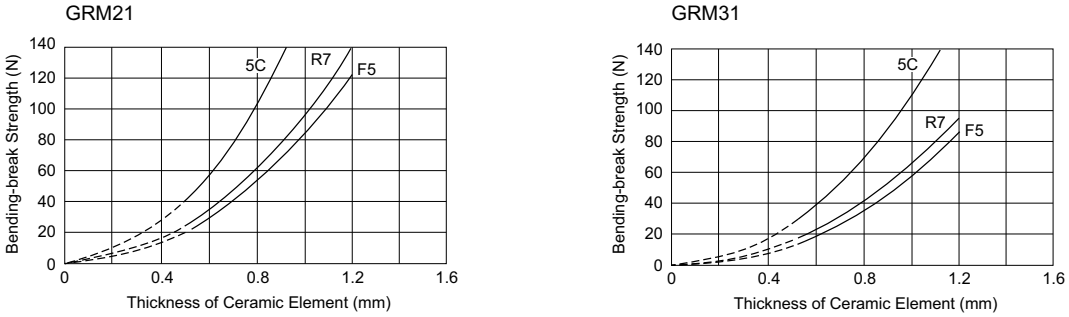
Break strength, P, is proportionate to the square of the thickness of the ceramic element and is expressed as a curve of secondary degree.

The formula is:

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

W : Width of ceramic element (mm)
T : Thickness of element (mm)
L : Distance between fulcrums (mm)
γ : Bending stress (N/mm^2)

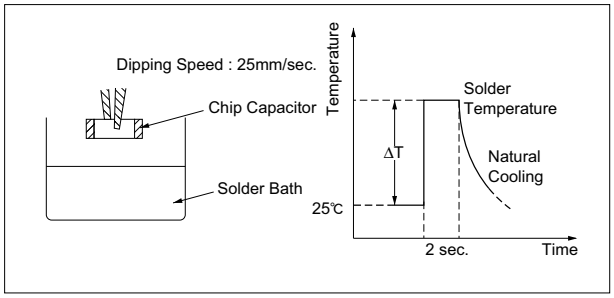
(5) Results



6. Thermal Shock

(1) Test method

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



(2) Test samples

GRM21 5C/R7/F5 Characteristics T=0.6mm typical

(3) Acceptance criteria

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

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Reference Data

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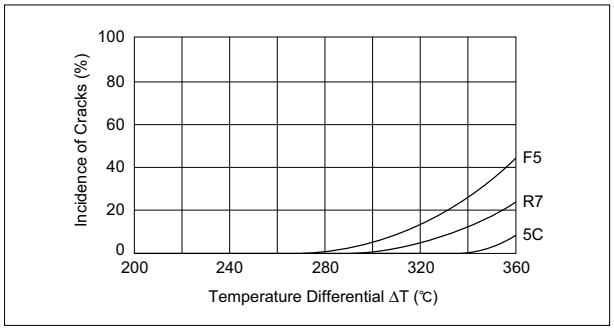
(4) Results



7. Solder Heat Resistance

(1) Test Method

① Reflow soldering:
Apply about 300 μm of solder paste over the alumina substrate. After reflow soldering, remove the chip and check for leaching that may have occurred on the outer electrode.

② Flow soldering:
After dipping the test sample with a pair of tweezers in wave solder (eutectic solder), check for leaching that may have occurred on the outer electrode.

③ Dip soldering:
After dipping the test sample with a pair of tweezers in static solder (eutectic solder), check for leaching that may have occurred on the outer electrode.

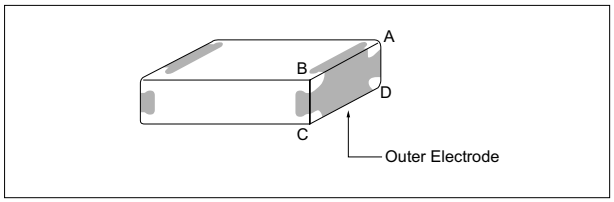
④ Flux to be used: An ethanol solution of 25% rosin.

(2) Test samples

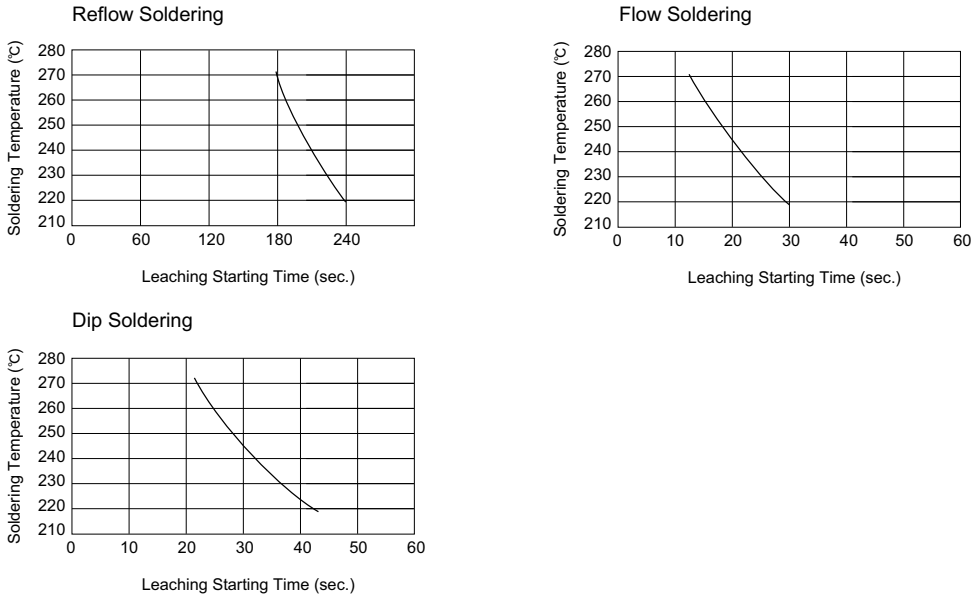
GRM21: For flow/reflow soldering T=0.6mm

(3) Acceptance criteria

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



(4) Results



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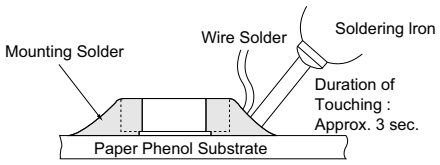
8. Thermal Shock when Making Corrections with a Soldering Iron

(1) Test Method

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



Soldering Iron	Tip Diameter
Ceramic heater 20W	ϕ3mm

(2) Test Samples

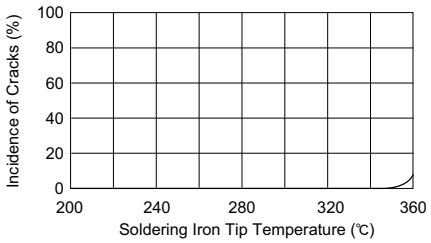
GRM21 5C/R7/F5 Characteristics T=0.6mm

(3) Acceptance Criteria for Defects

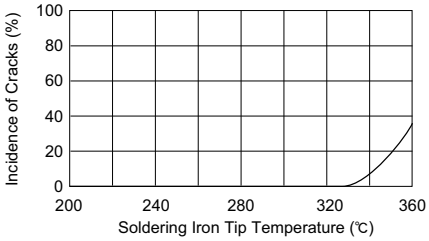
Observe the appearance of the test sample with a 60-power optical microscope. Those units displaying any breaks or cracks are determined to be defective.

(4) Results

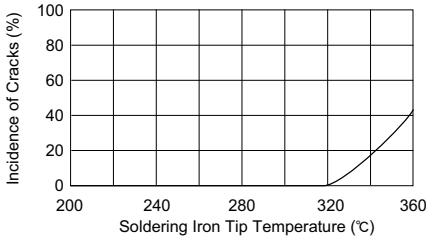
GRM21 5C (T=0.6)



GRM21 R7 (T=0.6)



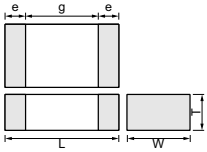
GRM21 F5 (T=0.6)



Chip Monolithic Ceramic Capacitors

muRata

Medium Voltage Low Dissipation Factor



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GRM21A	2.0±0.2	1.25±0.2	1.0 +0, -0.3	0.3	0.7
GRM31A	3.2±0.2	1.6±0.2	1.25 +0, -0.3		1.5*
GRM31B					
GRM32A	3.2±0.2	2.5±0.2	1.0 +0, -0.3		
GRM32B			1.25 +0, -0.3		
GRM42A	4.5±0.3	2.0±0.2	1.0 +0, -0.3		2.9

*GRM31A7U3D, GRM32A7U3D, GRM32B7U3D : 1.8mm min.

■ Features

1. Low-loss and suitable for high frequency circuits
2. Murata's original internal electrode structure realizes high flash-over voltage.
3. A new monolithic structure for small, surface-mountable devices capable of operating at high voltage levels
4. Sn-plated external electrodes realize good solderability.
5. Use the GRM21/31 type with flow or reflow soldering, and other types with reflow soldering only.

■ Applications

Ideal for use on high frequency pulse circuits such as snubber circuits for switching power supplies, DC-DC converters, ballasts (inverter fluorescent lamps), etc.

*: In case of use C0G char., DC630V product with pulse voltage, be sure not to use with 10kHz and less pulse or ripple voltage condition.
and these product are not suitable for commercial power line voltage application, such as AC filter.
For those applications, be sure to use AC voltage rating product.(GA2/GA3 series)

9

C0G Characteristics

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM31A5C2J101JW01D	DC630	C0G (EIA)	100±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J121JW01D	DC630	C0G (EIA)	120±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J151JW01D	DC630	C0G (EIA)	150±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J181JW01D	DC630	C0G (EIA)	180±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J221JW01D	DC630	C0G (EIA)	220±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J271JW01D	DC630	C0G (EIA)	270±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J331JW01D	DC630	C0G (EIA)	330±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J391JW01D	DC630	C0G (EIA)	390±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J471JW01D	DC630	C0G (EIA)	470±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A5C2J561JW01D	DC630	C0G (EIA)	560±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31B5C2J681JW01L	DC630	C0G (EIA)	680±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31B5C2J821JW01L	DC630	C0G (EIA)	820±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31B5C2J102JW01L	DC630	C0G (EIA)	1000±5%	3.2	1.6	1.25	1.5	0.3 min.

U2J Characteristics

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM21A7U2E101JW31D	DC250	U2J (EIA)	100±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E121JW31D	DC250	U2J (EIA)	120±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E151JW31D	DC250	U2J (EIA)	150±5%	2.0	1.25	1.0	0.7	0.3 min.

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Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM21A7U2E181JW31D	DC250	U2J (EIA)	180±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E221JW31D	DC250	U2J (EIA)	220±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E271JW31D	DC250	U2J (EIA)	270±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E331JW31D	DC250	U2J (EIA)	330±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E391JW31D	DC250	U2J (EIA)	390±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E471JW31D	DC250	U2J (EIA)	470±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E561JW31D	DC250	U2J (EIA)	560±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E681JW31D	DC250	U2J (EIA)	680±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E821JW31D	DC250	U2J (EIA)	820±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E102JW31D	DC250	U2J (EIA)	1000±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E122JW31D	DC250	U2J (EIA)	1200±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E152JW31D	DC250	U2J (EIA)	1500±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E182JW31D	DC250	U2J (EIA)	1800±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E222JW31D	DC250	U2J (EIA)	2200±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM31A7U2E272JW31D	DC250	U2J (EIA)	2700±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2E332JW31D	DC250	U2J (EIA)	3300±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2E392JW31D	DC250	U2J (EIA)	3900±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2E472JW31D	DC250	U2J (EIA)	4700±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2E562JW31D	DC250	U2J (EIA)	5600±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31B7U2E682JW31L	DC250	U2J (EIA)	6800±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31B7U2E822JW31L	DC250	U2J (EIA)	8200±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31B7U2E103JW31L	DC250	U2J (EIA)	10000±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31A7U2J100JW31D	DC630	U2J (EIA)	10±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J120JW31D	DC630	U2J (EIA)	12±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J150JW31D	DC630	U2J (EIA)	15±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J180JW31D	DC630	U2J (EIA)	18±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J220JW31D	DC630	U2J (EIA)	22±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J270JW31D	DC630	U2J (EIA)	27±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J330JW31D	DC630	U2J (EIA)	33±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J390JW31D	DC630	U2J (EIA)	39±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J470JW31D	DC630	U2J (EIA)	47±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J560JW31D	DC630	U2J (EIA)	56±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J680JW31D	DC630	U2J (EIA)	68±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J820JW31D	DC630	U2J (EIA)	82±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J101JW31D	DC630	U2J (EIA)	100±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J121JW31D	DC630	U2J (EIA)	120±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J151JW31D	DC630	U2J (EIA)	150±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J181JW31D	DC630	U2J (EIA)	180±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J221JW31D	DC630	U2J (EIA)	220±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J271JW31D	DC630	U2J (EIA)	270±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J331JW31D	DC630	U2J (EIA)	330±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J391JW31D	DC630	U2J (EIA)	390±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J471JW31D	DC630	U2J (EIA)	470±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J561JW31D	DC630	U2J (EIA)	560±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J681JW31D	DC630	U2J (EIA)	680±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J821JW31D	DC630	U2J (EIA)	820±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U2J102JW31D	DC630	U2J (EIA)	1000±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM32A7U2J122JW31D	DC630	U2J (EIA)	1200±5%	3.2	2.5	1.0	1.5	0.3 min.
GRM32A7U2J152JW31D	DC630	U2J (EIA)	1500±5%	3.2	2.5	1.0	1.5	0.3 min.
GRM32A7U2J182JW31D	DC630	U2J (EIA)	1800±5%	3.2	2.5	1.0	1.5	0.3 min.
GRM32A7U2J222JW31D	DC630	U2J (EIA)	2200±5%	3.2	2.5	1.0	1.5	0.3 min.
GRM31A7U3A100JW31D	DC1000	U2J (EIA)	10±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A120JW31D	DC1000	U2J (EIA)	12±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A150JW31D	DC1000	U2J (EIA)	15±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A180JW31D	DC1000	U2J (EIA)	18±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A220JW31D	DC1000	U2J (EIA)	22±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A270JW31D	DC1000	U2J (EIA)	27±5%	3.2	1.6	1.0	1.5	0.3 min.

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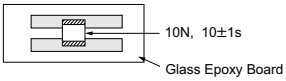
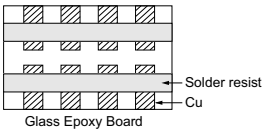
Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM31A7U3A330JW31D	DC1000	U2J (EIA)	33±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A390JW31D	DC1000	U2J (EIA)	39±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A470JW31D	DC1000	U2J (EIA)	47±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A560JW31D	DC1000	U2J (EIA)	56±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A680JW31D	DC1000	U2J (EIA)	68±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A820JW31D	DC1000	U2J (EIA)	82±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A101JW31D	DC1000	U2J (EIA)	100±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A121JW31D	DC1000	U2J (EIA)	120±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A151JW31D	DC1000	U2J (EIA)	150±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A181JW31D	DC1000	U2J (EIA)	180±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A221JW31D	DC1000	U2J (EIA)	220±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A271JW31D	DC1000	U2J (EIA)	270±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31A7U3A331JW31D	DC1000	U2J (EIA)	330±5%	3.2	1.6	1.0	1.5	0.3 min.
GRM31B7U3A391JW31L	DC1000	U2J (EIA)	390±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31B7U3A471JW31L	DC1000	U2J (EIA)	470±5%	3.2	1.6	1.25	1.5	0.3 min.
GRM31A7U3D100JW31D	DC2000	U2J (EIA)	10±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D120JW31D	DC2000	U2J (EIA)	12±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D150JW31D	DC2000	U2J (EIA)	15±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D180JW31D	DC2000	U2J (EIA)	18±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D220JW31D	DC2000	U2J (EIA)	22±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D270JW31D	DC2000	U2J (EIA)	27±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D330JW31D	DC2000	U2J (EIA)	33±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D390JW31D	DC2000	U2J (EIA)	39±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D470JW31D	DC2000	U2J (EIA)	47±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D560JW31D	DC2000	U2J (EIA)	56±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM31A7U3D680JW31D	DC2000	U2J (EIA)	68±5%	3.2	1.6	1.0	1.8	0.3 min.
GRM32A7U3D820JW31D	DC2000	U2J (EIA)	82±5%	3.2	2.5	1.0	1.8	0.3 min.
GRM32A7U3D101JW31D	DC2000	U2J (EIA)	100±5%	3.2	2.5	1.0	1.8	0.3 min.
GRM32A7U3D121JW31D	DC2000	U2J (EIA)	120±5%	3.2	2.5	1.0	1.8	0.3 min.
GRM32A7U3D151JW31D	DC2000	U2J (EIA)	150±5%	3.2	2.5	1.0	1.8	0.3 min.
GRM32B7U3D181JW31L	DC2000	U2J (EIA)	180±5%	3.2	2.5	1.25	1.8	0.3 min.
GRM32B7U3D221JW31L	DC2000	U2J (EIA)	220±5%	3.2	2.5	1.25	1.8	0.3 min.
GRM42A7U3F270JW31L	DC3150	U2J (EIA)	27±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F330JW31L	DC3150	U2J (EIA)	33±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F390JW31L	DC3150	U2J (EIA)	39±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F470JW31L	DC3150	U2J (EIA)	47±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F560JW31L	DC3150	U2J (EIA)	56±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F680JW31L	DC3150	U2J (EIA)	68±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F820JW31L	DC3150	U2J (EIA)	82±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A7U3F101JW31L	DC3150	U2J (EIA)	100±5%	4.5	2.0	1.0	2.9	0.3 min.

Specifications and Test Methods

No.	Item	Specifications	Test Method
1	Operating Temperature Range	−55 to +125℃	−
2	Appearance	No defects or abnormalities	Visual inspection
3	Dimensions	Within the specified dimension	Using calipers
4	Dielectric Strength	No defects or abnormalities	No failure should be observed when voltage in Table is applied between the terminations for 1 to 5 sec., provided the charge/discharge current is less than 50mA. Rated Voltage / Test Voltage DC250V: 200% of the rated voltage DC630V: 150% of the rated voltage DC1kV, DC2kV: 120% of the rated voltage DC3.15kV: DC4095V
5	Insulation Resistance (I.R.)	More than 10,000MΩ	The insulation resistance should be measured with DC500±50V (DC250±25V in case of rated voltage: DC250V) and within 60±5 sec. of charging.
6	Capacitance	Within the specified tolerance	The capacitance/Q should be measured at the frequency and voltage shown as follows. Capacitance / Frequency / Voltage C<1,000pF: 1±0.2MHz: AC0.5 to 5V(r.m.s.) C≧1,000pF: 1±0.2kHz: AC1±0.2V(r.m.s.)
7	Q	1,000 min.	
8	Capacitance Temperature Characteristics	Temp. Coefficient C0G char. : 0±30ppm/℃ (Temp. Range : +25 to +125℃) 0+30, −72ppm/℃ (Temp. Range : −55 to +25℃) U2J char. : −750±120ppm/℃ (Temp. Range : +25 to +125℃) −750+120, −347ppm/℃ (Temp. Range : −55 to +25℃)	The capacitance measurement should be made at each step specified in Table. Step / Temperature (℃) 1: 25±2 2: Min. Operating Temp.±3 3: 25±2 4: Max. Operating Temp.±2 5: 25±2
9	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
10	Vibration Resistance	Appearance: No defects or abnormalities Capacitance: Within the specified tolerance Q: 1,000 min.	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 

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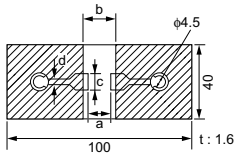
9

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
11	Deflection		No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
12	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). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
13	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor at 120 to 150℃* for 1 min. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •Immersing speed: 25±2.5mm/s *Preheating for more than 3.2×2.5mm
		Capacitance Change	Within ±2.5%	
		Q	1,000 min.	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±2.5%	
		Q	500 min.	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±5.0%	
		Q	350 min.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
16	Life	Appearance	No marking defects	Apply voltage as Table for 1,000 $^{+48}_{0}$ hrs. at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±3.0%	
		Q	350 min.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	The charge/discharge current is less than 50mA.



L×W (mm)	Dimension (mm) a	b	c	d
2.0×1.25	1.2	4.0	1.65	1.0
3.2×1.6	2.2	5.0	2.0	
3.2×2.5	2.2	5.0	2.9	
4.5×2.0	3.5	7.0	2.4	

Fig. 2

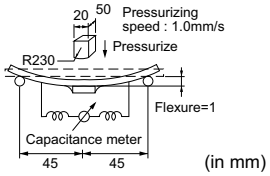


Fig. 3

Step	Temperature	Time
1	100 to 120℃	1 min.
2	170 to 200℃	1 min.

Step	Temperature (℃)	Time (min.)
1	Min. Operating Temp.±3	30±3
2	Room Temp.	2 to 3
3	Max. Operating Temp.±2	30±3
4	Room Temp.	2 to 3

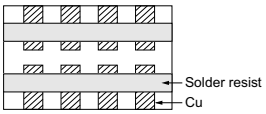


Fig. 4

Rated Voltage	Applied Voltage
DC250V	150% of the rated voltage
DC630V, DC1kV, DC2kV, DC3.15kV	120% of the rated voltage

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

Chip Monolithic Ceramic Capacitors

muRata

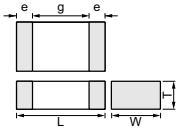
Medium Voltage High Capacitance for General Use

■ Features

1. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
2. Sn-plated external electrodes realize good solderability.
3. Use the GRM18/21/31 types with flow or reflow solderring, and other types with reflow soldering only.

■ Applications

1. Ideal for use on diode-snubber circuits for switching power supplies.
2. Ideal for use as primary-secondary coupling for DC-DC converter.
3. Ideal for use on line filters and ringer detectors for telephones, facsimiles and modems.



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM188	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.4
GRM21A	2.0 ±0.2	1.25 ±0.2	1.0 +0,-0.3	0.3 min.	0.7
GRM21B			1.25 ±0.2		
GRM31B	3.2 ±0.2	1.6 ±0.2	1.25 +0,-0.3		1.2
GRM31C			1.6 ±0.2		
GRM32Q	3.2 ±0.3	2.5 ±0.2	1.5 +0,-0.3		
GRM32D			2.0 +0,-0.3		
GRM43Q	4.5 ±0.4	3.2 ±0.3	1.5 +0,-0.3		2.2
GRM43D			2.0 +0,-0.3		
GRM55D	5.7 ±0.4	5.0 ±0.4	2.0 +0,-0.3		3.2

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM188R72E221KW07D	DC250	X7R (EIA)	220pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM188R72E331KW07D	DC250	X7R (EIA)	330pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM188R72E471KW07D	DC250	X7R (EIA)	470pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM188R72E681KW07D	DC250	X7R (EIA)	680pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM188R72E102KW07D	DC250	X7R (EIA)	1000pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM21AR72E102KW01D	DC250	X7R (EIA)	1000pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM188R72E152KW07D	DC250	X7R (EIA)	1500pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM21AR72E152KW01D	DC250	X7R (EIA)	1500pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM188R72E222KW07D	DC250	X7R (EIA)	2200pF ±10%	1.6	0.8	0.8	0.4	0.2 to 0.5
GRM21AR72E222KW01D	DC250	X7R (EIA)	2200pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM21AR72E332KW01D	DC250	X7R (EIA)	3300pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM21AR72E472KW01D	DC250	X7R (EIA)	4700pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM21AR72E682KW01D	DC250	X7R (EIA)	6800pF ±10%	2.0	1.25	1.0	0.7	0.3 min.
GRM21BR72E103KW03L	DC250	X7R (EIA)	10000pF ±10%	2.0	1.25	1.25	0.7	0.3 min.
GRM31BR72E153KW01L	DC250	X7R (EIA)	15000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72E223KW01L	DC250	X7R (EIA)	22000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31CR72E333KW03L	DC250	X7R (EIA)	33000pF ±10%	3.2	1.6	1.6	1.2	0.3 min.
GRM31CR72E473KW03L	DC250	X7R (EIA)	47000pF ±10%	3.2	1.6	1.6	1.2	0.3 min.
GRM31BR72E683KW01L	DC250	X7R (EIA)	68000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM32QR72E683KW01L	DC250	X7R (EIA)	68000pF ±10%	3.2	2.5	1.5	1.2	0.3 min.
GRM31CR72E104KW03L	DC250	X7R (EIA)	0.10μF ±10%	3.2	1.6	1.6	1.2	0.3 min.
GRM32DR72E104KW01L	DC250	X7R (EIA)	0.10μF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM32QR72E154KW01L	DC250	X7R (EIA)	0.15μF ±10%	3.2	2.5	1.5	1.2	0.3 min.
GRM43QR72E154KW01L	DC250	X7R (EIA)	0.15μF ±10%	4.5	3.2	1.5	2.2	0.3 min.
GRM32DR72E224KW01L	DC250	X7R (EIA)	0.22μF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM43DR72E224KW01L	DC250	X7R (EIA)	0.22μF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM43DR72E334KW01L	DC250	X7R (EIA)	0.33μF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM55DR72E334KW01L	DC250	X7R (EIA)	0.33μF ±10%	5.7	5.0	2.0	3.2	0.3 min.
GRM43DR72E474KW01L	DC250	X7R (EIA)	0.47μF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM55DR72E474KW01L	DC250	X7R (EIA)	0.47μF ±10%	5.7	5.0	2.0	3.2	0.3 min.
GRM55DR72E105KW01L	DC250	X7R (EIA)	1.0μF ±10%	5.7	5.0	2.0	3.2	0.3 min.
GRM31BR72J102KW01L	DC630	X7R (EIA)	1000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.

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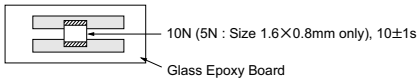
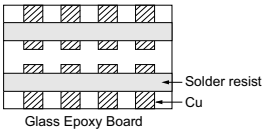
Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM31BR72J152KW01L	DC630	X7R (EIA)	1500pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72J222KW01L	DC630	X7R (EIA)	2200pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72J332KW01L	DC630	X7R (EIA)	3300pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72J472KW01L	DC630	X7R (EIA)	4700pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72J682KW01L	DC630	X7R (EIA)	6800pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR72J103KW01L	DC630	X7R (EIA)	10000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31CR72J153KW03L	DC630	X7R (EIA)	15000pF ±10%	3.2	1.6	1.6	1.2	0.3 min.
GRM32QR72J223KW01L	DC630	X7R (EIA)	22000pF ±10%	3.2	2.5	1.5	1.2	0.3 min.
GRM32DR72J333KW01L	DC630	X7R (EIA)	33000pF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM32DR72J473KW01L	DC630	X7R (EIA)	47000pF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM43QR72J683KW01L	DC630	X7R (EIA)	68000pF ±10%	4.5	3.2	1.5	2.2	0.3 min.
GRM43DR72J104KW01L	DC630	X7R (EIA)	0.10µF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM55DR72J154KW01L	DC630	X7R (EIA)	0.15µF ±10%	5.7	5.0	2.0	3.2	0.3 min.
GRM55DR72J224KW01L	DC630	X7R (EIA)	0.22µF ±10%	5.7	5.0	2.0	3.2	0.3 min.
GRM31BR73A471KW01L	DC1000	X7R (EIA)	470pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR73A102KW01L	DC1000	X7R (EIA)	1000pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR73A152KW01L	DC1000	X7R (EIA)	1500pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR73A222KW01L	DC1000	X7R (EIA)	2200pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR73A332KW01L	DC1000	X7R (EIA)	3300pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM31BR73A472KW01L	DC1000	X7R (EIA)	4700pF ±10%	3.2	1.6	1.25	1.2	0.3 min.
GRM32QR73A682KW01L	DC1000	X7R (EIA)	6800pF ±10%	3.2	2.5	1.5	1.2	0.3 min.
GRM32QR73A103KW01L	DC1000	X7R (EIA)	10000pF ±10%	3.2	2.5	1.5	1.2	0.3 min.
GRM32DR73A153KW01L	DC1000	X7R (EIA)	15000pF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM32DR73A223KW01L	DC1000	X7R (EIA)	22000pF ±10%	3.2	2.5	2.0	1.2	0.3 min.
GRM43DR73A333KW01L	DC1000	X7R (EIA)	33000pF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM43DR73A473KW01L	DC1000	X7R (EIA)	47000pF ±10%	4.5	3.2	2.0	2.2	0.3 min.
GRM55DR73A104KW01L	DC1000	X7R (EIA)	0.10µF ±10%	5.7	5.0	2.0	3.2	0.3 min.

Specifications and Test Methods

No.	Item	Specifications	Test Method
1	Operating Temperature Range	−55 to +125℃	−
2	Appearance	No defects or abnormalities	Visual inspection
3	Dimensions	Within the specified dimensions	Using calipers
4	Dielectric Strength	No defects or abnormalities	No failure should be observed when 150% of the rated voltage (200% of the rated voltage in case of rated voltage: DC250V, 120% of the rated voltage in case of rated voltage: DC1kV) is applied between the terminations for 1 to 5 sec., provided the charge/discharge current is less than 50mA.
5	Insulation Resistance (I.R.)	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	The insulation resistance should be measured with DC500±50V (DC250±25V in case of rated voltage: DC250V) and within 60±5 sec. of charging.
6	Capacitance	Within the specified tolerance	The capacitance/D.F. should be measured at a frequency of 1±0.2kHz and a voltage of AC1±0.2V(r.m.s.)
7	Dissipation Factor (D.F.)	0.025 max.	
8	Capacitance Temperature Characteristics	Cap. Change Within ±15% (Temp. Range: −55 to +125℃)	The capacitance measurement should be made at each step specified in Table. Step / Temperature (℃) 1 / 25±2 2 / Min. Operating Temp.±3 3 / 25±2 4 / Max. Operating Temp.±2 5 / 25±2 •Pretreatment Perform a heat treatment at 150 $^{+0}_{-10}$ ℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
9	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
10	Vibration Resistance	Appearance: No defects or abnormalities Capacitance: Within the specified tolerance D.F.: 0.025 max.	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 

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

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10

Specifications and Test Methods

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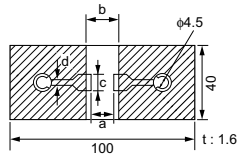
No.	Item		Specifications	Test Method
11	Deflection		No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
12	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). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
13	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor at 120 to 150℃* for 1 min. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •**Immersing speed**: 25±2.5mm/s •**Pretreatment** Perform a heat treatment at 150 $^{+1}_{-8}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*. *Preheating for more than 3.2×2.5mm
		Capacitance Change	Within ±10%	
		D.F.	0.025 max.	
		I.R.	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure. •**Pretreatment** Perform a heat treatment at 150 $^{+1}_{-8}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±7.5%	
		D.F.	0.025 max.	
		I.R.	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{-0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •**Pretreatment** Perform a heat treatment at 150 $^{+1}_{-8}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	



L×W (mm)	Dimension (mm) a	b	c	d
1.6×0.8	1.0	3.0	1.2	1.0
2.0×1.25	1.2	4.0	1.65	
3.2×1.6	2.2	5.0	2.0	
3.2×2.5	2.2	5.0	2.9	
4.5×3.2	3.5	7.0	3.7	
5.7×5.0	4.5	8.0	5.6	

Fig. 2

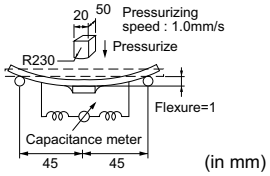


Fig. 3

Step	Temperature	Time
1	100 to 120℃	1 min.
2	170 to 200℃	1 min.

Step	Temperature (℃)	Time (min.)
1	Min. Operating Temp.±3	30±3
2	Room Temp.	2 to 3
3	Max. Operating Temp.±2	30±3
4	Room Temp.	2 to 3

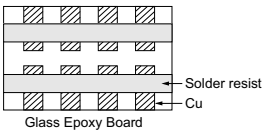


Fig. 4

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

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
16	Life	Appearance	No marking defects	Apply 120% of the rated voltage (150% of the rated voltage in case of rated voltage: DC250V, 110% of the rated voltage in case of rated voltage: DC1kV) for 1,000 $^{+48}_{0}$ hrs. at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure. The charge/discharge current is less than 50mA. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15% (rated voltage: DC250V, DC630V) Within ±20% (rated voltage: DC1kV)	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
17	Humidity Loading (Application: DC250V, DC630V item)	Appearance	No marking defects	Apply the rated voltage at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	

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

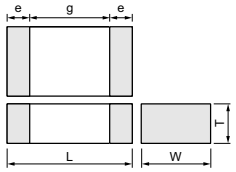
Chip Monolithic Ceramic Capacitors

muRata

Only for LCD Backlight Inverter Circuit

■ Features

1. Low-loss and suitable for high frequency circuits
2. Murata's original internal electrode structure realizes high flash-over voltage.
3. A new monolithic structure for small, surface-mountable devices capable of operating at high voltage levels.
4. Sn-plated external electrodes realize good solderability.
5. Only for reflow soldering
6. The capacitors less than 22pF can be applied maximum 4.0kV peak to peak at 100kHz or less only for the ballast or the resonance usage in the LCD backlight inverter circuit.



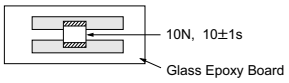
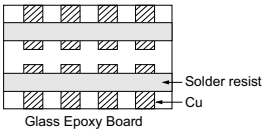
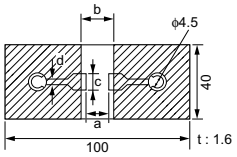
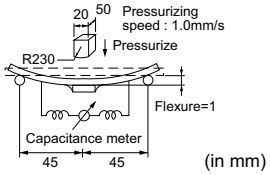
Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GRM42A	4.5 ±0.3	2.0 ±0.2	1.0 +0, - 0.3	0.3	2.9

■ Applications

Ideal for use as the ballast in LCD backlight inverter.

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GRM42A5C3F050DW01L	DC3150	C0G (EIA)	5.0 ±0.5pF	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F100JW01L	DC3150	C0G (EIA)	10 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F120JW01L	DC3150	C0G (EIA)	12 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F150JW01L	DC3150	C0G (EIA)	15 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F180JW01L	DC3150	C0G (EIA)	18 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F220JW01L	DC3150	C0G (EIA)	22 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F270JW01L	DC3150	C0G (EIA)	27 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F330JW01L	DC3150	C0G (EIA)	33 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F390JW01L	DC3150	C0G (EIA)	39 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F470JW01L	DC3150	C0G (EIA)	47 ±5%	4.5	2.0	1.0	2.9	0.3 min.

Specifications and Test Methods

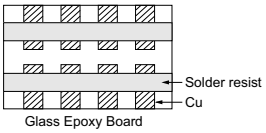
No.	Item	Specifications	Test Method
1	Operating Temperature Range	−55 to +125℃	−
2	Appearance	No defects or abnormalities	Visual inspection
3	Dimensions	Within the specified dimension	Using calipers
4	Dielectric Strength	No defects or abnormalities	No failure should be observed when DC4095V is applied between the terminations for 1 to 5 sec., provided the charge/discharge current is less than 50mA.
5	Insulation Resistance (I.R.)	More than 10,000MΩ	The insulation resistance should be measured with DC500±50V and within 60±5 sec. of charging.
6	Capacitance	Within the specified tolerance	The capacitance/Q should be measured at a frequency of 1±0.2MHz and a voltage of AC0.5 to 5V(r.m.s.)
7	Q	1,000 min.	
8	Capacitance Temperature Characteristics	Temp. Coefficient 0±30ppm/℃ (Temp. Range: +25 to +125℃) 0+30, −72ppm/℃ (Temp. Range: −55 to +25℃)	The capacitance measurement should be made at each step specified in Table. Step / Temperature (℃) 1: 25±2 2: Min. Operating Temp.±3 3: 25±2 4: Max. Operating Temp.±2 5: 25±2
9	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
10	Vibration Resistance	Appearance: No defects or abnormalities Capacitance: Within the specified tolerance Q: 1,000 min.	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 
11	Deflection	No cracking or marking defects should occur.  L×W (mm) / Dimension (mm): a / b / c / d 4.5×2.0: 3.5 / 7.0 / 2.4 / 1.0 Fig. 2	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 3

Continued on the following page.

11

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
12	**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). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
13	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor as table. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •**Immersing speed**: 25±2.5mm/s *Preheating Step 1: 100 to 120℃, 1 min. Step 2: 170 to 200℃, 1 min.
		Capacitance Change	Within ±2.5%	
		Q	1,000 min.	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure. Step 1: Min. Operating Temp.±3, 30±3 Step 2: Room Temp., 2 to 3 Step 3: Max. Operating Temp.±2, 30±3 Step 4: Room Temp., 2 to 3  Fig. 4
		Capacitance Change	Within ±2.5%	
		Q	1,000 min.	
		I.R.	More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±5.0%	
		Q	350 min.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
16	Life	Appearance	No marking defects	Apply 120% of the rated voltage for 1,000 $^{+48}_{0}$ hrs. at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure. The charge/discharge current is less than 50mA.
		Capacitance Change	Within ±3.0%	
		Q	350 min.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	

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

11

Chip Monolithic Ceramic Capacitors

muRata

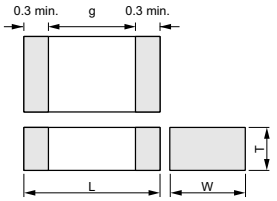
Only for Information Devices

■ Features

1. These items are designed specifically for telecommunications devices (IEEE802.3) in Ethernet LAN and primary-secondary coupling for DC-DC converter.
2. A new monolithic structure for small, high capacitance capable of operating at high voltage levels
3. Sn-plated external electrodes realizes good solderability.
4. Only for reflow soldering
5. The low-profile type (thickness: 1.5mm max.) is available. Fit for use on thinner type equipment.

■ Applications

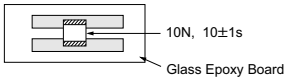
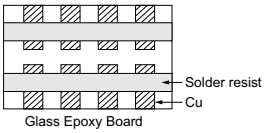
1. Ideal for use on telecommunications devices in Ethernet LAN
2. Ideal for use as primary-secondary coupling for DC-DC converter



Part Number	Dimensions (mm)			
	L	W	T	g min.
GR442Q	4.5 ±0.3	2.0 ±0.2	1.5 +0, -0.3	2.5
GR443D	4.5 ±0.4	3.2 ±0.3	2.0 +0, -0.3	
GR443Q			1.5 +0, -0.3	
GR455D	5.7 ±0.4	5.0 ±0.4	2.0 +0, -0.3	3.2

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GR442QR73D101KW01L	DC2000	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D121KW01L	DC2000	X7R (EIA)	120 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D151KW01L	DC2000	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D181KW01L	DC2000	X7R (EIA)	180 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D221KW01L	DC2000	X7R (EIA)	220 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D271KW01L	DC2000	X7R (EIA)	270 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D331KW01L	DC2000	X7R (EIA)	330 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D391KW01L	DC2000	X7R (EIA)	390 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D471KW01L	DC2000	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D561KW01L	DC2000	X7R (EIA)	560 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D681KW01L	DC2000	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D821KW01L	DC2000	X7R (EIA)	820 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D102KW01L	DC2000	X7R (EIA)	1000 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D122KW01L	DC2000	X7R (EIA)	1200 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR442QR73D152KW01L	DC2000	X7R (EIA)	1500 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GR443QR73D182KW01L	DC2000	X7R (EIA)	1800 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GR443QR73D222KW01L	DC2000	X7R (EIA)	2200 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GR443QR73D272KW01L	DC2000	X7R (EIA)	2700 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GR443QR73D332KW01L	DC2000	X7R (EIA)	3300 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GR443QR73D392KW01L	DC2000	X7R (EIA)	3900 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GR443DR73D472KW01L	DC2000	X7R (EIA)	4700 ±10%	4.5	3.2	2.0	2.5	0.3 min.
GR455DR73D103KW01L	DC2000	X7R (EIA)	10000 ±10%	5.7	5.0	2.0	3.2	0.3 min.

Specifications and Test Methods

No.	Item	Specifications	Test Method
1	Operating Temperature Range	−55 to +125℃	−
2	Appearance	No defects or abnormalities	Visual inspection
3	Dimensions	Within the specified dimensions	Using calipers
4	Dielectric Strength	No defects or abnormalities	No failure should be observed when voltage in table is applied between the terminations, provided the charge/discharge current is less than 50mA. Rated Voltage: DC2kV — Test Voltage: 120% of the rated voltage — Time: 60±1 sec. Test Voltage: AC1500V(r.m.s.) — Time: 60±1 sec.
5	Pulse Voltage	No self healing breakdowns or flash-overs have taken place in the capacitor.	10 impulse of alternating polarity is subjected. (5 impulse for each polarity) The interval between impulse is 60 sec. Applied Voltage: 2.5kV zero to peak
6	Insulation Resistance (I.R.)	More than 6,000MΩ	The insulation resistance should be measured with DC500±50V and within 60±5 sec. of charging.
7	Capacitance	Within the specified tolerance	The capacitance/D.F. should be measured at a frequency of 1±0.2kHz and a voltage of AC1±0.2V(r.m.s.)
8	Dissipation Factor (D.F.)	0.025 max.	
9	Capacitance Temperature Characteristics	Cap. Change within ±15% (Temp. Range: −55 to +125℃)	The capacitance measurement should be made at each step specified in Table. Step 1: 25±2 Step 2: Min. Operating Temp.±3 Step 3: 25±2 Step 4: Max. Operating Temp.±2 Step 5: 25±2 •Pretreatment Perform a heat treatment at 150 $^{+0}_{-10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
10	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
11	Vibration Resistance	Appearance: No defects or abnormalities Capacitance: Within the specified tolerance D.F.: 0.025 max.	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 

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

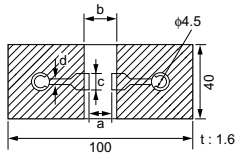
Continued on the following page.

12

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
12	Deflection		No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using 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% rin in weight proportion). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
14	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor as table. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •**Immersing speed**: 25±2.5mm/s •**Pretreatment** Perform a heat treatment at 150 $^{+1}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*. ∗**Preheating**
		Capacitance Change	Within ±10%	
		D.F.	0.025 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 3,000MΩ	
		Dielectric Strength	In accordance with item No.4	•**Pretreatment** Perform a heat treatment at 150 $^{+1}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
16	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •**Pretreatment** Perform a heat treatment at 150 $^{+1}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	



L×W (mm)	Dimension (mm)			
	a	b	c	d
4.5×2.0	3.5	7.0	2.4	1.0
4.5×3.2	3.5	7.0	3.7	
5.7×5.0	4.5	8.0	5.6	

Fig. 2

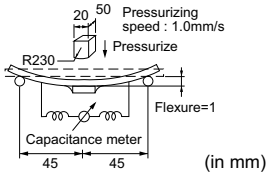


Fig. 3

∗**Preheating**

Step	Temperature	Time
1	100 to 120℃	1 min.
2	170 to 200℃	1 min.

Step	Temperature (℃)	Time (min.)
1	Min. Operating Temp.±3	30±3
2	Room Temp.	2 to 3
3	Max. Operating Temp.±2	30±3
4	Room Temp.	2 to 3

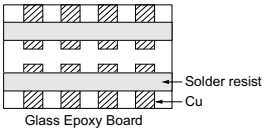


Fig. 4

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

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Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
17	Life	Appearance	No marking defects	Apply 110% of the rated voltage for 1,000 $^{+48}_{0}$ hrs. at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure. The charge/discharge current is less than 50mA. **•Pretreatment** Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±20%	
		D.F.	0.05 max.	
		I.R.	More than 2,000MΩ	
		Dielectric Strength	In accordance with item No.4	

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

12

Chip Monolithic Ceramic Capacitors

muRata

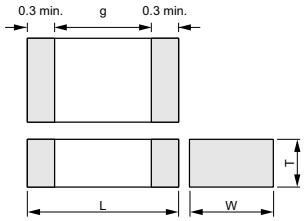
Only for Camera Flash Circuit

■ Features

1. Suitable for the trigger of the flash circuit, because real capacitance is stable during operating voltage.
2. The thin type fit for thinner camera.
3. Sn-plated external electrodes realizes good solderability.
4. For flow and reflow soldering

■ Applications

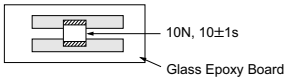
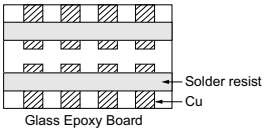
For strobe circuit



Part Number	Dimensions (mm)			
	L	W	T	g min.
GR731A	3.2 ±0.2	1.6 ±0.2	1.0 +0, -0.3	1.2
GR731B			1.25 +0, -0.3	
GR731C			1.6 ±0.2	

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GR731AW0BB103KW01D	DC 350	-	10000 ±10%	3.2	1.6	1.0	1.2	0.3 min.
GR731AW0BB153KW01D	DC 350	-	15000 ±10%	3.2	1.6	1.0	1.2	0.3 min.
GR731BW0BB223KW01L	DC 350	-	22000 ±10%	3.2	1.6	1.25	1.2	0.3 min.
GR731BW0BB333KW01L	DC 350	-	33000 ±10%	3.2	1.6	1.25	1.2	0.3 min.
GR731CW0BB473KW03L	DC 350	-	47000 ±10%	3.2	1.6	1.6	1.2	0.3 min.

Specifications and Test Methods

No.	Item		Specifications	Test Method
1	Operating Temperature Range		−55 to +125℃	−
2	Appearance		No defects or abnormalities	Visual inspection
3	Dimensions		Within the specified dimensions	Using calipers
4	Dielectric Strength		No defects or abnormalities	No failure should be observed when DC500V is applied between the terminations for 1 to 5 sec., provided the charge/discharge current is less than 50mA.
5	Insulation Resistance (I.R.)		C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	The insulation resistance should be measured with DC250±50V and within 60±5 sec. of charging.
6	Capacitance		Within the specified tolerance	The capacitance/D.F. should be measured at a frequency of 1±0.2kHz and a voltage of AC1±0.2V(r.m.s.)
7	Dissipation Factor (D.F.)		0.025 max.	
8	Capacitance Temperature Characteristics		Cap. Change Within ±10% (Apply DC350V bias) Within $^{+22}_{-33}$% (No DC bias) (Temp. Range : −55 to +125℃)	The capacitance measurement should be made at each step specified in Table. Step / Temperature (℃) 1 / 25±2 2 / Min. Operating Temp.±3 3 / 25±2 4 / Max. Operating Temp.±2 5 / 25±2 •Pretreatment Perform a heat treatment at 150 $^{+0}_{-10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
9	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
10	Vibration Resistance	Appearance	No defects or abnormalities	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 
		Capacitance	Within the specified tolerance	
		D.F.	0.025 max.	

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

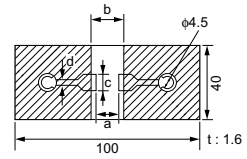
Continued on the following page.

13

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
11	Deflection		No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
12	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). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
13	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor at 120 to 150℃* for 1 min. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •**Immersing speed**: 25±2.5mm/s •**Pretreatment** Perform a heat treatment at 150 $^{+10}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±10%	
		D.F.	0.025 max.	
		I.R.	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
14	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure. •**Pretreatment** Perform a heat treatment at 150 $^{+10}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±7.5%	
		D.F.	0.025 max.	
		I.R.	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •**Pretreatment** Perform a heat treatment at 150 $^{+10}_{0}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	



L×W (mm)	Dimension (mm)			
	a	b	c	d
3.2×1.6	2.2	5.0	2.0	1.0

Fig. 2

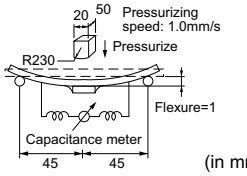


Fig. 3

Step	Temperature (℃)	Time (min.)
1	Min. Operating Temp.±3	30±3
2	Room Temp.	2 to 3
3	Max. Operating Temp.±2	30±3
4	Room Temp.	2 to 3

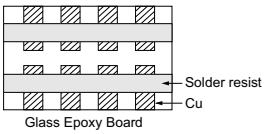


Fig. 4

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

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
16	Life	Appearance	No marking defects	Apply DC350V for 1,000 $^{+48}_{0}$ hrs. at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure. The charge/discharge current is less than 50mA. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
17	Humidity Loading	Appearance	No marking defects	Apply the rated voltage at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	

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

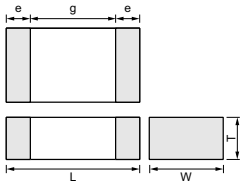
Chip Monolithic Ceramic Capacitors

muRata

AC250V (r.m.s.) Type (Which Meet Japanese Law)

■ Features

1. Chip monolithic ceramic capacitor for AC lines.
2. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
3. Sn-plated external electrodes realizes good solderability.
4. Only for reflow soldering
5. Capacitance 0.01 to 0.1uF for connecting lines and 470 to 4700pF for connecting lines to earth.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA242Q	4.5 ±0.3	2.0 ±0.2	1.5 +0, -0.3	0.3	2.5
GA243D	4.5 ±0.4	3.2 ±0.3	2.0 +0, -0.3		
GA243Q			1.5 +0, -0.3		
GA255D	5.7 ±0.4	5.0 ±0.4	2.0 +0, -0.3		3.2

■ Applications

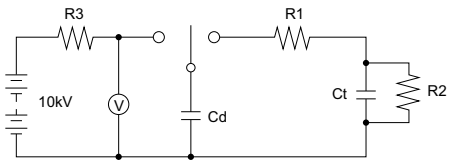
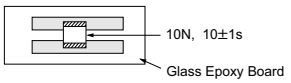
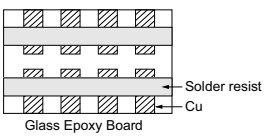
Noise suppression filters for switching power supplies, telephones, facsimiles, modems.

■ Reference Standard

GA2 series obtains no safety approval.
This series is based on the standards of the electrical appliance and material safety law of Japan (separated table 4).

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA242QR7E2471MW01L	AC 250 (r.m.s.)	X7R (EIA)	470pF ±20%	4.5	2.0	1.5	2.5	0.3 min.
GA242QR7E2102MW01L	AC 250 (r.m.s.)	X7R (EIA)	1000pF ±20%	4.5	2.0	1.5	2.5	0.3 min.
GA243QR7E2222MW01L	AC 250 (r.m.s.)	X7R (EIA)	2200pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243QR7E2332MW01L	AC 250 (r.m.s.)	X7R (EIA)	3300pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243DR7E2472MW01L	AC 250 (r.m.s.)	X7R (EIA)	4700pF ±20%	4.5	3.2	2.0	2.5	0.3 min.
GA243QR7E2103MW01L	AC 250 (r.m.s.)	X7R (EIA)	10000pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243QR7E2223MW01L	AC 250 (r.m.s.)	X7R (EIA)	22000pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243DR7E2473MW01L	AC 250 (r.m.s.)	X7R (EIA)	47000pF ±20%	4.5	3.2	2.0	2.5	0.3 min.
GA255DR7E2104MW01L	AC 250 (r.m.s.)	X7R (EIA)	0.10µF ±20%	5.7	5.0	2.0	3.2	0.3 min.

Specifications and Test Methods

No.	Item		Specifications	Test Method
1	Operating Temperature Range		−55 to +125℃	−
2	Appearance		No defects or abnormalities	Visual inspection
3	Dimensions		Within the specified dimensions	Using calipers
4	Dielectric Strength		No defects or abnormalities	No failure should be observed when voltage in table is applied between the terminations for 60±1 sec., provided the charge/discharge current is less than 50mA. Nominal Capacitance: Test Voltage C≧10,000pF: AC575V (r.m.s.) C<10,000pF: AC1500V (r.m.s.)
5	Insulation Resistance (I.R.)		More than 2,000MΩ	The insulation resistance should be measured with DC500±50V and within 60±5 sec. of charging.
6	Capacitance		Within the specified tolerance	The capacitance/D.F. should be measured at a frequency of 1±0.2kHz and a voltage of AC1±0.2V (r.m.s.)
7	Dissipation Factor (D.F.)		0.025 max.	
8	Capacitance Temperature Characteristics		Cap. Change Within ±15% (Temp. Range: −55 to +125℃)	The capacitance measurement should be made at each step specified in Table. Step: Temperature (℃) 1: 25±2 2: Min. Operating Temp.±3 3: 25±2 4: Max. Operating Temp.±2 5: 25±2 •Pretreatment Perform a heat treatment at 150 $^{+0}_{-10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
9	Discharge Test (Application: Nominal Capacitance C<10,000pF)	Appearance	No defects or abnormalities	As in Fig., discharge is made 50 times at 5 sec. intervals from the capacitor (Cd) charged at DC voltage of specified.  Ct: Capacitor under test Cd: 0.001μF R1: 1,000Ω R2: 100MΩ R3: Surge resistance
10	Adhesive Strength of Termination		No removal of the terminations or other defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.  Fig. 1
11	Vibration Resistance	Appearance	No defects or abnormalities	Solder the capacitor to the test jig (glass epoxy board). 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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 
		Capacitance	Within the specified tolerance	
		D.F.	0.025 max.	

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

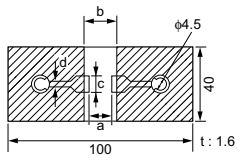
Continued on the following page.

14

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
12	Deflection		No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using 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). Immerse in solder solution for 2±0.5 sec. Immersing speed: 25±2.5mm/s Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder
14	Humidity Insulation	Appearance	No marking defects	The capacitor should be subjected to 40±2℃, relative humidity of 90 to 98% for 8 hrs., and then removed in room condition* for 16 hrs. until 5 cycles.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
15	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor as table. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition* for 24±2 hrs., then measure. •**Immersing speed**: 25±2.5mm/s •**Pretreatment** Perform a heat treatment at 150$^{+18}_{-1}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*. ✻**Preheating**
		Capacitance Change	Within ±10%	
		D.F.	0.025 max.	
		I.R.	More than 2,000MΩ	
		Dielectric Strength	In accordance with item No.4	
16	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hrs. at room condition*, then measure.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 2,000MΩ	
		Dielectric Strength	In accordance with item No.4	•**Pretreatment** Perform a heat treatment at 150$^{+18}_{-1}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.



L×W (mm)	Dimension (mm)			
	a	b	c	d
4.5×2.0	3.5	7.0	2.4	1.0
4.5×3.2	3.5	7.0	3.7	
5.7×5.0	4.5	8.0	5.6	

Fig. 2

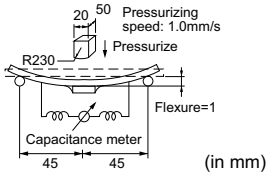


Fig. 3

Step	Temperature	Time
1	100 to 120℃	1 min.
2	170 to 200℃	1 min.

Step	Temperature (℃)	Time (min.)
1	Min. Operating Temp.±3	30±3
2	Room Temp.	2 to 3
3	Max. Operating Temp.±2	30±3
4	Room Temp.	2 to 3

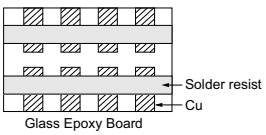


Fig. 4

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

Continued on the following page.

14

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Test Method
17	Humidity (Steady State)	Appearance	No marking defects	Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •Pretreatment Perform a heat treatment at 150 $^{+1.8}_{0}$ ℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
18	Life	Appearance	No marking defects	Apply voltage and time as Table at maximum operating temperature ±3℃. Remove and let sit for 24±2 hrs. at room condition*, then measure. The charge / discharge current is less than 50mA. Nominal Capacitance / Test Time / Test Voltage C≧10,000pF: 1,000 $^{+48}_{0}$ hrs. / AC300V (r.m.s.) C<10,000pF: 1,500 $^{+48}_{0}$ hrs. / AC500V (r.m.s.)* * Except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±20%	
		D.F.	0.05 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	
19	Humidity Loading	Appearance	No marking defects	Apply the rated voltage at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs. Remove and let sit for 24±2 hrs. at room condition*, then measure. •Pretreatment Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.
		Capacitance Change	Within ±15%	
		D.F.	0.05 max.	
		I.R.	More than 1,000MΩ	
		Dielectric Strength	In accordance with item No.4	

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

14

Chip Monolithic Ceramic Capacitors

muRata

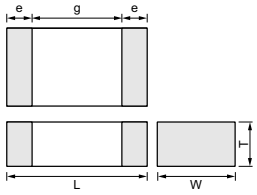
Safety Standard Recognized Type GC (UL, IEC60384-14 Class X1/Y2)

■ Features

1. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC lines.
2. A new monolithic structure for small, high capacitance capable of operating at high voltage levels.
3. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
4. The type GC can be used as an X1-class and Y2-class capacitor, line-by-pass capacitor of UL1414.
5. +125 degree C guaranteed
6. Only for reflow soldering

■ Applications

1. Ideal for use as Y capacitor or X capacitor for various switching power supplies
2. Ideal for modem applications



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA355D	5.7 ±0.4	5.0 ±0.4	2.0 ±0.3	0.3	4.0

■ Standard Recognition

	Standard No.	Class	Rated Voltage
UL	UL1414	Line By-pass	AC250V (r.m.s.)
VDE	IEC 60384-14 EN 60384-14	X1, Y2	
BSI	EN 60065 (14.2) IEC 60384-14 EN 60384-14		
SEMKO	IEC 60384-14 EN 60384-14		
ESTI	EN 60065 IEC 60384-14		

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA355DR7GC101KY02L	AC 250 (r.m.s.)	X7R (EIA)	100 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC151KY02L	AC 250 (r.m.s.)	X7R (EIA)	150 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC221KY02L	AC 250 (r.m.s.)	X7R (EIA)	220 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC331KY02L	AC 250 (r.m.s.)	X7R (EIA)	330 ±10%	5.7	5.0	2.0	4.0	0.3 min.

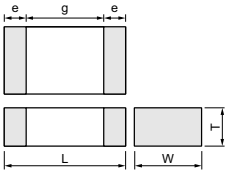
Chip Monolithic Ceramic Capacitors

muRata

Safety Standard Recognized Type GD (IEC60384-14 Class Y3)

■ Features

1. Available for equipment based on IEC/EN60950 and UL1950
2. The type GD can be used as a Y3-class capacitor.
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels
4. +125 degree C guaranteed
5. Only for reflow soldering
6. The low-profile type (thickness: 1.5mm max.) is available. Fit for use on thinner type equipment.



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA342A	4.5 ±0.3	2.0 ±0.2	1.0 +0, -0.3	0.3	2.5
GA342D			2.0 ±0.3		
GA342Q			1.5 +0, -0.3		
GA343D	4.5 ±0.4	3.2 ±0.3	2.0 +0, -0.3		
GA343Q			1.5 +0, -0.3		

■ Applications

1. Ideal for use on line filters and couplings for DAA modems without transformers
2. Ideal for use on line filters for information equipment

■ Standard Recognition

	Standard No.	Class	Rated Voltage
UL	UL 60950-1	Y3	AC250V(r.m.s.)
SEMKO	IEC 60384-14 EN 60384-14		

Applications

Size	Switching power supplies	Communication network devices such as a modem
4.5×3.2mm and under	—	◎

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA342D1XGD100JY02L	AC 250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD120JY02L	AC 250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD150JY02L	AC 250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD180JY02L	AC 250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD220JY02L	AC 250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGD270JW31L	AC 250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD330JW31L	AC 250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD390JW31L	AC 250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD470JW31L	AC 250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD560JW31L	AC 250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD680JW31L	AC 250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD820JW31L	AC 250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GD101KW01L	AC 250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD151KW01L	AC 250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD221KW01L	AC 250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD331KW01L	AC 250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD471KW01L	AC 250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD681KW01L	AC 250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD102KW01L	AC 250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD152KW01L	AC 250 (r.m.s.)	X7R (EIA)	1500 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA343QR7GD182KW01L	AC 250 (r.m.s.)	X7R (EIA)	1800 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343QR7GD222KW01L	AC 250 (r.m.s.)	X7R (EIA)	2200 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343DR7GD472KW01L	AC 250 (r.m.s.)	X7R (EIA)	4700 ±10%	4.5	3.2	2.0	2.5	0.3 min.

Chip Monolithic Ceramic Capacitors

muRata

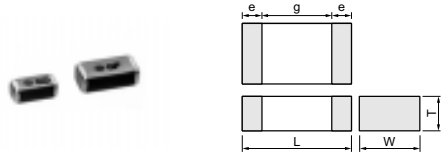
Safety Standard Recognized Type GF (IEC60384-14 Class Y2, X1/Y2)

■ Features

1. Available for equipment based on IEC/EN60950 and UL1950. Besides, the GA352/355 types are available for equipment based on IEC/EN60065, UL1492, and UL6500
2. The type GF can be used as a Y2-class capacitor.
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels
4. +125 degree C guaranteed
5. Only for reflow soldering
6. The low-profile type (thickness: 1.5mm max.) is available. Fit for use on thinner type equipment.

■ Applications

1. Ideal for use on line filters and couplings for DAA modems without transformers
2. Ideal for use on line filters for information equipment
3. Ideal for use as Y capacitor or X capacitor for various switching power supplies (GA352/355 types only)



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA342A	4.5 ±0.3	2.0 ±0.2	1.0 +0, -0.3	0.3	2.5
GA342D			2.0 ±0.2*		
GA342Q			1.5 +0, -0.3		
GA352Q	5.7 ±0.4	2.8 ±0.3	1.5 +0, -0.3		4.0
GA355D		5.0 ±0.4	2.0 +0, -0.3		
GA355Q			1.5 +0, -0.3		

*GA342D1X : 2.0±0.3

■ Standard Recognition

	Standard No.	Class	Status of Recognition		Rated Voltage
			Size : 4.5×2.0mm	Size : 5.7×2.8mm and over	
UL	UL1414	X1, Y2	—	◎	AC250V (r.m.s.)
	UL 60950-1	—	◎	—	
VDE	IEC 60384-14	X1, Y2	—	◎	
SEMKO	EN 60384-14	Y2	◎	◎	

Applications

Size	Switching power supplies	Communication network devices such as a modem
4.5×2.0mm	—	◎
5.7×2.8mm and over	◎	◎

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA342D1XGF100JY02L	AC 250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF120JY02L	AC 250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF150JY02L	AC 250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF180JY02L	AC 250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF220JY02L	AC 250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGF270JW31L	AC 250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF330JW31L	AC 250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF390JW31L	AC 250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF470JW31L	AC 250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF560JW31L	AC 250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF680JW31L	AC 250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF820JW31L	AC 250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GF101KW01L	AC 250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GF151KW01L	AC 250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342DR7GF221KW02L	AC 250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342DR7GF331KW02L	AC 250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342QR7GF471KW01L	AC 250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF471KW01L	AC 250 (r.m.s.)	X7R (EIA)	470 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342QR7GF681KW01L	AC 250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF681KW01L	AC 250 (r.m.s.)	X7R (EIA)	680 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342DR7GF102KW02L	AC 250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA352QR7GF102KW01L	AC 250 (r.m.s.)	X7R (EIA)	1000 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA352QR7GF152KW01L	AC 250 (r.m.s.)	X7R (EIA)	1500 ±10%	5.7	2.8	1.5	4.0	0.3 min.

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Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA355QR7GF182KW01L	AC 250 (r.m.s.)	X7R (EIA)	1800 ±10%	5.7	5.0	1.5	4.0	0.3 min.
GA355QR7GF222KW01L	AC 250 (r.m.s.)	X7R (EIA)	2200 ±10%	5.7	5.0	1.5	4.0	0.3 min.
GA355QR7GF332KW01L	AC 250 (r.m.s.)	X7R (EIA)	3300 ±10%	5.7	5.0	1.5	4.0	0.3 min.
GA355DR7GF472KW01L	AC 250 (r.m.s.)	X7R (EIA)	4700 ±10%	5.7	5.0	2.0	4.0	0.3 min.

Chip Monolithic Ceramic Capacitors

muRata

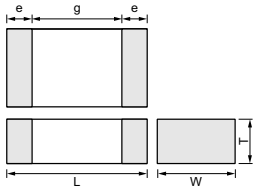
Safety Standard Recognized Type GB (IEC60384-14 Class X2)

■ Features

1. The type GB can be used as an X2-class capacitor.
2. Chip monolithic ceramic capacitor (certified as conforming to safety standards) for AC lines
3. A new monolithic structure for small, high capacitance capable of operating at high voltage levels
4. Compared to lead type capacitors, this new capacitor is greatly downsized and low-profiled to 1/10 or less in volume, and 1/4 or less in height.
5. +125 degree C guaranteed
6. Only for reflow soldering

■ Applications

Ideal for use as X capacitor for various switching power supplies



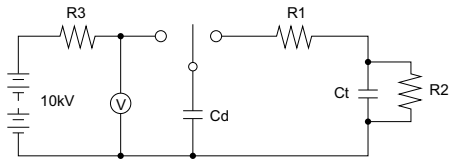
Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GA355Q	5.7 ±0.4	5.0 ±0.4	1.5 +0,-0.3	0.3	3.0
GA355D			2.0 +0,-0.3		
GA355E			2.5 +0,-0.3		
GA355X			2.9 +0,-0.4		

■ Standard Recognition

	Standard No.	Class	Rated Voltage
VDE	IEC 60384-14 EN 60384-14	X2	AC250V (r.m.s.)
SEMKO			
ESTI			

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode e (mm)
GA355QR7GB103KW01L	AC 250 (r.m.s.)	X7R (EIA)	10000 ±10%	5.7	5.0	1.5	3.0	0.3 min.
GA355QR7GB153KW01L	AC 250 (r.m.s.)	X7R (EIA)	15000 ±10%	5.7	5.0	1.5	3.0	0.3 min.
GA355DR7GB223KW01L	AC 250 (r.m.s.)	X7R (EIA)	22000 ±10%	5.7	5.0	2.0	3.0	0.3 min.
GA355ER7GB333KW01L	AC 250 (r.m.s.)	X7R (EIA)	33000 ±10%	5.7	5.0	2.5	3.0	0.3 min.
GA355ER7GB473KW01L	AC 250 (r.m.s.)	X7R (EIA)	47000 ±10%	5.7	5.0	2.5	3.0	0.3 min.
GA355XR7GB563KW06L	AC 250 (r.m.s.)	X7R (EIA)	56000 ±10%	5.7	5.0	2.9	3.0	0.3 min.

GA3 Series Specifications and Test Methods

<table>
<tr><th>No.</th><th>Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>−55 to +125℃</td><td>−</td></tr>
<tr><td>2</td><td>Appearance</td><td>No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>3</td><td>Dimensions</td><td>Within the specified dimensions</td><td>Using calipers</td></tr>
<tr><td>4</td><td>Dielectric Strength</td><td>No defects or abnormalities</td><td>No failure should be observed when voltage in table is applied between the terminations for 60±1 sec., provided the charge/discharge current is less than 50mA.
<table><tr><th></th><th>Test Voltage</th></tr><tr><td>Type GB</td><td>DC1075V</td></tr><tr><td>Type GC/GD/GF</td><td>AC1500V (r.m.s.)</td></tr></table></td></tr>
<tr><td>5</td><td>Pulse Voltage (Application: Type GD/GF)</td><td>No self healing breakdowns or flash-overs have taken place in the capacitor.</td><td>10 impulse of alternating polarity is subjected.
(5 impulse for each polarity)
The interval between impulse is 60 sec.
Applied Voltage: 2.5kV zero to peak</td></tr>
<tr><td>6</td><td>Insulation Resistance (I.R.)</td><td>More than 6,000MΩ</td><td>The insulation resistance should be measured with DC500±50V and within 60±5 sec. of charging.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance/Q/D.F. should be measured at a frequency of 1±0.2kHz (SL char.: 1±0.2MHz) and a voltage of AC1±0.2V (r.m.s.)</td></tr>
<tr><td>8</td><td>Dissipation Factor (D.F.)
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≦0.025</td></tr><tr><td>SL</td><td>Q≧400+20C*2 (C<30pF)
Q≧1000 (C≧30pF)</td></tr></table></td></tr>
<tr><td>9</td><td>Capacitance Temperature Characteristics</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr></table>Temperature characteristic guarantee is −55 to +125℃
<table><tr><th>Char.</th><th>Temperature Coefficient</th></tr><tr><td>SL</td><td>+350 to −1000ppm/℃</td></tr></table>Temperature characteristic guarantee is +20 to +85℃</td><td>The capacitance measurement should be made at each step specified in Table.
<table><tr><th>Step</th><th>Temperature (℃)</th></tr><tr><td>1</td><td>25±2 (20±2 for SL char.)</td></tr><tr><td>2</td><td>Min. Operating Temp.±3</td></tr><tr><td>3</td><td>25±2 (20±2 for SL char.)</td></tr><tr><td>4</td><td>Max. Operating Temp.±2</td></tr><tr><td>5</td><td>25±2 (20±2 for SL char.)</td></tr></table>SL char. :
The capacitance should be measured at even 85℃ between step 3 and step 4.
•Pretreatment for X7R char.
Perform a heat treatment at 150 +1 −8 ℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Discharge Test (Application: Type GC)</td><td>Appearance</td><td>No defects or abnormalities</td><td rowspan="3">As in Fig., discharge is made 50 times at 5 sec. intervals from the capacitor (Cd) charged at DC voltage of specified.
 

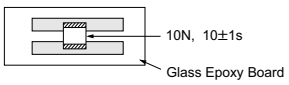
Ct: Capacitor under test Cd: 0.001μF
R1: 1,000Ω R2: 100MΩ R3: Surge resistance</td></tr>
<tr><td>I.R.</td><td>More than 1,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
<tr><td>11</td><td colspan="2">Adhesive Strength of Termination</td><td>No removal of the terminations or other defect should occur.</td><td>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1.
Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
 

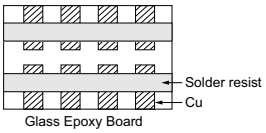
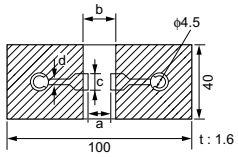
Fig. 1</td></tr>
</table>

*1 "Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa
*2 "C" expresses nominal capacitance value (pF).

Continued on the following page.

GA3 Series Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="3">12</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No defects or abnormalities</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board).
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 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.).
 
</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≦0.025</td></tr><tr><td>SL</td><td>Q≧400+20C*2 (C<30pF)
Q≧1000 (C≧30pF)</td></tr></table></td></tr>
<tr><td>13</td><td colspan="2">Deflection</td><td>No cracking or marking defects should occur.
 

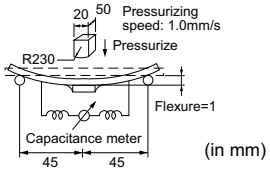
<table><tr><th rowspan="2">L×W (mm)</th><th colspan="4">Dimension (mm)</th></tr><tr><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>4.5×2.0</td><td>3.5</td><td>7.0</td><td>2.4</td><td rowspan="4">1.0</td></tr><tr><td>4.5×3.2</td><td>3.5</td><td>7.0</td><td>3.7</td></tr><tr><td>5.7×2.8</td><td>4.5</td><td>8.0</td><td>3.2</td></tr><tr><td>5.7×5.0</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table>Fig. 2</td><td>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2.
Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
 

Fig. 3</td></tr>
<tr><td>14</td><td colspan="2">Solderability of Termination</td><td>75% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion).
Immerse in solder solution for 2±0.5 sec.
Immersing speed: 25±2.5mm/s
Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu)
235±5°C H60A or H63A Eutectic Solder</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Resistance to Soldering Heat</td><td>Appearance</td><td>No marking defects</td><td rowspan="4">Preheat the capacitor as table. Immerse the capacitor in solder solution at 260±5℃ for 10±1 sec. Let sit at room condition*1 for 24±2 hrs., then measure.
•Immersing speed: 25±2.5mm/s
•Pretreatment for X7R char.
Perform a heat treatment at 150 $^{+}_{-10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.

*Preheating
<table><tr><th>Step</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>100 to 120℃</td><td>1 min.</td></tr><tr><td>2</td><td>170 to 200℃</td><td>1 min.</td></tr></table></td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±10%</td></tr><tr><td>SL</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>More than 1,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
</table>

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

*2 "C" expresses nominal capacitance value (pF).

Continued on the following page.

GA3 Series Specifications and Test Methods

Continued from the preceding page.

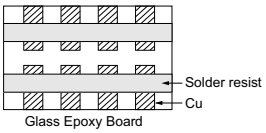
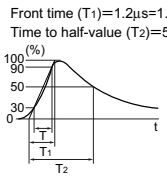
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="5">16</td><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4.
Perform the 5 cycles according to the 4 heat treatments listed in the following table.
Let sit for 24±2 hrs. at room condition*1, then measure.
<table><tr><th>Step</th><th>Temperature (℃)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. Operating Temp.±3</td><td>30±3</td></tr><tr><td>2</td><td>Room Temp.</td><td>2 to 3</td></tr><tr><td>3</td><td>Max. Operating Temp.±2</td><td>30±3</td></tr><tr><td>4</td><td>Room Temp.</td><td>2 to 3</td></tr></table>•Pretreatment for X7R char.
Perform a heat treatment at 150 $^{+}_{-}{}^{0}_{10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.
 

Fig. 4</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>SL</td><td>Within ±2.5% or ±0.25pF (Whichever is larger)</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≦0.05</td></tr><tr><td>SL</td><td>Q≧400+20C*2 (C<30pF)
Q≧1000 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>More than 3,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
<tr><td rowspan="5">17</td><td rowspan="5">Humidity (Steady State)</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Before this test, the test shown in the following is performed.
·Item 11 Adhesive Strength of Termination (applied force is 5N)
·Item 13 Deflection

Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% for 500 $^{+24}_{0}$ hrs.
Remove and let sit for 24±2 hrs. at room condition*1, then measure.
•Pretreatment for X7R char.
Perform a heat treatment at 150 $^{+}_{-}{}^{0}_{10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±15%</td></tr><tr><td>SL</td><td>Within ±5.0% or ±0.5pF (Whichever is larger)</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≦0.05</td></tr><tr><td>SL</td><td>Q≧275+5/2C*2 (C<30pF)
Q≧350 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>More than 3,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
<tr><td rowspan="5">18</td><td rowspan="5">Life</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Before this test, the test shown in the following is performed.
·Item 11 Adhesive Strength of Termination (apply force is 5N)
·Item 13 Deflection

Impulse Voltage
Each individual capacitor should be subjected to a 2.5kV (Type GC/GF: 5kV) Impulse (the voltage value means zero to peak) for three times. Then the capacitors are applied to life test.
 

Apply voltage as Table for 1,000 hrs. at 125 $^{+2}_{0}$℃, relative humidity 50% max.
<table><tr><th>Type</th><th>Applied Voltage</th></tr><tr><td>GB</td><td>AC312.5V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.</td></tr><tr><td>GC
GD
GF</td><td>AC425V (r.m.s.), except that once each hour the voltage is increased to AC1,000V (r.m.s.) for 0.1 sec.</td></tr></table>Let sit for 24±2 hrs. at room condition*1, then measure.
•Pretreatment for X7R char.
Perform a heat treatment at 150 $^{+}_{-}{}^{0}_{10}$℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>X7R</td><td>Within ±20%</td></tr><tr><td>SL</td><td>Within ±3.0% or ±0.3pF (Whichever is larger)</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>X7R</td><td>D.F.≦0.05</td></tr><tr><td>SL</td><td>Q≧275+5/2C*2 (C<30pF)
Q≧350 (C≧30pF)</td></tr></table></td></tr>
<tr><td>I.R.</td><td>More than 3,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
</table>

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

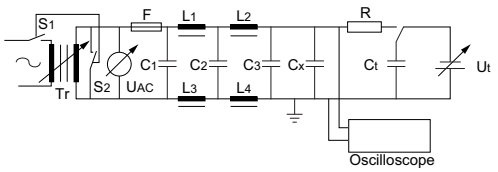
*2 "C" expresses nominal capacitance value (pF).

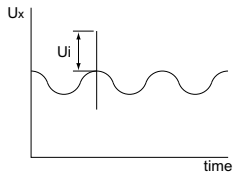
Continued on the following page.

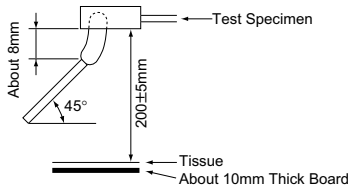
GA3 Series Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="5">19</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marking defects</td><td rowspan="5">Before this test, the test shown in the following is performed.
·Item 11 Adhesive Strength of Termination (apply force is 5N)
·Item 13 Deflection

Apply the rated voltage at 40±2℃ and relative humidity of 90 to 95% for 500 +24 0 hrs. Remove and let sit for 24±2 hrs. at room condition*1, then measure.
•Pretreatment for X7R char.
Perform a heat treatment at 150 +0 -10 ℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*1.</td></tr>
<tr><td>Capacitance Change</td><td>Char. | Capacitance Change
X7R | Within ±15%
SL | Within ±5.0% or ±0.5pF (Whichever is larger)</td></tr>
<tr><td>D.F.
Q</td><td>Char. | Specification
X7R | D.F.≦0.05
SL | Q≧275+5/2C*2 (C<30pF)
Q≧350 (C≧30pF)</td></tr>
<tr><td>I.R.</td><td>More than 3,000MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>In accordance with item No.4</td></tr>
<tr><td>20</td><td colspan="2">Active Flammability</td><td>The cheesecloth should not be on fire.</td><td>The capacitor should be individually wrapped in at least one but not more than two complete layers of cheesecloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 sec. The UAC should be maintained for 2 min. after the last discharge.
 

C1,2 : 1μF±10% C3 : 0.033μF±5% 10kV
L1 to 4 : 1.5mH±20% 16A Rod core choke
Ct : 3μF±5% 10kV R : 100Ω±2%
Cx : Capacitor under test UAC : UR±5%
F : Fuse, Rated 16A UR : Rated Voltage
Ut : Voltage applied to Ct
 

Type | Ui
GB, GD | 2.5kV
GC, GF | 5kV</td></tr>
<tr><td>21</td><td colspan="2">Passive Flammability</td><td>The burning time should not exceed 30 sec.
The tissue paper should not ignite.</td><td>The capacitor under test should be held in the flame in the position which best promotes burning. Each specimen should only be exposed once to the flame. Time of exposure to flame: 30 sec.
Length of flame : 12±1mm
Gas burner : Length 35mm min.
Inside Dia. 0.5±0.1mm
Outside Dia. 0.9mm max.
Gas : Butane gas Purity 95% min.
 
</td></tr>
</table>

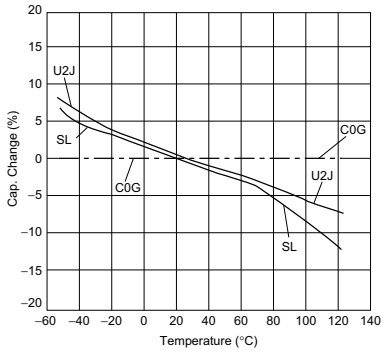
*1 "Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

*2 "C" expresses nominal capacitance value (pF).

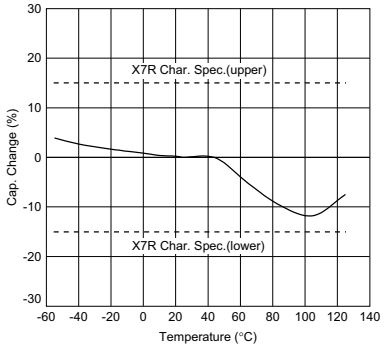
GRM/GR4/GR7/GA2/GA3 Series Data (Typical Example)

■ Capacitance - Temperature Characteristics

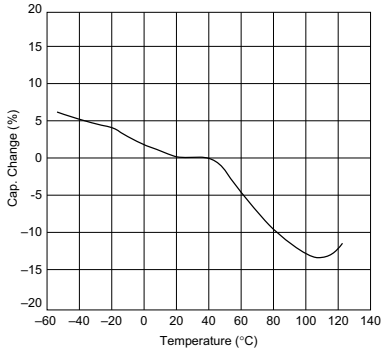
C0G/U2J/SL Characteristics



X7R Characteristics

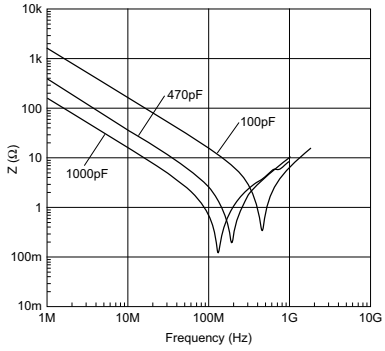


GR4 Series

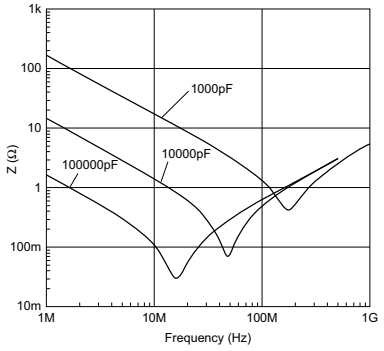


■ Impedance - Frequency Characteristics

GRM Series (C0G Char. 630V)



GRM Series (X7R Char. 250V)



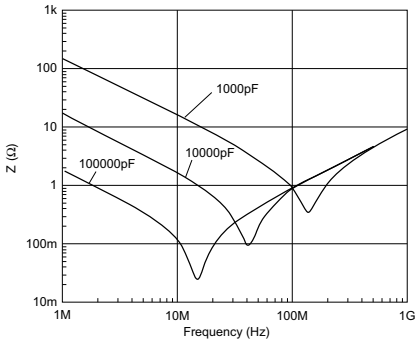
Continued on the following page.

GRM/GR4/GR7/GA2/GA3 Series Data (Typical Example)

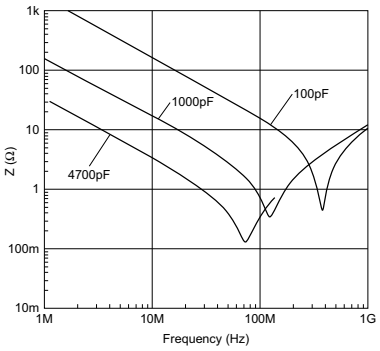
Continued from the preceding page.

■ Impedance - Frequency Characteristics

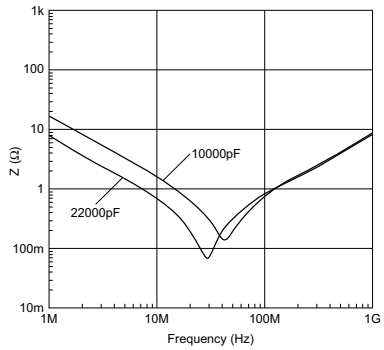
GRM Series (X7R Char. 630V)



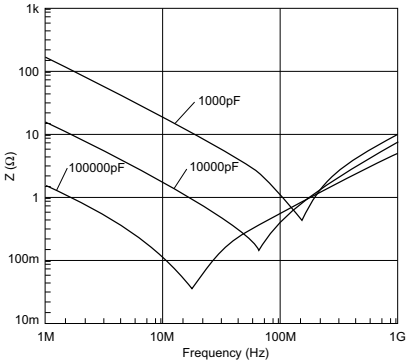
GR4 Series



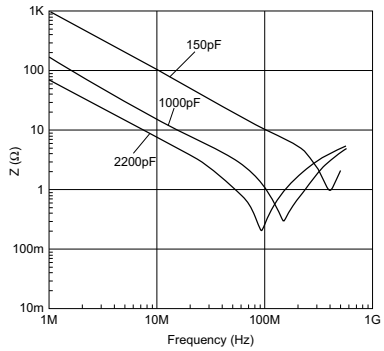
GR7 Series



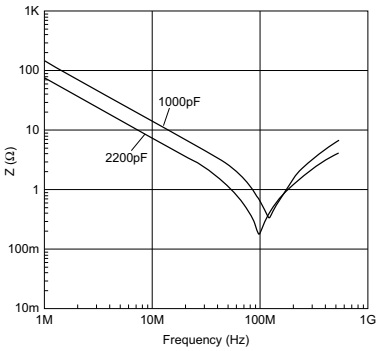
GA2 Series



GA3 Series (Type GD)



GA3 Series (Type GF)



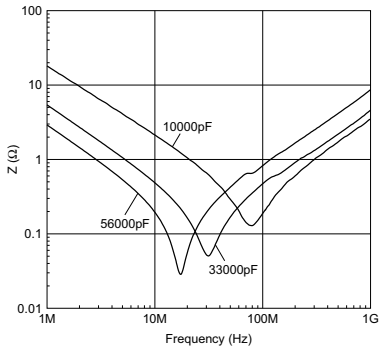
Continued on the following page.

GRM/GR4/GR7/GA2/GA3 Series Data (Typical Example)

Continued from the preceding page.

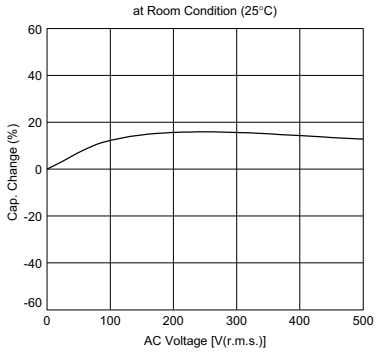
■ Impedance - Frequency Characteristics

GA3 Series (Type GB)

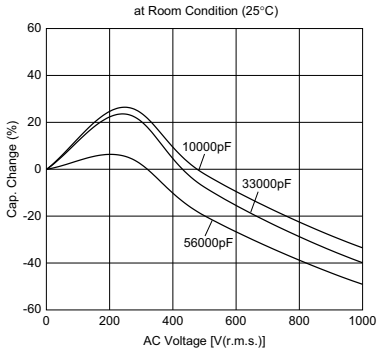


■ Capacitance - AC Voltage Characteristics

GA3 Series (Type GD/GF, X7R char.)



GA3 Series (Type GB)



Package

Taping is standard packaging method.

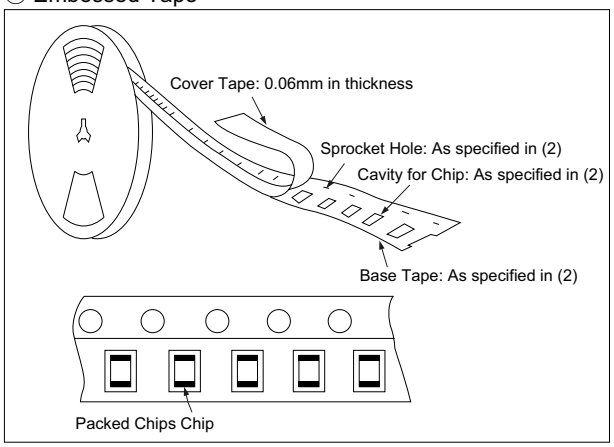
■ Minimum Quantity Guide

Part Number		Dimensions (mm)			Quantity (pcs.)	
					ø180mm Reel	
		L	W	T	Paper Tape	Embossed Tape
Medium Voltage	GRM18	1.6	0.8	0.8	4,000	-
	GRM21	2.0	1.25	1.0	4,000	-
				1.25	-	3,000
	GRM31/GR731	3.2	1.6	1.0	4,000	-
				1.25	-	3,000
				1.6	-	2,000
	GRM32	3.2	2.5	1.0	4,000	-
				1.25	-	3,000
				1.5	-	2,000
				2.0	-	1,000
	GRM42/GR442	4.5	2.0	1.0	-	3,000
				1.5	-	2,000
				2.0	-	2,000
	GRM43/GR443	4.5	3.2	1.5	-	1,000
				2.0	-	1,000
				2.5	-	500
	GRM55/GR455	5.7	5.0	2.0	-	1,000
AC250V	GA242	4.5	2.0	1.5	-	2,000
	GA243	4.5	3.2	1.5	-	1,000
				2.0	-	1,000
	GA255	5.7	5.0	2.0	-	1,000
Safety Std. Recognition	GA342	4.5	2.0	1.0	-	3,000
				1.5	-	2,000
				2.0	-	2,000
	GA343	4.5	3.2	1.5	-	1,000
				2.0	-	1,000
	GA352	5.7	2.8	1.5	-	1,000
	GA355	5.7	5.0	1.5	-	1,000
				2.0	-	1,000
				2.5	-	500
				2.7	-	500
				2.9	-	500

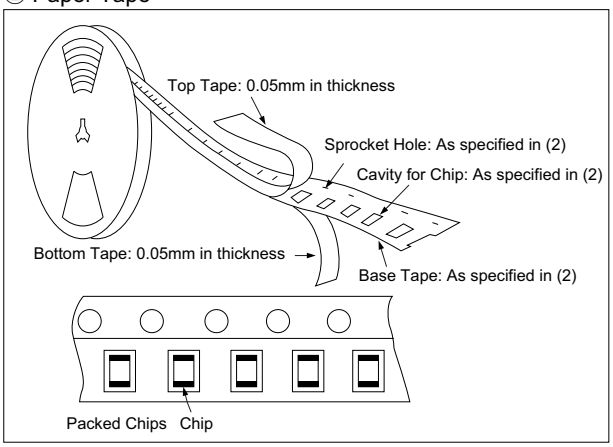
■ Tape Carrier Packaging

(1) Appearance of Taping

① Embossed Tape



② Paper Tape



Continued on the following page.

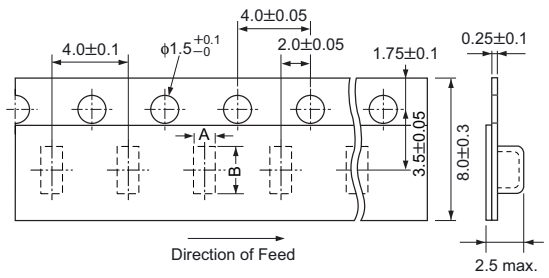
Package

Continued from the preceding page.

(2) Dimensions of Tape

① Embossed Tape

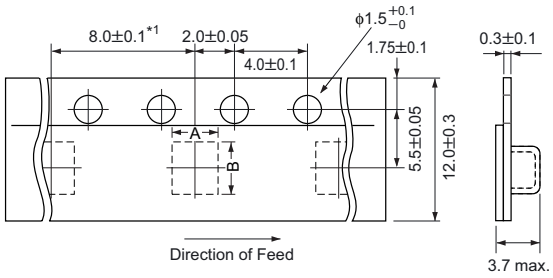
8mm width 4mm pitch Tape



Part Number	A*	B*
GRM21 (T≦1.25mm)	1.45	2.25
GRM31/GR731 (T≦1.25mm)	2.0	3.6
GRM32 (T≦1.25mm)	2.9	3.6

*Nominal Value

12mm width 8mm/4mm pitch Tape



Part Number	A*	B*
GRM42/GR442/GA242/GA342	2.5	5.1
GRM43/GR443/GA243/GA343	3.6	4.9
GA352	3.2	6.1
GRM55/GR455/GA255/GA355	5.4	6.1

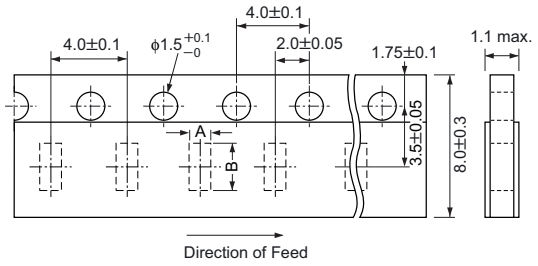
*1 4.0±0.1mm in case of GRM42/GR442/GA242/GA342

*Nominal Value

(in mm)

② Paper Tape

8mm width 4mm pitch Tape

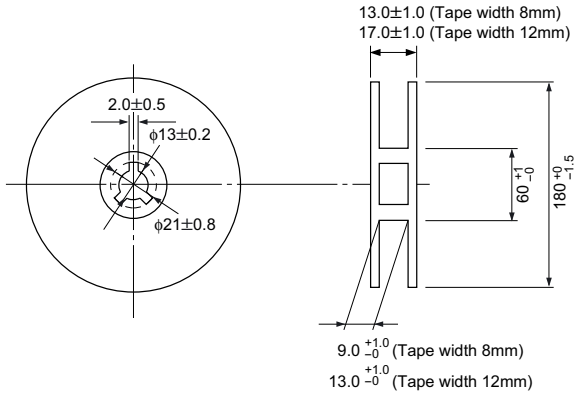


Part Number	A*	B*
GRM18	1.05	1.85
GRM21 (T=1.0mm)	1.45	2.25
GRM31/GR731 (T=1.0mm)	2.0	3.6
GRM32 (T=1.0mm)	2.9	3.6

*Nominal Value

(in mm)

(3) Dimensions of Reel



(in mm)

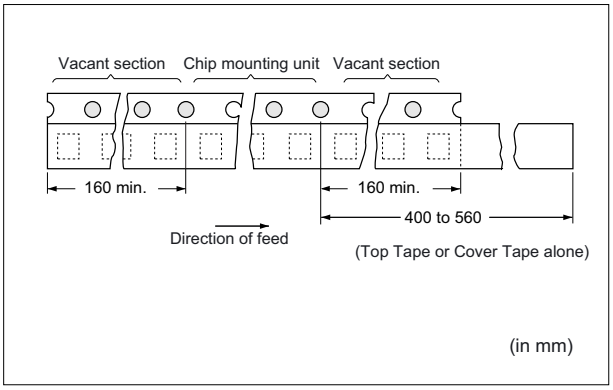
Continued on the following page.

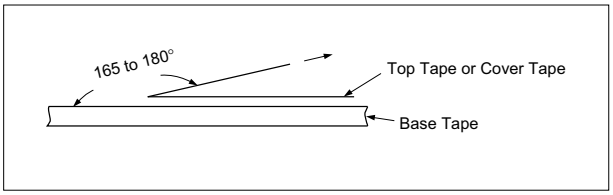
Package

Continued from the preceding page.

(4) Taping Method

① Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
② Part of the leader and part of the empty tape should be attached to the end of the tape as shown at right.
③ The top tape or cover tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
④ Missing capacitors number within 0.1% of the number per reel or 1 pc, whichever is greater, and are not continuous.
⑤ The top tape or cover tape and bottom tape should not protrude beyond the edges of the tape and should not cover sprocket holes.
⑥ Cumulative tolerance of sprocket holes, 10 pitches: ±0.3mm.
⑦ Peeling off force: 0.1 to 0.6N in the direction shown at right.





⚠Caution

■ Storage and Operating Conditions

Operating and storage environment

Do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade and 20 to 70%.

Use capacitors within 6 months after delivered.
Check the solderability after 6 months or more.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

■ Handling

1. Vibration and impact
   Do not expose a capacitor to excessive shock or vibration during use.
2. Do not directly touch the chip capacitor, especially the ceramic body. Residue from hands/fingers may create a short circuit environment.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

⚠Caution

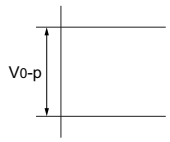
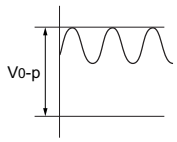
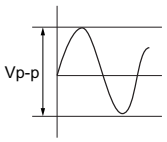
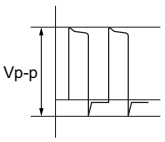
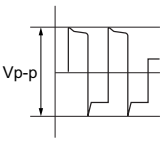
■ Caution (Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the Vo-p which contains DC bias within the rated voltage range.

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When DC-rated capacitors are to be used in input circuits from commercial power source (AC filter), be sure to use Safety Recognized Capacitors because various regulations on withstand voltage or impulse withstand established for each equipment should be taken into considerations.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

2. Operating Temperature, Self-generated Heat, and Load Reduction at High-frequency Voltage Condition

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency voltage, pulse voltage, it may self-generate heat due to dielectric loss.

(1) In case of X7R char.

Applied voltage should be the load such as self-generated heat is within 20°C on the condition of atmosphere temperature 25°C. When measuring, use a thermocouple of small thermal capacity -K of ø0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

Continued on the following page.

⚠Caution

Continued from the preceding page.

(2) In case of C0G, U2J char.

Due to the low self-heating characteristics of low-dissipation capacitors, the allowable electric power of these capacitors is generally much higher than that of X7R characteristic capacitors.

When a high frequency voltage which cause 20°C self heating to the capacitor is applied, it will exceed capacitor's allowable electric power.

The frequency of the applied sine wave voltage should be less than 500kHz (less than 100kHz in case of rated voltage: DC3.15kV). The applied voltage should be less than the value shown in figure below.

While, in case of non-sine wave which include a harmonic frequency, please contact our sales representatives or product engineers. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

<C0G char., Rated Voltage: DC3.15kV>

The capacitors less than 22pF can be applied maximum 4.0kV peak to peak at 100kHz or less only for the ballast or the resonance usage in the LCD backlight inverter circuit.

<Capacitor Selection Tool>

We are also offering free software the "capacitor selection tool: Murata Medium Voltage Capacitors Selection Tool by Voltage Form (*)" which will assist you in selecting a suitable capacitor.

The software can be downloaded from Murata's Internet Website.

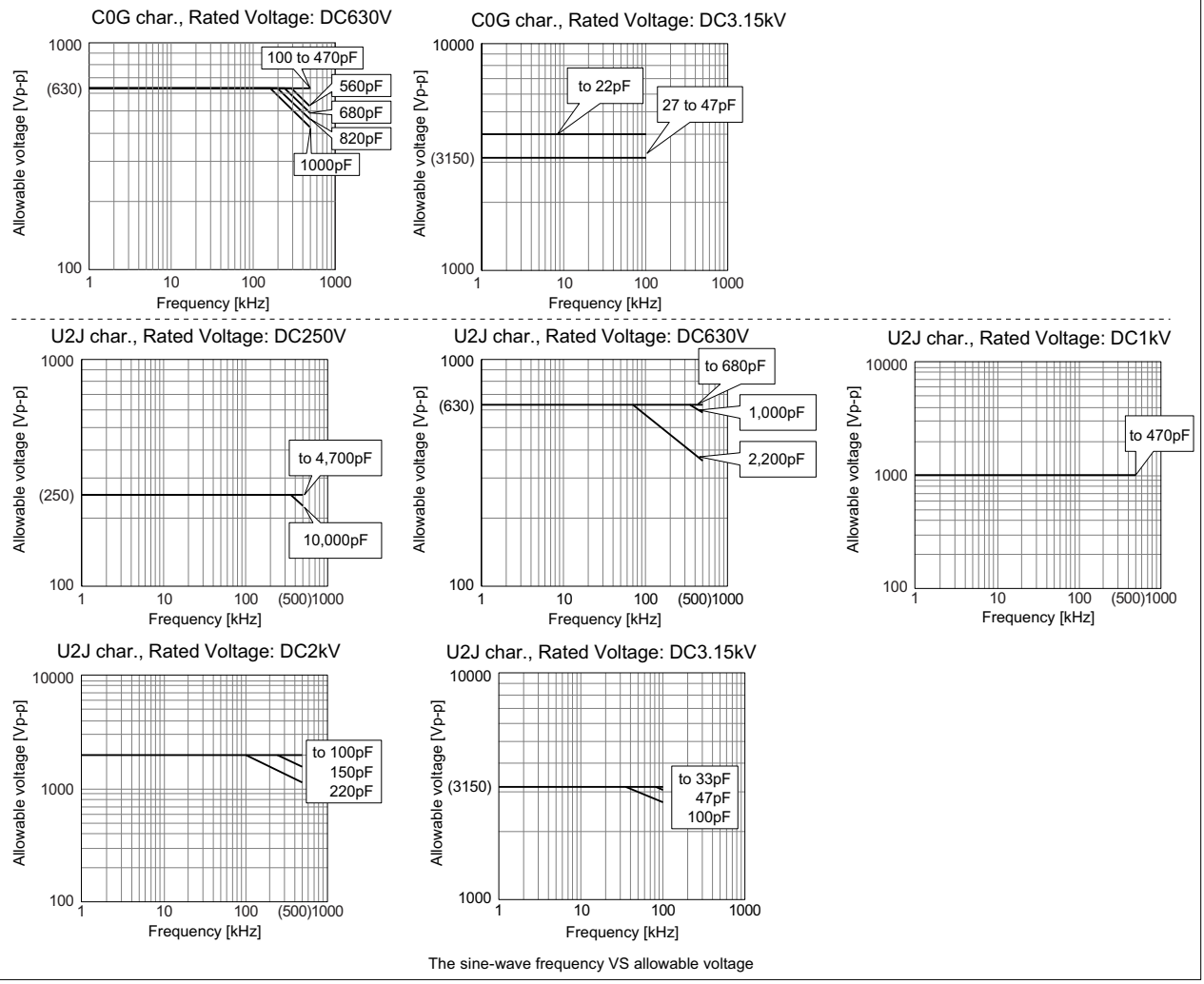
(http://www.murata.com/designlib/mmcsv_e.html).

By inputting capacitance values and applied voltage waveform of the specific capacitor series, this software will calculate the capacitor's power consumption and list suitable capacitors (non-sine wave is also available).

* Subject series are below.

· Temperature Characteristics C0G, U2J

The temperature of the surface of capacitor: 125˚C or less (including self-heating)



The sine-wave frequency VS allowable voltage

Continued on the following page.

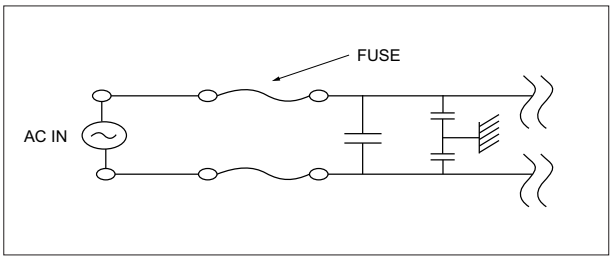
⚠Caution

Continued from the preceding page.

3. Fail-safe

Failure of a capacitor may result in a short circuit. Be sure to provide an appropriate fail-safe function such as a fuse on your product to help eliminate possible electric shock, fire, or fumes.

Please consider using fuses on each AC line if the capacitors are used between the AC input lines and earth (line bypass capacitors), to prepare for the worst case, such as a short circuit.



4. Test Condition for AC Withstanding Voltage

(1) Test Equipment

Tests for AC withstanding voltage should be made with equipment capable of creating a wave similar to a 50/60 Hz sine wave.

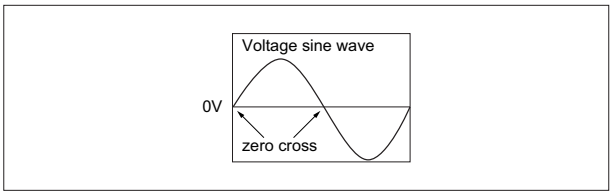
If the distorted sine wave or overload exceeding the specified voltage value is applied, a defect may be caused.

(2) Voltage Applied Method

The capacitor's leads or terminals should be firmly connected to the output of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage. If the test voltage is applied directly to the capacitor without raising it from near zero, it should be applied with the zero cross*. At the end of the test time, the test voltage should be reduced to near zero, and then the capacitor's leads or terminals should be taken off the output of the withstanding voltage test equipment. If the test voltage is applied directly to the capacitor without raising it from near zero, surge voltage may occur and cause a defect.

*ZERO CROSS is the point where voltage sine wave pass 0V.

- See the figure at right -



FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

⚠Caution

■ Caution (Soldering and Mounting)

1. Vibration and Impact

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

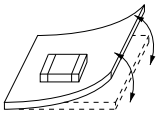
2. Circuit Board Material

It is possible for the chip to crack by the expansion and shrinkage of a metal board.
Please contact us if you want to use our ceramic capacitors on a metal board such as Aluminum.

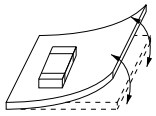
3. Land Layout for Cropping PC Board

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

[Component Direction]



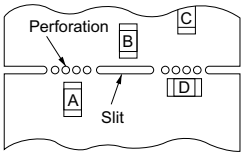
<Example to be avoided>



<Examples of improvements>

Locate chip horizontal to the direction in which stress acts.

[Chip Mounting Close to Board Separation Point]



Chip arrangement
Worst A>C>B~D Best

Continued on the following page.

⚠Caution

Continued from the preceding page.

4. Reflow Soldering

- When sudden heat is given to the components, the mechanical strength of the components should go down because remarkable temperature change causes deformity of components inside. In order to prevent mechanical damage in the components, preheating should be required for both of the components and the PCB board. Preheating conditions are shown in Table 1. It is required to keep temperature differential between the soldering and the components surface (ΔT) as small as possible.
- Solderability of Tin plating termination chip might be deteriorated when low temperature soldering profile where peak solder temperature is below the Tin melting point is used. Please confirm the solderability of Tin plating termination chip before use.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and solvent within the range shown in the Table 1.

Table 1

Part Number	Temperature Differential
G□□18/21/31	ΔT≦190℃
G□□32/42/43/52/55	ΔT≦130℃

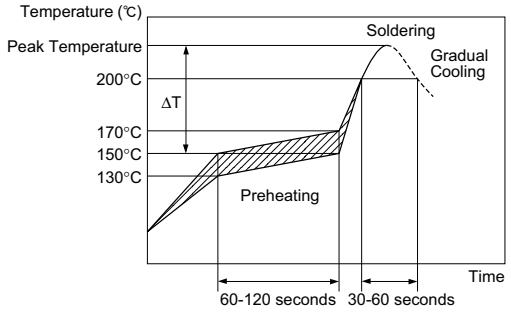
Recommended Conditions

	Pb-Sn Solder		Lead Free Solder
	Infrared Reflow	Vapor Reflow	
Peak Temperature	230-250°C	230-240°C	240-260°C
Atmosphere	Air	Air	Air or N_2

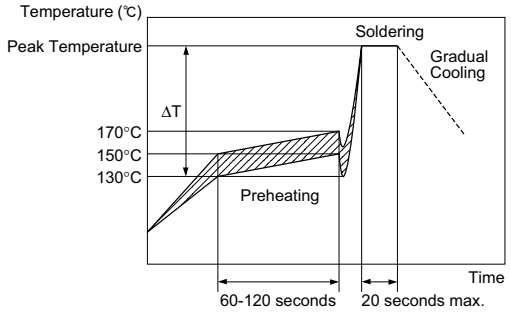
Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

[Standard Conditions for Reflow Soldering]

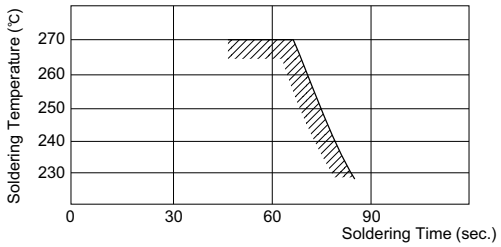
Infrared Reflow



Vapor Reflow



[Allowable Soldering Temperature and Time]

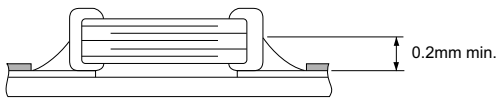


In case of repeated soldering, the accumulated soldering time must be within the range shown above.

Optimum Solder Amount for Reflow Soldering

- Overly thick application of solder paste results in excessive fillet height solder.
  This makes the chip more susceptible to mechanical and thermal stress on the board and may cause cracked chips.
- Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
- Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm min.

[Optimum Solder Amount for Reflow Soldering]



in section

Inverting the PCB

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

Continued on the following page.

⚠Caution

Continued from the preceding page.

5. Flow Soldering

- When sudden heat is given to the components, the mechanical strength of the components should go down because remarkable temperature change causes deformity of components inside. And an excessively long soldering time or high soldering temperature results in leaching by the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
- In order to prevent mechanical damage in the components, preheating should be required for both of the components and the PCB board. Preheating conditions are shown in Table 2. It is required to keep temperature differential between the soldering and the components surface (ΔT) as small as possible.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference between the component and solvent within the range shown in Table 2.
  Do not apply flow soldering to chips not listed in Table 2.

Table 2

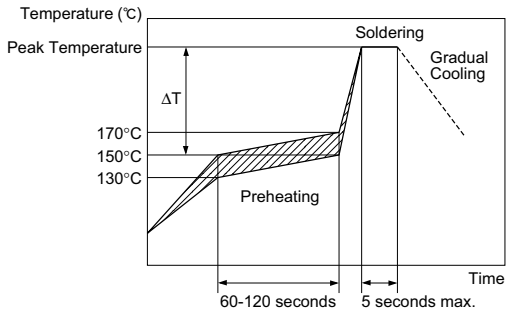
Part Number	Temperature Differential
G□□18/21/31	ΔT≦150℃

Recommended Conditions

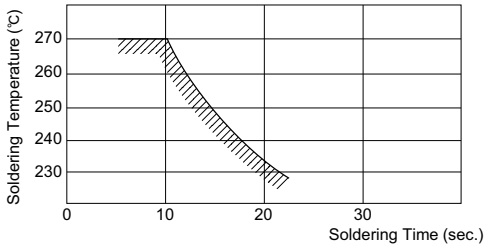
	Pb-Sn Solder	Lead Free Solder
Peak Temperature	240-250℃	250-260℃
Atmosphere	Air	N_2

Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

[Standard Conditions for Flow Soldering]

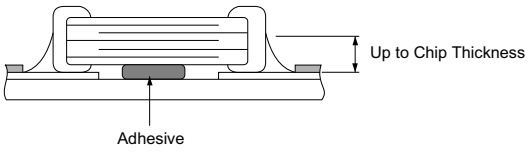


[Allowable Soldering Temperature and Time]



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

- Optimum Solder Amount for Flow Soldering
  The top of the solder fillet should be lower than the thickness of components. If the solder amount is excessively big, the risk of cracking is higher during board bending or under any other stressful conditions.



in section

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⚠Caution

Continued from the preceding page.

6. Correction with a Soldering Iron

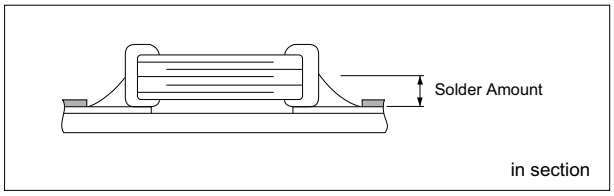
● When sudden heat is applied to the components by use of a soldering iron, the mechanical strength of the components will go down because the extreme temperature change causes deformations inside the components.
In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB board.
Preheating conditions, (The "Temperature of the Soldering Iron Tip", "Preheating Temperature", "Temperature Differential" between iron tip and the components and the PCB), should be within the conditions of table 3.
It is required to keep the temperature differential between the soldering Iron and the components surface (ΔT) as small as possible.
After soldering, do not allow the component/PCB to cool down rapidly.
The operating time for the re-working should be as short as possible. When re-working time is too long, it may cause solder leaching, and that will cause a reduction of the adhesive strength of the terminations.

Table 3

Part Number	Temperature of Soldering Iron tip	Preheating Temperature	Temperature Differential (ΔT)	Atmosphere
G□□18/21/31	350°C max.	150°C min.	ΔT≦190℃	air
G□□32/42/43/ 52/55	280°C max.	150°C min.	ΔT≦130℃	air

*Applicable for both Pb-Sn and Lead Free Solder.
Pb-Sn Solder: Sn-37Pb
Lead Free Solder: Sn-3.0Ag-0.5Cu

● Optimum Solder Amount when re-working Using a Soldering Iron
In case of smaller sizes than G□□18, the top of the solder fillet should be lower than 2/3's of the thickness of the component or 0.5mm whichever is smaller.
In case of larger sizes than G□□21, the top of the solder fillet should be lower than 2/3's of the thickness of the component.
If the solder amount is excessive, the risk of cracking is higher during board bending or under any other stressful conditions.
A Soldering iron ø3mm or smaller should be used.
It is also necessary to keep the soldering iron from touching the components during the re-work.
Solder wire with ø0.5mm or smaller is required for soldering.



7. Washing

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

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND FUMING WHEN THE PRODUCT IS USED.

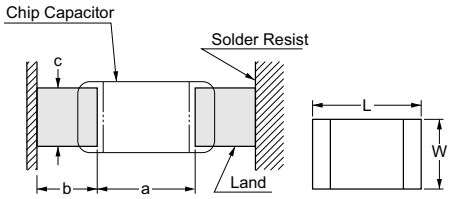
Notice

■ Notice (Soldering and Mounting)

1. Construction of Board Pattern

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

Construction and Dimensions of Pattern (Example)



Flow Soldering

L×W	a	b	c
1.6×0.8	0.6-1.0	0.8-0.9	0.6-0.8
2.0×1.25	1.0-1.2	0.9-1.0	0.8-1.1
3.2×1.6	2.2-2.6	1.0-1.1	1.0-1.4

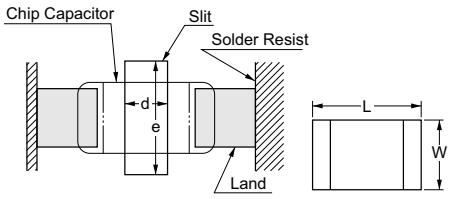
Flow soldering : 3.2×1.6 or less available.

Reflow Soldering

L×W	a	b	c
1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8
2.0×1.25	1.0-1.2	0.6-0.7	0.8-1.1
3.2×1.6	2.2-2.4	0.8-0.9	1.0-1.4
3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3
4.5×2.0	2.8-3.4	1.2-1.4	1.4-1.8
4.5×3.2	2.8-3.4	1.2-1.4	2.3-3.0
5.7×2.8	4.0-4.6	1.4-1.6	2.1-2.6
5.7×5.0	4.0-4.6	1.4-1.6	3.5-4.8

(in mm)

Dimensions of Slit (Example)



Preparing slit helps flux cleaning and resin coating on the back of the capacitor.
But, the length of slit design should be shorter enough as much as possible to prevent the mechanical damage in the capacitor.
The longer slit design might receive more severe mechanical stress from the PCB.
Recommendable slit design is shown in the Table.

L×W	d	e
1.6×0.8	-	-
2.0×1.25	-	-
3.2×1.6	1.0-2.0	3.2-3.7
3.2×2.5	1.0-2.0	4.1-4.6
4.5×2.0	1.0-2.8	3.6-4.1
4.5×3.2	1.0-2.8	4.8-5.3
5.7×2.8	1.0-4.0	4.4-4.9
5.7×5.0	1.0-4.0	6.6-7.1

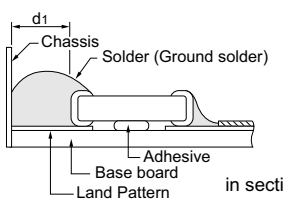
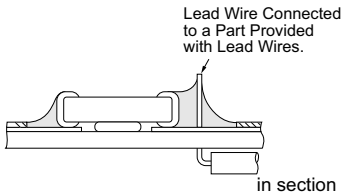
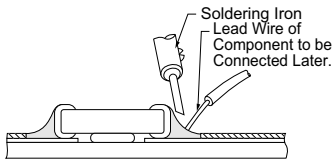
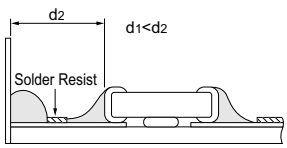
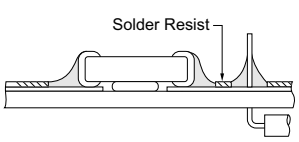
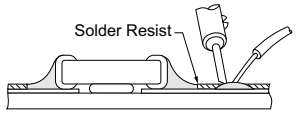
(in mm)

Continued on the following page.

Notice

Continued from the preceding page.

Land Layout to Prevent Excessive Solder

	Mounting Close to a Chassis	Mounting with Leaded Components	Mounting Leaded Components Later
Examples of Prohibition			
Examples of Improvements by the Land Division			

2 Mounting of Chips

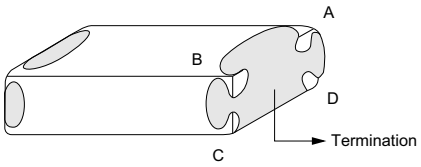
● Thickness of adhesives applied
Keep thickness of adhesives applied (50-105μm or more) to reinforce the adhesive contact considering the thickness of the termination or capacitor (20-70μm) and the land pattern (30-35μm).

● Mechanical shock of the chip placer
When the positioning claws and pick-up nozzle are worn, the load is applied to the chip while positioning is concentrated in one position, thus causing cracks, breakage, faulty positioning accuracy, etc.
Careful checking and maintenance are necessary to prevent unexpected trouble.
An excessively low bottom dead point of the suction nozzle imposes great force on the chip during mounting, causing cracked chips. Please set the suction nozzle's bottom dead point on the upper surface of the board.

3 Soldering

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

Depending on the conditions of the soldering temperature and/or immersion (melting time), effective areas may be lost in some part of the terminations.
To prevent this, be careful in soldering so that any possible loss of the effective area on the terminations will securely remain at a maximum of 25% on all edge length A-B-C-D-A of part with A, B, C, D, shown in the Figure below.



(2) Flux Application

● An excessive amount of flux generates a large quantity of flux gas, causing deteriorated solderability. So apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering.)
● Flux containing too high percentage of halide may cause corrosion of the outer electrodes unless sufficient cleaning. Use flux with a halide content of 0.2% max.
● Do not use strong acidic flux.
● Do not use water-soluble flux*.
(*Water-soluble flux can be defined as non rosin type flux including wash-type flux and non-wash-type flux.)

Continued on the following page.

Notice

Continued from the preceding page.

4. Cleaning

Please confirm there is no problem in the reliability of the product beforehand when cleaning it with the intended equipment.

The residue after cleaning it might cause the decrease in the surface resistance of the chip and the corrosion of the electrode part, etc. As a result it might cause reliability to deteriorate. Please confirm beforehand that there is no problem with the intended equipment in ultrasonic cleansing.

5. Resin Coating

Please use it after confirming there is no influence on the product with a intended equipment beforehand when the resin coating and molding.

A cracked chip might be caused at the cooling/heating cycle by the amount of resin spreading and/or bias thickness.

The resin for coating and molding must be selected as the stress is small when stiffening and the hygroscopic is low as possible.

■ Rating

1. Capacitance change of capacitor

(1) In case of X7R char.

Capacitors have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage. So, it is not likely to be suitable for use in a time constant circuit.

Please contact us if you need detailed information.

(2) In case of any char. except X7R

Capacitance might change a little depending on the surrounding temperature or an applied voltage.

Please contact us if you intend to use this product in a strict time constant circuit.

2. Performance check by equipment

Before using a capacitor, check that there is no problem in the equipment's performance and the specifications.

Generally speaking, CLASS 2 (X7R char.) ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance. So, the capacitance value may change depending on the operating condition in the equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in a capacitance value change of a capacitor, such as leakage current and noise suppression characteristics.

Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

ISO 9001 Certifications

■ Qualified Standards

The products listed here have been produced by ISO 9001 certified factory.

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