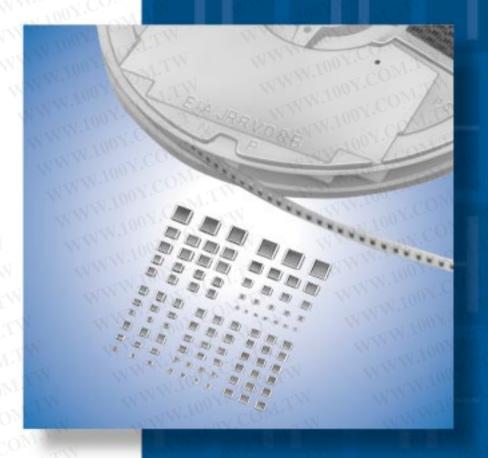
特力材料886-3-5753170 胜特力电子(上海) 86-21-34970699 胜特力电子(深圳) 86-755-83298787 Http://www. 100y. com. tw

# **Chip Monolithic Ceramic Capacitors**



muRata

Innovator in Electronics

Manufacturing Co., Ltd.

# **CONTENTS**

Part Numbering	
Selection Guide	
for General Purpose GRM Series (Temperature Compensating Type) —	
for General Purpose GRM Series (High Dielectric Constant Type)	1
1 · 2 Specifications and Test Methods	2
GRM Series Data	3
3 Capacitor Array GNM Series	3
3 Specifications and Test Methods	3
4 Low ESL LLL/LLA/LLM Series	4
4 Specifications and Test Methods	4.11
5 High-Q Type GJM Series	49
5 Specifications and Test Methods	52
6 High Frequency GQM Series	COM.
●GQM Series Data	V.CONTY 5
6 Specifications and Test Methods	TY.COM.TY5
7 High Frequency Type ERB Series	00 X COM 6
7 Specifications and Test Methods	100 x COM 6
ERB Series Data	6 Line Co
8 Monolithic Microchip GMA Series	6
8 Specifications and Test Methods	6
9 for Bonding GMD Series	7.100 x . 7
9 Specifications and Test Methods	WWW.1007
10 for Ultrasonic Sensors GRM Series	WW.10079
10 Specifications and Test Methods	
Package	8
<b>∆</b> Caution —	8
Notice	9
Reference Data	9

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12	Medium Voltage High Capacitance for General Use
13	Only for LCD Backlight Inverters Circuit
14	Only for Information Devices/Tip & Ring
15	Only for Camera Flash Circuit
16	AC250V (r.m.s.) Type (Which Meet Japanese Law)
17	Safety Standard Recognized Type GC (UL, IEC60384-14 Class X1/Y2)
18	Safety Standard Recognized Type GD (IEC60384-14 Class Y3)
19	Safety Standard Recognized Type GF (IEC60384-14 Class Y2, X1/Y2)
20	Safety Standard Recognized Type GB (IEC60384-14 Class X2)
GA	3 Series Specifications and Test Methods
GR	M/GR4/GR7/GA2/GA3 Series Data (Typical Example)
Pac	ckage
٨C	Caution
Not	tice -
ISC	9001 Certifications

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

#### for EU RoHS Compliant

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- $\cdot$  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

GR | M | 18 | 8 | B1 | 1H | 102 | K | A01 | K (Part Number)

**1**Product ID

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

#### 3Dimension (LXW)

Code	Dimension (LXW)	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
OM	0.9×0.6mm	0302
11	1.25 X 1.0mm	0504
15	1.0×0.5mm	0402
18	1.6×0.8mm	0603
1M C	1.37×1.0mm	0504
21	2.0×1.25mm	0805
22	2.8×2.8mm	1111
31	3.2X1.6mm	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

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#### 4Dimension (T)

Code	Dimension (T)
2	0.2mm
2	2-elements (Array Type)
3	0.3mm
4	4-elements (Array Type)
5	0.5mm
6007.	0.6mm
7	0.7mm
8	0.8mm
9	0.85mm
Α	1.0mm
В	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. WWW.100Y.COM.TW





**5**Temperature Characteristics

Code Public STD Code		Code	Referance Temperature	Temperature Range	Capacitance Change or Temperature Coefficient	Operating Temperature Range
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	N 20°C	20 to 85°C	-150±60ppm/°C	-25 to 85°C
2R	RH *1	JIS	20°C	20 to 85°C	-220±60ppm/°C	-25 to 85°C
2S	SH *1	JIS	20°C	20 to 85°C	-330±60ppm/°C	-25 to 85°C
2T	TH *1	JIS	20°C	20 to 85°C	-470±60ppm/°C	-25 to 85°C
3C	CJ*1	JIS	20°C	20 to 125°C	0±120ppm/°C	-55 to 125°C
3P	PJ *1	JIS	20°C	20 to 85°C	-150±120ppm/°C	-25 to 85°C
3R	RJ *1	JIS	20°C	20 to 85°C	-220±120ppm/°C	-25 to 85°C
3S	SJ *1	JIS	20°C	20 to 85°C	-330±120ppm/°C	-25 to 85°C
3T 🔨	TJ *1	JIS	20°C	20 to 85°C	-470±120ppm/°C	-25 to 85°C
3U	UJ *1	JIS	20°C	20 to 85°C	-750±120ppm/°C	-25 to 85°C
4C	CK *1	JIS	20°C	20 to 125°C	0±250ppm/°C	-55 to 125°C
5C	C0G *1	EIA	25°C	25 to 125°C	0±30ppm/°C	-55 to 125°C
5G	X8G *1	EIA	25°C	25 to 150°C	0±30ppm/°C	-55 to 150°C
6C	C0H *1	EIA	25°C	25 to 125°C	0±60ppm/°C	-55 to 125°C
6P	P2H *1	EIA	25°C	25 to 85°C	-150±60ppm/°C	-55 to 125°C
6R	R2H *1	EIA	25°C	25 to 85°C	-220±60ppm/°C	-55 to 125°C
6S	S2H *1	EIA	25°C	25 to 85°C	-330±60ppm/°C	-55 to 125°C
6T	T2H *1	EIA	25°C	25 to 85°C	-470±60ppm/°C	-55 to 125°C
7U	U2J *1	EIA	25°C	25 to 125°C	-750±120ppm/°C	-55 to 125°C
B1	B *2	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
В3	В	JIS	20°C	-25 to 85°C	±10%	-25 to 85°C
C7	X7S	EIA	25°C	-55 to 125°C	±22%	-55 to 125°C
C8	X6S	EIA	25°C	-55 to 105°C	±22%	-55 to 105°C
D7	X7T	EIA	25°C	-55 to 125°C	+22, -33%	-55 to 125°C
D8	X6T	EIA	25°C	-55 to 105°C	+22, -33%	-55 to 105°C
E7	X7U	EIA	25°C	-55 to 125°C	+22, -56%	-55 to 125°C
F1	F *2	JIS	20°C	-25 to 85°C	+30, -80%	-25 to 85°C
F5	Y5V	EIA	25°C	-30 to 85°C	+22, -82%	-30 to 85°C
L8	X8L	EIA	25°C	-55 to 150°C	+15, -40%	-55 to 150°C
R1	R *2	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R3	R	JIS	20°C	-55 to 125°C	±15%	-55 to 125°C
R6	X5R	EIA	25°C	-55 to 85°C	±15%	-55 to 85°C
R7	X7R	EIA	25°C	-55 to 125°C	±15%	-55 to 125°C
R9	X8R	EIA	25°C	-55 to 150°C	±15%	-55 to 150°C
9E (0)	ZLM	*3	20°C	-25 to 20°C	-4700+1000/-2500ppm/°C	-25 to 85°C
M. T.	COM		200	20 to 85°C	-4700+500/-1000ppm/°C	23 13 03 0
wo	MOD	1	25°C	-55 to 125°C	±10% *4	-55 to 125°C
1.14.		TW	25 0	55 15 125 5	+22, -33% *5	00 10 120 0

<sup>\*1</sup> Please refer to table for Capacitance Change under reference temperature.

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<sup>\*2</sup> Capacitance change is specified with 50% rated voltage applied.

<sup>\*3,\*4</sup> Murata Temperature Characteristic Code.

<sup>\*4</sup> Apply DC350V bias.

<sup>\*5</sup> No DC bias.

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●Capacitance Change from each temperature

#### JIS Code

1100 Y.	Capacitance Change from 20°C (%)					
Murata Code	-5!	5°C	-2	5°C	-10°C	
	Max.	Min.	Max.	Min.	Max.	Min.
1X	- T. T.	- 1	-100 x	10A1.1	-	_
2C	0.82	-0.45	0.49	-0.27	0.33	-0.18
2P	COM	-	1.32	0.41	0.88	0.27
2R	07.0-	_	1.70	0.72	1.13	0.48
28	ov GO	- W	2.30	1.22	1.54	0.81
2T	MO2	-	3.07	1.85	2.05	1.23
3C	1.37	-0.90	0.82	-0.54	0.55	-0.36
3P	CO	TXN.	1.65	0.14	1.10	0.09
3R	1700-	M., -	2.03	0.45	1.35	0.30
38	106 Y.	- (1 <u>-</u> V)	2.63	0.95	1.76	0.63
3T	W. To - of C	Olym-	3.40	1.58	2.27	1.05
3U	W 100 1	10M-1	4.94	2.84	3.29	1.89
4C	2.56	-1.88	1.54	-1.13	1.02	-0.75

#### EIA Code

			Capacitance Cha	inge from 25°C (%)			
Murata Code	-5!	-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	

#### 6Rated Voltage

Criatou Fortago		• oupu	o.taoo	
Code	Rated Voltage	• • • • • • • • • • • • • • • • • • • •	sed by three-dig	
0G	DC4V		e first and seco ure expresses	_
01	DC6.3V	number	s.If there is a d	ecimal
1A C	DC10V	letter "F	". In this case,	all figu
1C	DC16V	Ex.)	Code	
1E	DC25V	Y. 0	R50	
1H	DC50V	V.CO	1R0	
2A	DC100V		100	
2D	DC200V	101.C	103	
2E	DC250V	C.C.	TIN	
YD	DC300V			
2H	DC500V			
2J	DC630V			
3A	DC1kV			
3D	DC2kV			
3F	DC3.15kV			
ВВ	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)			

#### Capacitance

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.

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

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#### 8 Capacitance Tolerance

Code	Capacitance Tolerance	TC	Series	Capac	itance Step
W	±0.05pF	СΔ	GRM/GJM	≦9.9pF	0.1pF
MAN	M.Co.	WW	GRM/GJM	≦9.9pF	0.1pF
5 W.1	$00^{-1}$	C4	W. Market Contract of the Cont	≦1pF	0.1pF
В	±0.1pF	СД	GQM	1.1 to 9.9pF	1pF and E24 Serie
	COMP.	N W	ERB	≦9.9pF	1pF and E24 Series
-11	V.In. COM.	СД	GRM/GJM	≦9.9pF	0.1pF
	±0.25pF	except CΔ	GRM	≦5pF	* 1pF
C		TVI 1	ERB	≤9.9pF	1pF and E24 Series
	W.100 COM	СД	GQM CONT	≦1pF	0.1pF
	1007.0		GQM	1.1 to 9.9pF	1pF and E24 Series
	M. CO	СД	GRM/GJM	5.1 to 9.9pF	0.1pF
D	±0.5pF	except CΔ	GRM	5.1 to 9.9pF	* 1pF
	1101.00	СΔ	ERB/GQM	5.1 to 9.9pF	1pF and E24 Series
•	120/	СΔ	GJM	≥10pF	E12 Series
G	<b>G</b> ±2%	СΔ	GQM/ERB	≥10pF	E24 Series
J	1504	CΔ-SL	GRM/GA3	≥10pF	E12 Series
J M	±5%	СОСА	ERB/GQM/GJM	≥10pF	E24 Series
14	100	B, R, X7R, X5R, ZLM	GRM/GR7/GA3	COM- E	Series
K	±10%	COG	GNM	E	Series
		B, R, X7R, X5R, ZLM	GR4, GMD	I CO E1	2 Series
77	W 10	B, R, X7R, X7S	GRM/GMA	COM-E	5 Series
	12004	X5R, X7R, X7S	GNM	E:	3 Series
M	±20%	X7R	GA2	CONE:	3 Series
	W. A.	X5R, X7R, X7S, X6S	LLL/LLA/LLM	E:	3 Series
Z	+80%, -20%	F, Y5V	GRM	E;	3 Series
R		Dep	ends on individual standards.	×1 CO	

<sup>\*</sup> E24 series is also available.

#### Individual Specification Code

#### Packaging

kaging	TH WW. 100Y. CM.TW	
Code	Packaging	
0.5	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)	
В	Bulk	
C	Bulk Case	
T	Bulk Tray	

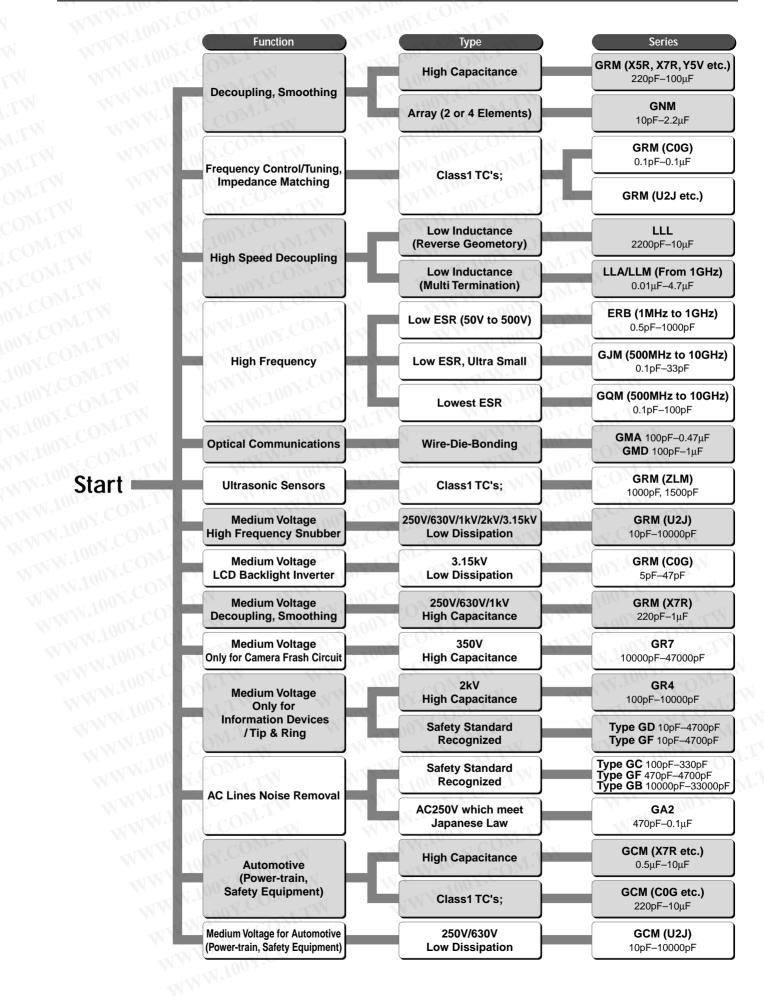
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## **Selection Guide of Chip Monolithic Ceramic Capacitors**



# **Chip Monolithic Ceramic Capacitors**



## for General Purpose GRM Series (Temperature Compensating Type)

#### ■ Features

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

General electronic equipment

Part Number	Dr.	Din	nensions	(mm)		
rait ivuilibei	L	W	T	е	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	- 0	$M_{\bullet}$	0.25 ±0.05	0.1 to 0.3	0.4	-
GRM153	1.0 ±0.05	0.5 ±0.05	0.3 ±0.03	0.1 10 0.3	0.4	(A)
GRM155		- 1	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*	1.0 ±0.1	U.0 ±U.1	0.8 ±0.1	0.2 10 0.5	0.5	
GRM216	9		0.6 ±0.1			
GRM219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7	
GRM21A	2.0 ±0.1	1.25 ±0.1	1.0 +0/-0.2	0.2 10 0.7	0.7	
GRM21B		C(0)	1.25 ±0.1			
GRM316			0.6 ±0.1			
GRM319	3.2 ±0.15	1.6 ±0.15	0.85 ±0.1	0.3 to 0.8	1.5	e g e
GRM31M		JU	1.15 ±0.1	0.3 10 0.8	1.5	
GRM31C	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2	7		
GRM329	· 1	-7	0.85 ±0.1	-41		
GRM32A	4.0		1.0 +0/-0.2			
GRM32M	V J.A.	0 .	1.15 ±0.1	7. 7		
GRM32N	22102	25102	1.35 ±0.15	0.2 44	1.0	
GRM32C	3.2 ±0.3	2.5 ±0.2	1.6 ±0.2	0.3 min.	1.0	L SIN W
GRM32R	M . 3	_	1.8 ±0.2	MA	- 1	
GRM32D		400	2.0 ±0.2	- 17	11	
GRM32E	_TXX	Inc	2.5 ±0.2	11/10		

## Temperature Compensating Type C0G(5C) Characteristics

Part Number	W.	GRM	M02	GRM03	GRM15 1.0x0.5 [0402] 50 (1H)	
L x W [EIA]		0.4x0.2	[01005]	0.6x0.3 [0201]		
Rated Volt.	M.T.V	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )		
тс	M.I.	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	
Capacitance, C	apacitance Toler	rance and T Dimension	MY.CO	N WWW	MY.Co. TW	
0.10pF( <b>R10</b> )	W, B		N.Ing. COM.	0.3(3)	0.5( <b>5</b> )	
0.20pF( <b>R20</b> )	W, B	0.2(2)	1100 Y. OM.	0.3(3)	0.5 <b>(5)</b>	
0.30pF( <b>R30</b> )	W, B	0.2(2)	M. Con	0.3(3)	0.5( <b>5</b> )	
0.40pF( <b>R40</b> )	W, B	0.2 <b>(2)</b>	MW.In. COM	0.3( <b>3</b> )	0.5( <b>5</b> )	
0.50pF( <b>R50</b> )	W, B	0.2 <b>(2</b> )	11007.	0.3 <b>(3</b> )	0.5( <b>5</b> )	
0.60pF( <b>R60</b> )	W, B	0.2 <b>(2</b> )	MM. COL	0.3(3)	0.5( <b>5</b> )	
0.70pF( <b>R70</b> )	W, B	0.2 <b>(2)</b>	W.100	0.3(3)	0.5( <b>5</b> )	
0.80pF( <b>R80</b> )	W, B	0.2 <b>(2</b> )	MM. 100X.C.	0.3(3)	0.5( <b>5</b> )	
0.90pF( <b>R90</b> )	W, B	0.2 <b>(2)</b>	WWW.	0.3 <b>(3</b> )	0.5 <b>(5</b> )	
1.0pF( <b>1R0</b> )	W, B, C	0.2 <b>(2)</b>	W.100	0.3 <b>(3</b> )	0.5( <b>5</b> )	
1.1pF( <b>1R1</b> )	W, B, C	0.2 <b>(2)</b>	MM. 1100X.	0.3 <b>(3</b> )	0.5 <b>(5</b> )	
1.2pF( <b>1R2</b> )	W, B, C	0.2 <b>(2)</b>	W. T.	0.3 <b>(3</b> )	0.5 <b>(5)</b>	
1.3pF( <b>1R3</b> )	W, B, C	0.2 <b>(2</b> )	W.100 -	0.3 <b>(3</b> )	0.5 <b>(5</b> )	
1.4pF( <b>1R4</b> )	W, B, C	0.2( <b>2</b> )	1/1/1/100	0.3 <b>(3)</b>	0.5( <b>5</b> )	
1.5pF( <b>1R5</b> )	W, B, C	0.2 <b>(2</b> )		0.3(3)	0.5( <b>5</b> )	
1.6pF( <b>1R6</b> )	W, B, C	0.2( <b>2</b> )	V	0.3 <b>(3)</b>	0.5( <b>5</b> )	
1.7pF( <b>1R7</b> )	W, B, C	0.2( <b>2</b> )		0.3 <b>(3)</b>	0.5( <b>5</b> )	
1.8pF( <b>1R8</b> )	W, B, C	0.2( <b>2</b> )	W. I.	0.3 <b>(3</b> )	0.5 <b>(5</b> )	
1.9pF( <b>1R9</b> )	W, B, C	0.2( <b>2</b> )	N. Tan	0.3(3)	0.5( <b>5</b> )	
2.0pF( <b>2R0</b> )	W, B, C	0.2( <b>2</b> )	N WWW	0.3 <b>(3</b> )	0.5 <b>(5</b> )	
2.1pF( <b>2R1</b> )	W, B, C	0.2( <b>2</b> )		0.3 <b>(3</b> )	0.5 <b>(5</b> )	
2.2pF( <b>2R2</b> )	W, B, C	0.2(2)		0.3(3)	0.5( <b>5</b> )	

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

Continued on the following page.

Part Number			GRM02	GRM03	GRM15	
L x W [EIA]	00 r.	0.4	x0.2 [01005]	0.6x0.3 [0201]	1.0x0.5 [0402] 50 ( <b>1H</b> )	
Rated Volt.	100 X	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )		
тс	A.1003.	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	
Capacitance, C	apacitance Tole	erance and T Dimens	sion	CONT.		
2.3pF( <b>2R3</b> )	W, B, C	0.2(2)	100	0.3(3)	0.5( <b>5</b> )	
2.4pF( <b>2R4</b> )	W, B, C	0.2(2)	WWW	0.3(3)	0.5( <b>5</b> )	
2.5pF( <b>2R5</b> )	W, B, C	0.2(2)	TINN.IO	0.3(3)	0.5( <b>5</b> )	
2.6pF( <b>2R6</b> )	W, B, C	0.2(2)	N V	0.3(3)	0.5( <b>5</b> )	
2.7pF( <b>2R7</b> )	W, B, C	0.2(2)	M MM	0.3(3)	0.5( <b>5</b> )	
2.8pF( <b>2R8</b> )	W, B, C	0.2(2)	· VIVI	0.3(3)	0.5( <b>5</b> )	
2.9pF( <b>2R9</b> )	W, B, C	0.2(2)		0.3(3)	0.5( <b>5</b> )	
3.0pF( <b>3R0</b> )	W, B, C	0.2(2)		0.3(3)	0.5( <b>5</b> )	
3.1pF( <b>3R1</b> )	W, B, C	0.2(2)		0.3(3)	0.5( <b>5</b> )	
3.2pF( <b>3R2</b> )	W, B, C	0.2(2)	TEN MAN	0.3(3)	0.5( <b>5</b> )	
3.3pF( <b>3R3</b> )	W, B, C	0.2(2)	VIV.	0.3(3)	0.5( <b>5</b> )	
3.4pF( <b>3R4</b> )	W, B, C	0.2(2)	101:1	0.3(3)	0.5( <b>5</b> )	
3.5pF( <b>3R5</b> )	W, B, C	0.2(2)	W. W.	0.3(3)	0.5( <b>5</b> )	
3.6pF( <b>3R6</b> )	W, B, C	0.2(2)	ON	0.3(3)	0.5( <b>5</b> )	
3.7pF( <b>3R7</b> )	W, B, C	0.2(2)	COMITY	0.3(3)	0.5( <b>5</b> )	
3.8pF( <b>3R8</b> )	W, B, C	0.2(2)	C	0.3(3)	0.5( <b>5</b> )	
3.9pF( <b>3R9</b> )	W, B, C	0.2(2)	COMP	0.3(3)	0.5( <b>5</b> )	
4.0pF( <b>4R0</b> )	W, B, C	0.2(2)		0.3(3)	0.5( <b>5</b> )	
4.1pF( <b>4R1</b> )	W, B, C	0.2(2)	N. CON TW	0.3(3)	0.5( <b>5</b> )	
4.2pF( <b>4R2</b> )	W, B, C	0.2(2)	COM	0.3(3)	0.5( <b>5</b> )	
4.3pF( <b>4R3</b> )	W, B, C	0.2(2)	10.	0.3(3)	0.5( <b>5</b> )	
4.4pF( <b>4R4</b> )	W, B, C	0.2(2)	ON COMMENT	0.3(3)	0.5( <b>5</b> )	
4.5pF( <b>4R5</b> )	W, B, C	0.2(2)	TON.	0.3(3)	0.5( <b>5</b> )	
4.6pF( <b>4R6</b> )	W, B, C	0.2(2)	1107.	0.3(3)	0.5( <b>5</b> )	
4.7pF( <b>4R7</b> )	W, B, C	0.2(2)	· COM	0.3(3)	0.5( <b>5</b> )	
4.8pF( <b>4R8</b> )	W, B, C	0.2(2)	N. Oor. COM:	0.3(3)	0.5( <b>5</b> )	
4.9pF( <b>4R9</b> )	W, B, C	0.2(2)	1007.	0.3(3)	0.5( <b>5</b> )	
5.0pF( <b>5R0</b> )	W, B, C	0.2(2)	M. COM	0.3(3)	0.5( <b>5</b> )	
5.1pF( <b>5R1</b> )	W, B, C, D	0.2(2)	1100 COVI.	0.3(3)	0.5( <b>5</b> )	
5.2pF( <b>5R2</b> )	W, B, C, D	0.2(2)	W. TOWN CO.	0.3(3)	0.5( <b>5</b> )	
5.3pF( <b>5R3</b> )	W, B, C, D	0.2(2)	A A . TO COM.	0.3(3)	0.5( <b>5</b> )	
5.4pF( <b>5R4</b> )	W, B, C, D	0.2(2)	111.100 1. JOH	0.3(3)	0.5( <b>5</b> )	
5.5pF( <b>5R5</b> )	W, B, C, D	0.2(2)	W. Anny.Co	0.3(3)	0.5( <b>5</b> )	
5.6pF( <b>5R6</b> )	W, B, C, D	0.2(2)	MAN. TO	0.3(3)	0.5( <b>5</b> )	
5.7pF( <b>5R7</b> )	W, B, C, D	0.2(2)	A 1. 20 100 X.	0.3(3)	0.5( <b>5</b> )	
5.8pF( <b>5R8</b> )	W, B, C, D	0.2(2)	MAN N. Cr	0.3(3)	0.5( <b>5</b> )	
5.9pF( <b>5R9</b> )	W, B, C, D	0.2(2)	TINN TO	0.3(3)	0.5( <b>5</b> )	
6.0pF( <b>6R0</b> )	W, B, C, D	0.2(2)	M. 1. 100x	0.3(3)	0.5( <b>5</b> )	
6.1pF( <b>6R1</b> )	W, B, C, D	0.2(2)	MAM	0.3(3)	0.5( <b>5</b> )	
6.2pF( <b>6R2</b> )	W, B, C, D	0.2(2)	TAN W. Tu	0.3(3)	0.5( <b>5</b> )	
6.3pF( <b>6R3</b> )	W, B, C, D	0.2(2)	W W	0.3(3)	0.5( <b>5</b> )	
6.4pF( <b>6R4</b> )	W, B, C, D	0.2(2)	MAN	0.3(3)	0.5( <b>5</b> )	
6.5pF( <b>6R5</b> )	W, B, C, D	0.2(2)	1 10 10 10 10 10 10 10 10 10 10 10 10 10	0.3(3)	0.5( <b>5</b> )	
6.6pF( <b>6R6</b> )	W, B, C, D	0.2(2)	W W .	0.3(3)	0.5( <b>5</b> )	
6.7pF( <b>6R7</b> )	W, B, C, D	0.2( <b>2</b> )	N WWW.I	0.3(3)	0.5( <b>5</b> )	
6.8pF( <b>6R8</b> )	W, B, C, D	0.2( <b>2</b> )	- TN.	0.3(3)	0.5( <b>5</b> )	
6.9pF( <b>6R9</b> )	W, B, C, D	0.2( <b>2</b> )	M W	0.3(3)	0.5( <b>5</b> )	
7.0pF( <b>7R0</b> )	W, B, C, D	0.2( <b>2</b> )	WWIE	0.3(3)	0.5( <b>5</b> )	
7.0pF( <b>7R0</b> ) 7.1pF( <b>7R1</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	
7.1pF( <b>7R1</b> ) 7.2pF( <b>7R2</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	

The part numbering code is shown in ().

Part Number		GRI		GRM03	GRM15	
L x W [EIA]	00 2.	0.4x0.2	[01005]	0.6x0.3 [0201]	1.0x0.5 [0402] 50 (1H) COG (5C)	
Rated Volt.	100X	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )		
тс	1.100	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )		
Capacitance, C	apacitance	Tolerance and T Dimension	MAN Jan	COM.		
7.3pF( <b>7R3</b> )	W, B, C, D	0.2 <b>(2</b> )	W ' 100	0.3(3)	0.5( <b>5</b> )	
7.4pF( <b>7R4</b> )	W, B, C, D	0.2(2)		0.3(3)	0.5 <b>(5)</b>	
7.5pF( <b>7R5</b> )	W, B, C, D	0.2(2)	TWW.IO	0.3(3)	0.5( <b>5</b> )	
7.6pF( <b>7R6</b> )	W, B, C, D	0.2( <b>2</b> )	W Tall	0.3(3)	0.5( <b>5</b> )	
7.7pF( <b>7R7</b> )	W, B, C, D	0.2( <b>2</b> )		0.3 <b>(3</b> )	0.5 <b>(5)</b>	
7.8pF( <b>7R8</b> )	W, B, C, D	0.2( <b>2</b> )	TWW.	0.3(3)	0.5( <b>5</b> )	
7.9pF( <b>7R9</b> )	W, B, C, D	0.2( <b>2</b> )		0.3 <b>(3)</b>	0.5( <b>5</b> )	
8.0pF( <b>8R0</b> )	W, B, C, D	0.2( <b>2</b> )	W WW	0.3( <b>3</b> )	0.5( <b>5</b> )	
8.1pF( <b>8R1</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	
8.2pF( <b>8R2</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	
8.3pF( <b>8R3</b> )	W, B, C, D	0.2(2)	WW WY	0.3(3)	0.5( <b>5</b> )	
8.4pF( <b>8R4</b> )	W, B, C, D	0.2(2)	10 h	0.3(3)	0.5( <b>5</b> )	
8.5pF( <b>8R5</b> )	W, B, C, D	0.2(2)	TW W	0.3(3)	0.5( <b>5</b> )	
8.6pF( <b>8R6</b> )	W, B, C, D	0.2(2)	W W	0.3(3)	0.5( <b>5</b> )	
8.7pF( <b>8R7</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	
8.8pF( <b>8R8</b> )	W, B, C, D	0.2( <b>2</b> )		0.3(3)	0.5( <b>5</b> )	
8.9pF( <b>8R9</b> )	W, B, C, D	0.2(2)	UNITED	0.3(3)	0.5( <b>5</b> )	
9.0pF( <b>9R0</b> )	W, B, C, D	0.2(2)	COM.	0.3(3)	0.5( <b>5</b> )	
9.1pF( <b>9R1</b> )	W, B, C, D	0.2( <b>2</b> )	TIV	0.3(3)	0.5( <b>5</b> )	
9.2pF( <b>9R2</b> )	W, B, C, D	0.2( <b>2</b> )	CUM	0.3(3)	0.5( <b>5</b> )	
9.3pF( <b>9R3</b> )	W, B, C, D	0.2(2)	-1COM.1	0.3(3)	0.5( <b>5</b> )	
9.4pF( <b>9R4</b> )	W, B, C, D	0.2(2)		0.3 <b>(3</b> )	0.5( <b>5</b> )	
9.5pF( <b>9R5</b> )	W, B, C, D	0.2(2)	T.CUM TY	0.3 <b>(3</b> )	0.5( <b>5</b> )	
9.6pF( <b>9R6</b> )	W, B, C, D	0.2( <b>2</b> )	-1 COM. 1	0.3 <b>(3</b> )	0.5( <b>5</b> )	
9.7pF( <b>9R7</b> )	W, B, C, D	0.2(2)	007. J. T. T. W.	0.3(3)	0.5( <b>5</b> )	
9.8pF( <b>9R8</b> ) 9.9pF( <b>9R9</b> )	W, B, C, D	0.2(2)	CUTT	0.3(3)	0.5( <b>5</b> )	
1100	W, B, C, D	0.2(2)	100	0.3(3)	0.5( <b>5</b> )	
10pF( <b>100</b> )	J	0.2(2)	1100Y.	0.3(3)	0.5( <b>5</b> )	
12pF( <b>120</b> )	CONT.	0.2(2)	N. COL	0.3(3)	0.5( <b>5</b> )	
15pF( <b>150</b> )	J	0.2(2)	W.100 -1 COM.	0.3(3)	0.5( <b>5</b> )	
18pF( <b>180</b> )	Cn	0.2(2)	11007.001	0.3(3)	0.5( <b>5</b> )	
22pF( <b>220</b> ) 27pF( <b>270</b> )	J	0.2( <b>2</b> ) 0.2( <b>2</b> )	M. COP	0.3 <b>(3</b> ) 0.3 <b>(3</b> )	0.5( <b>5</b> ) 0.5( <b>5</b> )	
33pF( <b>330</b> )	~1CO	0.2( <b>2</b> )	XXVI.110 -1 CO	0.3(3)	0.5( <b>5</b> )	
39pF( <b>390</b> )	J	0.2( <b>2</b> )	1007.0	0.3(3)	0.5( <b>5</b> )	
47pF( <b>470</b> )	, J	0.2( <b>2</b> )	NAM N CC	0.3(3)	0.5( <b>5</b> )	
56pF( <b>560</b> )	J	0.2(2)	0.2( <b>2</b> )	0.3( <b>3</b> )	0.5( <b>5</b> )	
68pF( <b>680</b> )	100	TITY .	0.2( <b>2</b> )	0.3(3)	0.5( <b>5</b> )	
82pF( <b>820</b> )	J	COMP	0.2( <b>2</b> )	0.3(3)	0.5( <b>5</b> )	
100pF( <b>101</b> )	J	COM	0.2( <b>2</b> )	0.3(3)	0.5( <b>5</b> )	
120pF( <b>121</b> )	300	A.C. MILIN	100°	3.0(0)	0.5( <b>5</b> )	
150pF( <b>151</b> )	J	N.COM.	MMM	A COR. LA	0.5( <b>5</b> )	
180pF( <b>181</b> )	J. 10	A. COMP.	1, 100	COM	0.5( <b>5</b> )	
220pF( <b>221</b> )	J	NOTICE	4/1/1/10	Or. OW.IN	0.5( <b>5</b> )	
270pF( <b>271</b> )	NJ .	COMP		W.Con TW	0.5( <b>5</b> )	
330pF( <b>331</b> )	J.	100 . COM: 1	· Vivi	TON-1	0.5( <b>5</b> )	
390pF( <b>391</b> )	J	1007.	-41	1007.	0.5( <b>5</b> )	
470pF( <b>471</b> )	J	A. COM.	N WWW	· P	0.5( <b>5</b> )	
560pF( <b>561</b> )	J	M.100 CUM:7			0.5( <b>5</b> )	
680pF( <b>681</b> )	J	11007.	W.		0.5( <b>5</b> )	

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The part numbering code is shown in ().

Part Number L x W [EIA]		GRM	02	GRM03	GRM15	
		0.4x0.2 [	01005]	0.6x0.3 [0201]	1.0x0.5 [0402	
Rated Volt.	.00Y.C	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	50 ( <b>1H</b> )	
тс	700.	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	
Capacitance, Cap	pacitance 1	Folerance and T Dimension	11/1/11/100	COM		
820pF( <b>821</b> )	J100	Y. OM.TW	10	ON. THE	0.5( <b>5</b> )	
1000pF( <b>102</b> )	J	V.CO	MM	MY.CO. CTW	0.5( <b>5</b> )	
The part numbering Dimensions are sho		vn in (). id Rated Voltage in Vdc.	MAN.	V.100Y.COM.TW		
Part Number		GRM18		GRM21	GRM31	
L \A/ [□1A]	-31	1 ( 0 0 [0(00]	2.0	1 11 DE [000E]	2.2.4 ( [120/]	

The part numbering code is shown in ().

L x W [EIA]	Part Number	G	SRM18	GR	RM21	GR	M31	
TC	L x W [EIA]	1.6x0.8 [0603]		2.0 x1.2	25 [0805]	3.2x1.6 [1206]		
Capacitance, Capacitance Tolerance and T Dimension	Rated Volt.	100 ( <b>2A</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1</b> 1	
0.10pF(R10) B	тс	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0 ( <b>5</b> 0	
0.20pF(R20) B 0.8(8) 0.8(8) 0.8(8) 0.00pF(R30) C 0.8(8) 0.8(8) 0.00pF(R40) C 0.8(8) 0.8(8) 0.00pF(R50) C 0.8(8) 0.8(8) 0.8(8) 0.00pF(R50) C 0.8(8) 0.8(8) 0.8(8) 0.00pF(R60) C 0.8(8) 0.8(8) 0.8(8) 0.00pF(R80) C 0.8(8) 0.8(8) 0.8(8) 0.00pF(R80) C 0.8(8) 0.8(8) 0.8(8) 0.00pF(R90) D 0.8(8) 0.8(8) 0.8(8) 0.00pF(R90) J 0.8(8) 0.00pF(R	Capacitance, Ca	ice Tolerance and T	T Dimension		100Y.	MIIM	'	
0.30pF(R30)	0.10pF( <b>R10</b> )	-11WW.10	0.8(8)	V W	WW.	On TAN		
0.40pF(R40) C	0.20pF( <b>R20</b> )	-12N-10	0.8(8)		W.100	COM		
0.50pF(R50)	0.30pF( <b>R30</b> )	MM	0.8(8)	W A	1007	TIME		
0.60pF(R60) C 0.8(8) 0.8(8) 0.8(8) 0.8(8) 0.80pF(R80) C 0.8(8) 0.8(8) 0.8(8) 0.8(8) 0.80pF(R80) C 0.8(8) 0.8(8) 0.8(8) 0.8(8) 0.8(8) 0.90pF(R90) C 0.8(8) 0	0.40pF( <b>R40</b> )		0.8(8)	AVA	WWW.	COM		
0.70pF(R70)	0.50pF( <b>R50</b> )	0.8( <b>8</b> )	0.8(8)	7.	1111.100	COM	e T	
0.80pF(R80)	0.60pF( <b>R60</b> )	0.8( <b>8</b> )	0.8(8)	TW	11/11/1			
0.90pF(R90) C 0.8(8) 0.8(8) 0.8(8) 1.0pF(1R0) C 0.9(8) 0.8(8) 0.8(8) 3.0pF(3R0) C 0.8(8) 0.8(8) 0.8(8) 3.0pF(3R0) C 0.8(8) 0.8(	0.70pF( <b>R70</b> )	0.8(8)	0.8(8)			COL	N.	
1.0pF(1R0) C 0.8(8) 0.8(8)  2.0pF(2R0) C 0.8(8) 0.8(8)  3.0pF(3R0) C 0.8(8) 0.8(8)  4.0pF(4R0) C 0.8(8) 0.8(8)  5.0pF(5R0) C 0.8(8) 0.8(8)  6.0pF(6R0) D 0.8(8) 0.8(8)  8.0pF(8R0) D 0.8(8) 0.8(8)  8.0pF(8R0) D 0.8(8) 0.8(8)  9.0pF(9R0) D 0.8(8) 0.8(8)  10pF(100) J 0.8(8) 0.8(8)  12pF(120) J 0.8(8) 0.8(8)  15pF(150) J 0.8(8) 0.8(8)  22pF(220) J 0.8(8) 0.8(8)  22pF(220) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  47pF(470) J 0.8(8) 0.8(8)  48pF(6R0) J 0.8(8) 0.8(8)  4100pF(101) J 0.8(8) 0.8(8)  120pF(121) J 0.8(8) 0.8(8)  150pF(151) J 0.8(8) 0.8(8)  150pF(151) J 0.8(8) 0.8(8)	0.80pF( <b>R80</b> )	0.8(8)	0.8(8)	$\Lambda_{i,I_{i,I_{i}}}$	- TVV.1	ON'		
2.0pF(2R0) C 0.8(8) 0.8(8) 0.8(8)  3.0pF(3R0) C 0.8(8) 0.8(8)  4.0pF(4R0) C 0.8(8) 0.8(8)  5.0pF(5R0) C 0.8(8) 0.8(8)  6.0pF(6R0) D 0.8(8) 0.8(8)  7.0pF(7R0) D 0.8(8) 0.8(8)  8.0pF(8R0) D 0.8(8) 0.8(8)  9.0pF(9R0) D 0.8(8) 0.8(8)  10pF(100) J 0.8(8) 0.8(8)  112pF(120) J 0.8(8) 0.8(8)  112pF(120) J 0.8(8) 0.8(8)  122pF(220) J 0.8(8) 0.8(8)  22pF(220) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  47pF(470) J 0.8(8) 0.8(8)  33pF(30) J 0.8(8) 0.8(8)  47pF(470) J 0.8(8) 0.8(8)  47pF(470) J 0.8(8) 0.8(8)  48pF(680) J 0.8(8) 0.8(8)  48pF(680) J 0.8(8) 0.8(8)  48pF(680) J 0.8(8) 0.8(8)  410pF(101) J 0.8(8) 0.8(8)  420pF(202) J 0.8(8) 0.8(8)  43pF(303) J 0.8(8) 0.8(8)  440pF(680) J 0.8(8) 0.8(8)  450pF(680) J 0.8(8) 0.8(8)  450pF(680) J 0.8(8) 0.8(8)  450pF(691) J 0.8(8) 0.8(8)  450pF(692) J 0.8(8) 0.8(8)  450pF(692) J 0.8(8) 0.8(8)  450pF(692) J 0.8(8) 0.8(8)  450pF(693) J 0.8(8) 0.8(8)  450pF(694) J 0.8(8) 0.8(8)  450pF(695) J 0.8(8) 0.8(8)  450pF(695	0.90pF( <b>R90</b> )	0.8(8)	0.8(8)		MM	1007.		
3.0pF(3R0) C 0.8(8) 0.8	1.0pF( <b>1R0</b> )	0.8(8)	0.8(8)	DIVI		· COh	WW	
4.0pF(4R0)       C       0.8(8)       0.8(8)         5.0pF(5R0)       C       0.8(8)       0.8(8)         6.0pF(6R0)       D       0.8(8)       0.8(8)         7.0pF(7R0)       D       0.8(8)       0.8(8)         8.0pF(8R0)       D       0.8(8)       0.8(8)         9.0pF(9R0)       D       0.8(8)       0.8(8)         10pF(100)       J       0.8(8)       0.8(8)         12pF(120)       J       0.8(8)       0.8(8)         15pF(150)       J       0.8(8)       0.8(8)         18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         33pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151) </td <td>2.0pF(<b>2R0</b>)</td> <td>0.8(<b>8</b>)</td> <th>0.8<b>(8</b>)</th> <td>OM.T.</td> <td></td> <td>1.100</td> <td></td>	2.0pF( <b>2R0</b> )	0.8( <b>8</b> )	0.8 <b>(8</b> )	OM.T.		1.100		
5.0pF(5R0)       C       0.8(8)       0.8(8)         6.0pF(6R0)       D       0.8(8)       0.8(8)         7.0pF(7R0)       D       0.8(8)       0.8(8)         8.0pF(8R0)       D       0.8(8)       0.8(8)         9.0pF(9R0)       D       0.8(8)       0.8(8)         10pF(100)       J       0.8(8)       0.8(8)         12pF(120)       J       0.8(8)       0.8(8)         15pF(150)       J       0.8(8)       0.8(8)         18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         33pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151) <td>3.0pF(<b>3R0</b>)</td> <td>0.8(8)</td> <th>0.8(8)</th> <td>TW</td> <td>MM.</td> <td>1001.0</td> <td>TIN</td>	3.0pF( <b>3R0</b> )	0.8(8)	0.8(8)	TW	MM.	1001.0	TIN	
6.0pF(6R0) D 0.8(8) 0.8(8) 0.8(8)  7.0pF(7R0) D 0.8(8) 0.8(8) 0.8(8)  8.0pF(8R0) D 0.8(8) 0.8(8)  9.0pF(9R0) D 0.8(8) 0.8(8)  10pF(100) J 0.8(8) 0.8(8)  12pF(120) J 0.8(8) 0.8(8)  15pF(150) J 0.8(8) 0.8(8)  22pF(220) J 0.8(8) 0.8(8)  22pF(220) J 0.8(8) 0.8(8)  27pF(270) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  33pF(330) J 0.8(8) 0.8(8)  47pF(470) J 0.8(8) 0.8(8)  56pF(560) J 0.8(8) 0.8(8)  56pF(560) J 0.8(8) 0.8(8)  82pF(820) J 0.8(8) 0.8(8)  82pF(820) J 0.8(8) 0.8(8)  120pF(101) J 0.8(8) 0.8(8)  150pF(151) J 0.8(8) 0.8(8)	4.0pF( <b>4R0</b> )	0.8( <b>8</b> )	0.8(8)	COM	-xIVI	M. T. CO		
7.0pF(7R0) D 0.8(8) 0.8(8) 0.8(8) 0.9(9) D 0.8(8) 0.8(8) 0.8(8) 0.9(9) D 0.8(8) 0.8(8) 0.8(8) 0.9(8) 0.9(9) D 0.8(8) 0.8(	5.0pF( <b>5R0</b> )	0.8(8)	0.8(8)	- M.T.VI		XX.100 1	Mil	
8.0pf(8R0) D 0.8(8) 0.8(8)  9.0pf(9R0) D 0.8(8) 0.8(8)  10pf(100) J 0.8(8) 0.8(8)  12pf(120) J 0.8(8) 0.8(8)  15pf(150) J 0.8(8) 0.8(8)  22pf(220) J 0.8(8) 0.8(8)  27pf(270) J 0.8(8) 0.8(8)  33pf(330) J 0.8(8) 0.8(8)  33pf(390) J 0.8(8) 0.8(8)  47pf(470) J 0.8(8) 0.8(8)  56pf(560) J 0.8(8) 0.8(8)  82pf(820) J 0.8(8) 0.8(8)  82pf(820) J 0.8(8) 0.8(8)  100pf(101) J 0.8(8) 0.8(8)  120pf(121) J 0.8(8) 0.8(8)  150pf(151) J 0.8(8) 0.8(8)	6.0pF( <b>6R0</b> )	0.8(8)	0.8(8)	I.Co.		, Took C	TI	
9.0pF(9R0) D 0.8(8) 0.8(8) 10pF(100) J 0.8(8) 0.8(8) 12pF(120) J 0.8(8) 0.8(8) 15pF(150) J 0.8(8) 0.8(8) 18pF(180) J 0.8(8) 0.8(8) 22pF(220) J 0.8(8) 0.8(8) 27pF(270) J 0.8(8) 0.8(8) 33pF(330) J 0.8(8) 0.8(8) 33pF(390) J 0.8(8) 0.8(8) 47pF(470) J 0.8(8) 0.8(8) 56pF(560) J 0.8(8) 0.8(8) 56pF(560) J 0.8(8) 0.8(8) 82pF(820) J 0.8(8) 0.8(8) 100pF(101) J 0.8(8) 0.8(8) 120pF(121) J 0.8(8) 0.8(8) 150pF(151) J 0.8(8) 0.8(8)	7.0pF( <b>7R0</b> )	0.8( <b>8</b> )	0.8 <b>(8</b> )	-1 COM.	- 1	WW.IO	OM	
10pF(100)       J       0.8(8)       0.8(8)         12pF(120)       J       0.8(8)       0.8(8)         15pF(150)       J       0.8(8)       0.8(8)         18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         33pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	8.0pF( <b>8R0</b> )	0.8( <b>8</b> )	0.8(8)	M.T.		1007	and.	
12pF(120)       J       0.8(8)       0.8(8)         15pF(150)       J       0.8(8)       0.8(8)         18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         33pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	9.0pF( <b>9R0</b> )	0.8(8)	0.8(8)	of Con	W Y	MAN TOOK		
15pF(150)       J       0.8(8)       0.8(8)         18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	10pF( <b>100</b> )	0.8(8)	0.8(8)	COM	-41	STAN W. 10	CON	
18pF(180)       J       0.8(8)       0.8(8)         22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	12pF( <b>120</b> )	0.8(8)	0.8(8)	1007.	In	W . 100		
22pF(220)       J       0.8(8)       0.8(8)         27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	15pF( <b>150</b> )	0.8(8)	0.8 <b>(8</b> )	CON.	W	WWW	V.C	
27pF(270)       J       0.8(8)       0.8(8)         33pF(330)       J       0.8(8)       0.8(8)         39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	18pF( <b>180</b> )	0.8(8)	0.8(8)	.100	1.1	TAN W. IV	-1 C	
33pF(330)       J       0.8(8)       0.8(8)         39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	22pF( <b>220</b> )	0.8( <b>8</b> )	0.8 <b>(8</b> )	11007.		11	10 1.	
39pF(390)       J       0.8(8)       0.8(8)         47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	27pF( <b>270</b> )	0.8(8)	0.8(8)	W. Park.Co			ON.C	
47pF(470)       J       0.8(8)       0.8(8)         56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	33pF( <b>330</b> )	0.8(8)	0.8(8)	W.100	OM.	· Www.	LU	
56pF(560)       J       0.8(8)       0.8(8)         68pF(680)       J       0.8(8)       0.8(8)         82pF(820)       J       0.8(8)       0.8(8)         100pF(101)       J       0.8(8)       0.8(8)         120pF(121)       J       0.8(8)       0.8(8)         150pF(151)       J       0.8(8)       0.8(8)	39pF( <b>390</b> )	0.8(8)	0.8(8)	1001	TIM	N V	1007.	
68pF(680)     J     0.8(8)     0.8(8)       82pF(820)     J     0.8(8)     0.8(8)       100pF(101)     J     0.8(8)     0.8(8)       120pF(121)     J     0.8(8)     0.8(8)       150pF(151)     J     0.8(8)     0.8(8)	47pF( <b>470</b> )	0.8(8)	0.8 <b>(8</b> )	WW.	TO THE		- 007	
82pF(820)     J     0.8(8)     0.8(8)       100pF(101)     J     0.8(8)     0.8(8)       120pF(121)     J     0.8(8)     0.8(8)       150pF(151)     J     0.8(8)     0.8(8)	56pF( <b>560</b> )	0.8(8)	0.8(8)	W.100 F	COM.		N.In.	
100pF(101)     J     0.8(8)     0.8(8)       120pF(121)     J     0.8(8)     0.8(8)       150pF(151)     J     0.8(8)     0.8(8)	68pF( <b>680</b> )	0.8(8)	0.8(8)	11007	TI		-x1 100	
120pF( <b>121</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> ) 150pF( <b>151</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> )	82pF( <b>820</b> )	0.8(8)	0.8(8)	WWW.	COM	VVV	111.5	
150pF( <b>151</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> )			<del></del>	111.100	COM.1	1		
		4 1 1 1 1 1		11/11/10	OY.			
180pF( <b>181</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> )	150pF( <b>151</b> )	0.8(8)		WW.I	COM.			
		0.8(8)	<del>- 1 / 7 / 7 / 7 / 7 / 7 / 7 / 7 / 7 / 7 /</del>	W 1	00 2			
220pF( <b>221</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> )	220pF( <b>221</b> )			MAN				
270pF( <b>271</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> ) 330pF( <b>331</b> ) <b>J</b> 0.8( <b>8</b> ) 0.8( <b>8</b> )	270pF( <b>271</b> )	0.8(8)	0.8(8)					

The part numbering code is shown in ().

Part Number	-1 (	GR	M18	GR	M21	GRM31	
L x W [EIA]	01.	1.6x0.8	3 [0603]	2.0 x1.2	25 [0805]	3.2x1.6	[1206]
Rated Volt.	Rated Volt.		50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )
тс	.100	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )
Capacitance, Ca	pacitan	ce Tolerance and T D	Dimension	MW.IO	COMP	·	
390pF( <b>391</b> )	J	0.8(8)	0.8(8)	100 1			
470pF( <b>471</b> )	J	0.8(8)	0.8(8)	NAME OF THE PROPERTY OF	CO		
560pF( <b>561</b> )	J	0.8(8)	0.8(8)	TANN. Too	-1 CONL	J	
680pF( <b>681</b> )	J	0.8(8)	0.8(8)	W 100	J. OWIT		
820pF( <b>821</b> )	J	0.8(8)	0.8(8)	MM	N.Co.	N	
1000pF( <b>102</b> )	J	0.8(8)	0.8(8)	7.11.11	COM	- 1	
1200pF( <b>122</b> )	J	0.8(8)	0.8(8)	1111	1007.	1.44	
1500pF( <b>152</b> )	J	0.8(8)	0.8(8)	MIN.	CO	TW	
1800pF( <b>182</b> )	J	-1XV 100 x	0.8(8)	0.6(6)	Ing. COM	- 1	
2200pF( <b>222</b> )	J	100X:	0.8(8)	0.6(6)	11007.	177	
2700pF( <b>272</b> )	J	WW.Iso	0.8(8)	0.6(6)	M. CO.	W	
3300pF( <b>332</b> )	J	1002	0.8(8)	0.6(6)	W.100	M	
3900pF( <b>392</b> )	J	NW LOOK	0.8(8)	M.A.	11007.0	0.85( <b>9</b> )	
4700pF( <b>472</b> )	J	.10	COM.	U XI	0.6(6)	0.85( <b>9</b> )	
5600pF( <b>562</b> )	J	100	T. COM.		0.85( <b>9</b> )	0.85( <b>9</b> )	
6800pF( <b>682</b> )	J	WW	OY.CO	V V	0.85( <b>9</b> )	0.85( <b>9</b> )	
8200pF( <b>822</b> )	J	11/1/11/11	<1 COM		0.85( <b>9</b> )	0.85( <b>9</b> )	
10000pF( <b>103</b> )	J	N T	00 r. OW.	1.11	0.85( <b>9</b> )	0.85( <b>9</b> )	-
12000pF( <b>123</b> )	ŊJ	MAN	TOUX CO.	TI	0.85( <b>9</b> )	Y.C.	
15000pF( <b>153</b> )	J	VVX	Jun 1 CON		0.85( <b>9</b> )	COM	N
18000pF( <b>183</b> )	J	W.	11001	1.11	1.25( <b>B</b> )	ON'	
22000pF( <b>223</b> )	J	WW	N. CO	W	1.25( <b>B</b> )	007.00	
27000pF( <b>273</b> )	J		W.In	Mi		TOWN.	0.85( <b>9</b> )
33000pF( <b>333</b> )	J	1/1/	11001	MITH	111	100,	0.85( <b>9</b> )
39000pF( <b>393</b> )	J	V W	NYV.	UN	WWW	100 Y.CO	0.85(9)
47000pF( <b>473</b> )	J		100 E	COMP.	TAN'	N. TO	1.15( <b>M</b> )
56000pF( <b>563</b> )	J	W V	11007	MITH	N V	M 100 x	1.15( <b>M</b> )
68000pF( <b>683</b> )	J	TVN .	MM.	COM	WW	A. OUN'CA	1.6( <b>C</b> )
82000pF( <b>823</b> )	J	1.	. TIN 100	COM	-11	1111.Ju	1.6( <b>C</b> )
0.10μF( <b>104</b> )	J	TW	A A	N.C.	N (1)	1007.	1.6( <b>C</b> )

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

## Temperature Compensating Type C0G(5C) Characteristics Low Profile

Part Number	~ 1	GRM15	MM
L x W [EIA]	100 1	1.0x0.5 [0402]	COM
Rated Volt.	V.100	50 ( <b>1H</b> )	
тс	W.10	C0G ( <b>5C</b> )	MAN TOON CON
Capacitance, Ca	pacitano	Tolerance and T Dimension	MM
120pF( <b>121</b> )	J	0.3(3)	
150pF( <b>151</b> )	J	0.3(3)	
180pF( <b>181</b> )	J	0.3(3)	
220pF( <b>221</b> )	J	0.3(3)	
270pF( <b>271</b> )	J	0.3(3)	
330pF( <b>331</b> )	J	0.3(3)	
390pF( <b>391</b> )	J	0.3(3)	

The part numbering code is shown in  $\ (\ ).$ 

Part Number	-1 (	GRM15	
L x W [EIA]	01.	1.0x0.5 [0402]	
Rated Volt.		50 ( <b>1H</b> )	
тс	700	C0G ( <b>5C</b> )	
Capacitance, Ca	pacitano	ce Tolerance and T Dimension	
470pF( <b>471</b> )	J10	0.3(3)	

Dimensions are shown in mm and Rated Voltage in Vdc.

# **Temperature Compensating Type U2J(7U) Characteristics**

Part Number	WIN	GRM03		GF	GRM15		RM18	GRM21		GRM31
L x W [EIA]	N.	0.6x0.3	3 [0201]	1.0x0	5 [0402]	1.6x0.	8 [0603]	2.0x1.2	5 [0805]	3.2x1.6 [1206]
Rated Volt.		50 ( <b>1H</b> )	25 ( <b>1E</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	50 ( <b>1 H</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )
тс	4	U2J ( <b>7U</b> )								
Capacitance, Ca	pacitano	e Tolerance a	and T Dimens	ion	N	WW		ON	N	
1.0pF( <b>1R0</b> )	С	0.3(3)	100 x.	0.5( <b>5</b> )		0.8(8)	11.100	COM	_1	
2.0pF( <b>2R0</b> )	С	0.3(3)	Anny.	0.5( <b>5</b> )	M	0.8(8)	-1100Y	-117	M	
3.0pF( <b>3R0</b> )	С	0.3(3)	W. 100	0.5( <b>5</b> )	-XX	0.8(8)	M.r.	COM	- W	
4.0pF( <b>4R0</b> )	С	0.3(3)	100	0.5( <b>5</b> )	17.4	0.8(8)	-W.100	MOD	1	
5.0pF( <b>5R0</b> )	N C	0.3(3)	144.	0.5( <b>5</b> )		0.8(8)	100	N.C.	WIL	
6.0pF( <b>6R0</b> )	D	0.3(3)	W.In.	0.5( <b>5</b> )	-31	0.8(8)	M.Y.	of COL		
7.0pF( <b>7R0</b> )	D	0.3(3)	10	0.5( <b>5</b> )	W.T.	0.8(8)	- N. 1	10.	M.r.	
8.0pF( <b>8R0</b> )	D	0.3(3)	MAN	0.5( <b>5</b> )	IV	0.8(8)		OU.Y.	VITIE	
9.0pF( <b>9R0</b> )	D	0.3(3)		0.5( <b>5</b> )	OM.	0.8(8)		ast C	Divi	1
10pF( <b>100</b> )	J	0.3(3)	1111	0.5( <b>5</b> )	OM.TY	0.8(8)	W. Tan	700 .	OM.	
12pF( <b>120</b> )	J	0.3(3)	MINA	0.5( <b>5</b> )		0.8(8)	MW	1007.	11	
15pF( <b>150</b> )	MJ -	0.3(3)		0.5( <b>5</b> )	COM.	0.8(8)	-111	N.IO	$CO_{Mr}$	-XXI
18pF( <b>180</b> )	J	W	0.3(3)	0.5( <b>5</b> )		0.8(8)		XX 100 1	Mos	
22pF( <b>220</b> )	J	- XX	0.3(3)	0.5( <b>5</b> )	V.CO	0.8(8)	W	400	V.Co	TW
27pF( <b>270</b> )	J	7.	0.3(3)	0.5( <b>5</b> )	COM	0.8(8)		M.In.	47 CO	-XX
33pF( <b>330</b> )	J		0.3(3)	0.5( <b>5</b> )	01.0	0.8(8)		10	13.	VIII
39pF( <b>390</b> )	$CD_{\overline{D}}$		0.3(3)	0.5( <b>5</b> )	V.CO	0.8(8)	1	MAG	MY.C	WT
47pF( <b>470</b> )	J	$M_{I,I,J}$	0.3(3)	0.5( <b>5</b> )	40.	0.8(8)		T.WW.T	-7 C	$0_{N_P}$
56pF( <b>560</b> )	J	WILL	0.3(3)	0.5( <b>5</b> )	1001	0.8(8)		MAI	1001.	MI
68pF( <b>680</b> )	J	Divis.	0.3(3)	0.5( <b>5</b> )	· NV.C	0.8(8)	N	WIN W.	. Mary	T
82pF( <b>820</b> )	V j	W.I.	0.3(3)	0.5( <b>5</b> )	100 -	0.8(8)	1		Too	COM.
100pF( <b>101</b> )	J		0.3(3)	0.5( <b>5</b> )	1007.	0.8(8)	N.	MA	×1 1007	·Mo
120pF( <b>121</b> )	J	COMP.	- 1	0.5( <b>5</b> )	11.3	0.8(8)		WW	14.	CO
150pF( <b>151</b> )	1(1)	Mo	1.44	0.5( <b>5</b> )	W.100.	0.8(8)			M.Ino	TON!
180pF( <b>181</b> )	J	I.Com	TW	0.5( <b>5</b> )	1 100	0.8(8)	WI	11/1	10	17.0
220pF( <b>221</b> )	J	-1 COM	- 1		WWW	0.8(8)		TX.	M.M.	V.CO
270pF( <b>271</b> )	3 J ()	77.0	VII.	1	10 10	0.8(8)	Mir	-	T.W.I	90
330pF( <b>331</b> )	J	WY.Co.	W			0.8(8)	WILL			1001
390pF( <b>391</b> )	JJ.	-1 ((	Mi			0.8(8)	Diar.		WWW.	, 3
470pF( <b>471</b> )	J	1001.	MILMO		NY TON	0.8(8)	OWITT		44	
560pF( <b>561</b> )	MJ.	any.C	Oh- TI	N	MM	0.8(8)		N		
680pF( <b>681</b> )	J	Ton	-OM-	- 1		0.8(8)	COMP			
1000pF( <b>102</b> )	J	1100X	01/17	11		0.8(8)				
1200pF( <b>122</b> )	J	N.	CO.	TV	0.5( <b>5</b> )	0.8(8)				
1500pF( <b>152</b> )	J	W.100	COM		0.5(5)	0.8(8)				
1800pF( <b>182</b> )	J	100	1.0	17/1	0.5( <b>5</b> )	0.8(8)				

The part numbering code is shown in ().

The part numbering code is shown in ().

Part Number	-16	GR	M03	GR	M15	GR	M18	<b>GRM21</b> 2.0x1.25 [0805]		GRM21		GRM31
L x W [EIA]	01.	0.6x0.3	3 [0201]	1.0x0.5	5 [0402]	1.6x0.8	8 [0603]			3.2x1.6 [1206]		
Rated Volt.		50 ( <b>1H</b> )	25 ( <b>1E</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )		
тс	100	U2J ( <b>7U</b> )	U2J ( <b>7U</b> )	U2J ( <b>7U</b> )								
Capacitance, Ca	pacitan	ce Tolerance a	and T Dimensi	ion	M.In	-1 CO	-53					
2200pF( <b>222</b> )	J4(	107:0	TIN		0.5( <b>5</b> )	0.8(8)	WIII					
2700pF( <b>272</b> )	J	and Co	W		0.5( <b>5</b> )	0.8(8)	W					
3300pF( <b>332</b> )	J	100	Mr.		0.5( <b>5</b> )	0.8(8)	$O_{Mr}$	J				
3900pF( <b>392</b> )	J	1007.0	TV		0.5( <b>5</b> )	0.8(8)	OWITY					
4700pF( <b>472</b> )	J	· ·	Obs	N	0.5( <b>5</b> )	0.8(8)	TO T	1				
5600pF( <b>562</b> )	J	N.100	COM	- 7		0.8(8)	COMP.	- 1				
6800pF( <b>682</b> )	J	1007			MA	0.8(8)		1.11				
8200pF( <b>822</b> )	J	M.r.	A COMP.			0.8(8)	V.CUP	TW				
10000pF( <b>103</b> )	J	-11V 10V	COM			0.8(8)	CON	- 1				
12000pF( <b>123</b> )	J	100	N.Co	WIL		- × 10	0.8(8)	0.6(6)				
15000pF( <b>153</b> )	J	MINTO	of CO			MW.	0.8(8)	0.6(6)				
18000pF( <b>183</b> )	J	-N.1	M. r.	Mil		· www.1	0.8(8)	0.6(6)				
22000pF( <b>223</b> )	J	MM	OUT.	WILL		MAL	0.8(8)	0.85(9)				
27000pF( <b>273</b> )	J		~ T C	OMr.	I.		COV.C	0.85(9)	N			
33000pF( <b>333</b> )	J	111	100 1.			-311	1.100	1.0( <b>A</b> )	-1			
39000pF( <b>393</b> )	J		Loon Y.	11			-1100Y	1.25( <b>B</b> )				
47000pF( <b>473</b> )	J		W.In.	COM	-XXI	Wire	M. 7.	1.25( <b>B</b> )				
56000pF( <b>563</b> )	J	AN A	TX 1003	Mon	LAL	77	1XV.100	MOD	0.85( <b>9</b> )	0.85( <b>9</b> )		
68000pF( <b>683</b> )	J	WV	144.	Y.Cu	TW	W	1100	Y.C.	1.25( <b>B</b> )	1.15( <b>M</b> )		
82000pF( <b>823</b> )	J		W. In.	-1 CON	- XXI	- 41	WW.I	of COD	1.25( <b>B</b> )	1.15( <b>M</b> )		
0.10μF( <b>104</b> )	J	- W	-110	01.	1777	1	-3110	W	1.25( <b>B</b> )	1.15( <b>M</b> )		

The part numbering code is shown in ().

## **Temperature Compensating Type P2H(6P) Characteristics**

Part Number	) N. P.	GRM15	GRM18
L x W [EIA]	MO	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.	COD	50 ( <b>1H</b> )	50 (1 <b>H</b> )
тс	Y.CO	P2H ( <b>6P</b> )	P2H ( <b>6P</b> )
Capacitance, Cap	pacitance	e Tolerance and T Dimension	TW WWW. MY.CO.
1.0pF( <b>1R0</b> )	С	0.5(5)	0.8( <b>8</b> )
2.0pF( <b>2R0</b> )	C	0.5( <b>5</b> )	0.8( <b>8</b> )
3.0pF( <b>3R0</b> )	C	0.5( <b>5</b> )	0.8(8)
4.0pF( <b>4R0</b> )	C	0.5 <b>(5</b> )	0.8(8)
5.0pF( <b>5R0</b> )	C	0.5( <b>5</b> )	0.8( <b>8</b> )
6.0pF( <b>6R0</b> )	D	0.5(5)	0.8( <b>8</b> )
7.0pF( <b>7R0</b> )	D	0.5 <b>(5</b> )	0.8(8)
8.0pF( <b>8R0</b> )	D	0.5( <b>5</b> )	0.8( <b>8</b> )
9.0pF( <b>9R0</b> )	D	0.5( <b>5</b> )	0.8(8)
10pF( <b>100</b> )	J	0.5( <b>5</b> )	0.8( <b>8</b> )
12pF( <b>120</b> )	J.	0.5( <b>5</b> )	0.8(8)
15pF( <b>150</b> )	J	0.5( <b>5</b> )	0.8(8)
18pF( <b>180</b> )	J	0.5( <b>5</b> )	0.8(8)
22pF( <b>220</b> )	J	0.5( <b>5</b> )	0.8(8)
27pF( <b>270</b> )	J	0.5( <b>5</b> )	0.8(8)
33pF( <b>330</b> )	J	1007.	0.8(8)

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

Part Number	-100N1.	GRM15	GRM18
L x W [EIA]	Dr. OM.TW	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.	OOY. COM.TW	50 ( <b>1H</b> )	50 ( <b>1H</b> )
тс	100 COM.TV	P2H ( <b>6P</b> )	P2H ( <b>6P</b> )
Capacitance, Cap	pacitance Tolerance and T D	imension	COMP
39pF( <b>390</b> )	1,107.	100	0.8(8)
47pF( <b>470</b> )	M. CO.	CM WWW.	0.8(8)
56pF( <b>560</b> )	M. COM.	TWW.IO	0.8(8)
68pF( <b>680</b> )	J 1007.	TW	0.8(8)
82pF( <b>820</b> )	M. CO.	TW WWW	0.8(8)
100pF( <b>101</b> )	J. 1.100	M. Tank	0.8(8)
120pF( <b>121</b> )	1)	TITY W	0.8(8)
150pF( <b>151</b> )	JVI W. D. CC	NIN W	0.8(8)

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

## **Temperature Compensating Type R2H(6R) Characteristics**

Part Number		GRM03	GRM15	GRM18
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 ( <b>1E</b> )	50 (1 <b>H</b> )	50 ( <b>1H</b> )
тс	N	R2H ( <b>6R</b> )	R2H ( <b>6R</b> )	R2H ( <b>6R</b> )
Capacitance, Ca	pacitance	e Tolerance and T Dimension	V. I. V. 10	COM
1.0pF( <b>1R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
2.0pF( <b>2R0</b> )	С	0.3(3)	0.5 <b>(5</b> )	0.8(8)
3.0pF( <b>3R0</b> )	С	0.3(3)	0.5 <b>(5</b> )	0.8(8)
4.0pF( <b>4R0</b> )	С	0.3(3)	0.5 <b>(5</b> )	0.8(8)
5.0pF( <b>5R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
6.0pF( <b>6R0</b> )	D	0.3(3)	0.5 <b>(5</b> )	0.8(8)
7.0pF( <b>7R0</b> )	D	0.3 <b>(3</b> )	0.5 <b>(5</b> )	0.8(8)
8.0pF( <b>8R0</b> )	D	0.3(3)	0.5 <b>(5</b> )	0.8(8)
9.0pF( <b>9R0</b> )	D	0.3(3)	0.5 <b>(5</b> )	0.8(8)
10pF( <b>100</b> )	$\mathbf{C}\mathbf{D}_{D}$	0.3(3)	0.5 <b>(5</b> )	0.8(8)
12pF( <b>120</b> )	٦	0.3(3)	0.5 <b>(5</b> )	0.8 <b>(8)</b>
15pF( <b>150</b> )	J	0.3(3)	0.5 <b>(5</b> )	0.8(8)
18pF( <b>180</b> )	JC	0.3(3)	0.5 <b>(5</b> )	0.8(8)
22pF( <b>220</b> )	Ĵ	0.3(3)	0.5 <b>(5</b> )	0.8(8)
27pF( <b>270</b> )	J.	0.3(3)	0.5 <b>(5</b> )	0.8(8)
33pF( <b>330</b> )	J	0.3(3)	0.5 <b>(5</b> )	0.8(8)
39pF( <b>390</b> )	/(/)	0.3(3)	M.Inn. COW.	0.8(8)
47pF( <b>470</b> )	J	0.3(3)	1100Y.	0.8(8)
56pF( <b>560</b> )	J	0.3(3)	NN. CO	0.8(8)
68pF( <b>680</b> )	100	0.3(3)	100 COM.1	0.8(8)
82pF( <b>820</b> )	J	0.3(3)	W 1007.	0.8(8)
100pF( <b>101</b> )	J	0.3(3)	MM. COM	0.8(8)
120pF( <b>121</b> )	J	100x. OM.14.	M.1002	0.8(8)
150pF( <b>151</b> )	MJ.	TY.	MM TOOL TILL	0.8(8)
180pF( <b>181</b> )	J	TONICONI	A COM	0.8 <b>(8)</b>

The part numbering code is shown in ().

WWW.100Y.COM.TW Dimensions are shown in mm and Rated Voltage in Vdc.

## **Temperature Compensating Type S2H(6S) Characteristics**

Part Number		GRM03	GRM15	GRM18
L x W [EIA]	100	0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.		25 ( <b>1E</b> )	50 ( <b>1H</b> )	50 ( <b>1H</b> )
тс	W.19	S2H ( <b>6S</b> )	S2H ( <b>6S</b> )	S2H ( <b>6S</b> )
Capacitance, Ca	pacitan	ce Tolerance and T Dimension	TNW.100 TCON	OV.
1.0pF( <b>1R0</b> )	С	0.3(3)	0.5( <b>5</b> )	0.8(8)
2.0pF( <b>2R0</b> )	C	0.3(3)	0.5( <b>5</b> )	0.8(8)
3.0pF( <b>3R0</b> )	С	0.3(3)	0.5( <b>5</b> )	0.8(8)
4.0pF( <b>4R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
5.0pF( <b>5R0</b> )	С	0.3(3)	0.5( <b>5</b> )	0.8(8)
6.0pF( <b>6R0</b> )	D	0.3(3)	0.5( <b>5</b> )	0.8(8)
7.0pF( <b>7R0</b> )	D	0.3(3)	0.5( <b>5</b> )	0.8(8)
8.0pF( <b>8R0</b> )	D	0.3(3)	0.5( <b>5</b> )	0.8(8)
9.0pF( <b>9R0</b> )	D	0.3(3)	0.5 <b>(5</b> )	0.8(8)
10pF( <b>100</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
12pF( <b>120</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
15pF( <b>150</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
18pF( <b>180</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
22pF( <b>220</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
27pF( <b>270</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
33pF( <b>330</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
39pF( <b>390</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
47pF( <b>470</b> )	J	0.3(3)	W.T.	0.8(8)
56pF( <b>560</b> )	J	0.3(3)	TH MM	0.8(8)
68pF( <b>680</b> )	J	0.3(3)	DNI.	0.8(8)
82pF( <b>820</b> )	J	0.3(3)	ON:I'M	0.8(8)
100pF( <b>101</b> )	J	0.3(3)	O. LA MM	0.8(8)
120pF( <b>121</b> )	J	TANN. TO	CONT.	0.8(8)
150pF( <b>151</b> )	J	M 1003.	- M.T.	0.8(8)
180pF( <b>181</b> )	J	WIN WIN	(CO) IN	0.8(8)
220pF( <b>221</b> )	J	11.100	COM.	0.8(8)

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

## **Temperature Compensating Type T2H(6T) Characteristics**

Part Number	MY.	GRM03	GRM15	GRM18
L x W [EIA]	C C	0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.	100 x	25 ( <b>1E</b> )	50 ( <b>1H</b> )	50 ( <b>1H</b> )
тс үүү	X 100 Y	T2H ( <b>6T</b> )	T2H ( <b>6T</b> )	T2H ( <b>6T</b> )
Capacitance, Cap	pacitance To	olerance and T Dimension	W. JOOY. CO. ITW	WW. 1007.C.
1.0pF( <b>1R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
2.0pF( <b>2R0</b> )	C	0.3 <b>(3</b> )	0.5 <b>(5</b> )	0.8(8)
3.0pF( <b>3R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
4.0pF( <b>4R0</b> )	C	0.3(3)	0.5 <b>(5</b> )	0.8(8)
5.0pF( <b>5R0</b> )	С	0.3(3)	0.5 <b>(5</b> )	0.8(8)
6.0pF( <b>6R0</b> )	D	0.3(3)	0.5 <b>(5</b> )	0.8(8)
7.0pF( <b>7R0</b> )	D	0.3 <b>(3</b> )	0.5 <b>(5</b> )	0.8(8)
8.0pF( <b>8R0</b> )	D	0.3(3)	0.5( <b>5</b> )	0.8(8)

The part numbering code is shown in ().

Part Number	-1 CO	GRM03	GRM15	GRM18
L x W [EIA]	10 x	0.6x0.3 [0201]	1.0x0.5 [0402]	1.6x0.8 [0603]
Rated Volt.	OON.	25 ( <b>1E</b> )	50 ( <b>1H</b> )	50 ( <b>1H</b> )
тс	1007	T2H ( <b>6T</b> )	T2H ( <b>6T</b> )	T2H ( <b>6T</b> )
Capacitance, Cap	pacitance To	olerance and T Dimension	M.M. Too COM.	
9.0pF( <b>9R0</b> )	D	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
10pF( <b>100</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
12pF( <b>120</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
15pF( <b>150</b> )	J 1	0.3( <b>3</b> )	0.5 <b>(5</b> )	0.8(8)
18pF( <b>180</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
22pF( <b>220</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
27pF( <b>270</b> )	J	0.3(3)	0.5 <b>(5</b> )	0.8(8)
33pF( <b>330</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
39pF( <b>390</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
47pF( <b>470</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
56pF( <b>560</b> )	J	0.3( <b>3</b> )	0.5( <b>5</b> )	0.8(8)
68pF( <b>680</b> )	J	0.3( <b>3</b> )	0.5 <b>(5</b> )	0.8(8)
82pF( <b>820</b> )	J	0.3( <b>3</b> )	0.5 <b>(5</b> )	0.8(8)
100pF( <b>101</b> )	J	0.3(3)	0.5( <b>5</b> )	0.8(8)
120pF( <b>121</b> )	J	131.100 . COM:1	W.100	0.8(8)
150pF( <b>151</b> )	J	WW TOOK OF THE	N N N 100	0.8(8)
180pF( <b>181</b> )	J	COM.	and william	0.8(8)
220pF( <b>221</b> )	J	W. 100 COM.	1, 10, 10	0.8(8)
270pF( <b>271</b> )	J	WW TOOK .	TN NN	0.8(8)
330pF( <b>331</b> )	J	TANN TO COM	WW.	0.8(8)
390pF( <b>391</b> )	J	W 1001	T.I.	0.8(8)
470pF( <b>471</b> )	J	MM . WY.CO	TW WWW	0.8(8)

WWW.100Y.COM.TW

WWW.100Y.COM.TW WW.100Y.C Dimensions are shown in mm and Rated Voltage in Vdc. WWW.100Y.COM.TW

# **Chip Monolithic Ceramic Capacitors**



## for General Purpose GRM Series (High Dielectric Constant Type)

#### ■ Features

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

#### Applications

General electronic equipment

Part Number	Or.	Din	nensions	(mm)		
rait Nullibei	L	W	T	е	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		$M^{-1}$	0.25 ±0.05	0.1 to 0.3	0.4	All I
GRM153	1.0 ±0.05	0.5 ±0.05	0.3 ±0.03	0.1 10 0.3	0.4	(A)
GRM155		- 1	0.5 ±0.05	0.15 to 0.35	0.3	D 40 B
GRM185	1.6 ±0.1	0.8 ±0.1	0.5 +0/-0.1	0.2 to 0.5	0.5	
GRM188*	1.0 ±0.1	U.0 ±U.1	0.8 ±0.1	0.2 10 0.5	0.5	
GRM216	, -		0.6 ±0.1			
GRM219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7	
GRM21A	2.0 ±0.1	1.25 ±0.1	1.0 +0/-0.2	0.2 10 0.7	0.7	
GRM21B		C(0)	1.25 ±0.1			
GRM316			0.6 ±0.1			
GRM319	3.2 ±0.15	1.6 ±0.15	0.85 ±0.1	0.3 to 0.8	1.5	e g e
GRM31M		JU	1.15 ±0.1	0.3 10 0.8	1.5	
GRM31C	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2	7		
GRM329	. 1	-7	0.85 ±0.1			
GRM32A	4.0		1.0 +0/-0.2			
GRM32M	N J.V	0	1.15 ±0.1	7		
GRM32N	2 2 +0 2	2.5 ±0.2	1.35 ±0.15	0.3 min.	1.0	
GRM32C	3.2 ±0.3	2.5 ±0.2	1.6 ±0.2	0.3 MIN.	1.0	L SIN W
GRM32R	Mes		1.8 ±0.2	LAN	-11	
GRM32D		400	2.0 ±0.2	- 17	MA	
GRM32E		The	2.5 ±0.2	11/10.		

<sup>\*</sup> Bulk Case :  $1.6 \pm 0.07(L) \times 0.8 \pm 0.07(W) \times 0.8 \pm 0.07(T)$ 

## High Dielectric Constant Type X5R(R6) Characteristics

Part Number		GR	M02	GR	M03		GRM1	5			GRM1	8		111	GRM2	1		GR	M31		GR	M32
L x W [EIA]		0.4x0.2	[01005]	0.6x0.	3 [0201]	1.0x	:0.5 [C	402]	DAI	1.6x	0.8 [0	603]		2x1	1.25 [8	305]	< 3	.2x1.6	5 [120	6]	3.2x2.	5 [1210]
Rated Volt.		10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )
тс оу.СО	M.	X5R ( <b>R6</b> )			X5R ( <b>R6</b> )			X5R ( <b>R6</b> )		X5R ( <b>R6</b> )		X5R ( <b>R6</b> )										
Capacitance, Ca	pacitar	nce Tol	erance	and	T Dim	ensio	า	001	Z.C	O.P.		N		•	NV		40	M.		- N T	TW	
68pF ( <b>680</b> )	ĸ	0.2 ( <b>2</b> )	N			NW	W.	100	V.		.V.	W			W	NV	xi 1	001	CC	OW.	TV	N
100pF ( <b>101</b> )	K	0.2 ( <b>2</b> )	IN			W		N.1	ON	Co	OM	TV	V		1	- TST	W.	700	Y.U	0	1.1	
150pF ( <b>151</b> )	K	0.2 ( <b>2</b> )	TV	N				W.	100		201	1.1					NV	1.10	907.	CC	M	I
220pF ( <b>221</b> )	K	0.2 ( <b>2</b> )	1.7				W	NV	.10	00.A	CC	M.	TY	V.		V	W	V. V	100	y.C	ON	1.7
330pF ( <b>331</b> )	K	0.2 ( <b>2</b> )	UM Mr.	TV	Ñ.		V	W	N.	100	y.C		T.I	W			W		1.10	OY.		M
470pF ( <b>471</b> )	K	0.2 ( <b>2</b> )	101	1.T			4	NV	NV	1.10		CC	M	L.M.	N		W	JW	W.1	003	V.C	ON
680pF ( <b>681</b> )	K	907.	0.2* ( <b>2</b> )	M	41	V		1	IN	N.1	100	y.C	ON	, T	W			W	IN	110	OY.	CO
1000pF ( <b>102</b> )	К	100	0.2* ( <b>2</b> )		T.IV	0.5 ( <b>5</b> )			0.8		1.10	OY.	CO	M	TV			W				
1500pF ( <b>152</b> )	к	N.10	0.2* ( <b>2</b> )	0.3 ( <b>3</b> )	M	IM	κT		W		W.1	002		ON	LT							

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

GRM21B Series  $6.3V/22\mu F$  (L:  $2.0\pm0.15$ , W:  $1.25\pm0.15$ , T:  $1.25\pm0.15$ mm) GRM31C Series 6.3V/100µF (L: 3.2±0.3, W: 1.6±0.3, T: 1.6±0.3mm)

Continued on the following page.





<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*\*:</sup> In case of Rated Volt.6.3V. Capacitance Tolerance should be M.

Part Number			M02		M03		GRM1		- 4 (		GRM1		TV		GRM2				M31	, 1		M32
L x W [EIA]	<u> </u>		[01005]				0.5 [0		F0		0.8 [0		( )	76.	1.25 [8			.2x1.6			3.2x2.5	T
Rated Volt.	100 x	10 ( <b>1A</b> )	J. z .	-	N.		-			- 06	16 ( <b>1C</b> )	/	6.3 ( <b>0J</b> )	1	16 ( <b>1C</b> )		50 ( <b>1H</b> )		16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	25 ( <b>1E</b> )	
тс		X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5F ( <b>R6</b>												
Capacitance, Ca	apacitan	ce Tole	erance	and	T Dim	ensior	1		W	N.Y	0	J C	$0_{M_1}$	.0 -	(X)							
2200pF ( <b>222</b> )	K	10 x	0.2* ( <b>2</b> )	0.3 ( <b>3</b> )	T.A.	0.5 ( <b>5</b> )			0.8 ( <b>8</b> )	W.	<sup>7</sup> 00	V.	102	1.7								
3300pF ( <b>332</b> )	K	100	0.2* ( <b>2</b> )	0.3 ( <b>3</b> )	1.1	W			W	NV	.10	ON	CO	DI.	TV							
4700pF ( <b>472</b> )	к	1 1 (	0.2* ( <b>2</b> )	0.3 ( <b>3</b> )	M.	0.5 ( <b>5</b> )			0.8	W		100	y.C	<del>))}</del>	1.1	N						
6800pF ( <b>682</b> )	к	W.	0.2* ( <b>2</b> )	0.3 ( <b>3</b> )	01	1.1	N			N	NV	.10	ô.*	CC	M.	LAN	s I					
10000pF ( <b>103</b> )	К	N	0.2*	0.3 ( <b>3</b> )	CC	M.	0.5 ( <b>5</b> )	V	0.8	N N		N.1	. 00'	v.C	OM	- 1	N					
15000pF ( <b>153</b> )	К	W	(2)		0.3* ( <b>3</b> )	OM	(0)	N	(0)		NV	M.	100	o¥.	CO	M. 3	LM					
22000pF	К	NV		10	0.3*		0.5	Ţ.N.	0.8		W	NV.	N.1	007	.Cl	ON	L.T	N				
(223) 33000pF	К	W		N.1	0.3*	C	( <b>5</b> )	.1	(8)		- 1			700			M.J					
47000pF	К			M.	0.3*	Y.	( <b>5</b> )	1.7				11	NV	1.10	002	.C	M		N			
(473) 68000pF	Nĸ		W	NV	0.3*	007	( <b>5</b> )		T	N			TW.		100	y.C		VI.7	N			
(683) 0.10μF	К				0.3*	100	( <b>5</b> )		V.	0.8					1.10	OX	7 C	DIM	. 1	N.		
( <b>104</b> ) 0.15μF	K				(3)	1.19	(5)	0.5*	DM	(8)	N	0.8		N	W.	00	Y.C	O1		W		
( <b>154</b> ) 0.22μF	К	N			W	<del>41.1</del>	100	( <b>5</b> )	4O	0.8	N	(8)		W	W	<u>J</u> v	ON	,cº	-W	TV	Ñ	
( <b>224</b> ) 0.33μF	K	W			WY		11	( <b>5</b> )	CO	(8)	TV			T		N.	100	<u>, C</u>		1.1	N	
( <b>334</b> ) 0.47μF	ĸ	TV	«T		W		W.	( <b>5</b> )	1.U	0.8*	LT			1	NY	NN	.10		CC	M		N
( <b>474</b> ) 0.68μF	CK						VÝ	( <b>5</b> ) 0.5*	U.X.	(8)	M.				17	W	N.1	100 <u>.</u>	Į.C	OM	1. T	N
( <b>684</b> ) 1μF	K	M.	IN -				W	( <b>5</b> ) 0.5*	00	0.8*		i.T	N			WW	1N -	10	<del>57.</del>	20	M.	TY
( <b>105</b> ) 2.2μF	K		1.1	N		_	NN	(5)	10	(8)	0.8*	M.	W	1.25*		W	1.6	N.1	303	. C	ON	T
( <b>225</b> ) 4.7μF	00 1.	<u>c</u> 0	M		ī		W		N.1	10 X	(8)	OM	0.8*	( <b>B</b> ) 1.25*		N .	( <b>C</b> )	TN.	100		co <sup>1</sup>	M.
( <b>475</b> ) 10μF	UK N	V.C	Me	TY	"		N		W.	700	17.	201	( <b>8</b> )	(B)	1.25*		W.	1.6*	1.10	007	.CC	)M
( <b>106</b> )	K, M**	N.	201	VV.					NV	1.1V	003	CC	(8)	T	( <b>B</b> )	1.25*	1	( <b>C</b> )	1.6*	706	2.5*	OU
( <b>226</b> )	M	OOY	CC	JAN.	ŢV	V		V	IN	NN -	100	Y.C		AJ	W	( <b>B</b> )		W	( <b>C</b> )	1.6*	(E)	2.5
(476)	M	100	Y.C	-01	T.L	N N				N	1.10	01.	C	M	IN	N		W	77	( <b>C</b> )		( <b>E</b> )
100μF ( <b>107</b> )	М	1.10	0 X .		M	Lin	κĪ		M	TXV	W.1	$00_{3}$	«7 <b>(</b>	ON	[.T.					1.6* ( <b>C</b> )		

GRM21B Series  $6.3V/22\mu F$  (L:  $2.0\pm0.15$ , W:  $1.25\pm0.15$ , T:  $1.25\pm0.15mm$ )

GRM31C Series  $6.3V/100\mu F$  (L:  $3.2\pm0.3$ , W:  $1.6\pm0.3$ , T:  $1.6\pm0.3$ mm)

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*\*:</sup> In case of Rated Volt.6.3V, Capacitance Tolerance should be M.

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

Part Number		GR	M03	GR	M15	GR	M18	V CC	GRM21			GRM31		GR	M32
L x W [EIA]	100	0.6x0.3	3 [0201]	1.0x0.5	[0402]	1.6x0.8	3 [0603]	2.0	x1.25 [08	305]	3.2	2x1.6 [12	06]	3.2x2.5	5 [1210]
Rated Volt.		6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	25 ( <b>1E</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	10 ( <b>1A</b> )		4 <b>G</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )
тс	W.1	X6S ( <b>C8</b> )	X6T ( <b>D8</b> )	X6S ( <b>C8</b> )	X6S ( <b>C8</b> )										
Capacitance, Ca	pacitan	ce Tolera	nce and	T Dimens	sion		TIVI	Too	-1 C.C	Mr.	-XXI		1	1	
15000pF( <b>153</b> )	K	0.3*(3)		TI			14.	x1 100	7.0	-M	- 1				
22000pF( <b>223</b> )	000pF( <b>223</b> ) <b>K</b> 0.3*( <b>3</b> )		V.CU	Mar	W		WW	14.	N.C	0,50	TW				
33000pF( <b>333</b> )	K	0.3*(3)		Mr.				11.77	-7	OM	- 1				
47000pF( <b>473</b> )	K	0.3*(3)	ON.	- 1	LIN		11/4	-x1 1	001.		(17)				
0.10μF( <b>104</b> )	K	Mor	0.3*(3)	OB	TIN.		W	MAN	· coV	Cor	- 11				
0.15μF( <b>154</b> )	K	-TXN.1	00 -	0.5*( <b>5</b> )	T. F.	-			Ino.	- CO	Mr				
0.22μF( <b>224</b> )	K		1007	0.5*( <b>5</b> )	TT 1	V			1100	1.	717	11			
0.33μF( <b>334</b> )	K		7.0	0.5*( <b>5</b> )	N.T.	(N				V.C	724	TW			
0.47μF( <b>474</b> )	K	-18	1.100	0.5*( <b>5</b> )	Mi				W.10	0 -	OM	× 1			
0.68μF( <b>684</b> )	K	WW	- 40	M.C.	0.5*( <b>5</b> )				-11	001.		TW			
1.0μF( <b>105</b> )	K	- TVN	W. In	~37	0.5*( <b>5</b> )			43/1	MAN	~~~	$Co_{z}$	W	N .		
2.2μF( <b>225</b> )	K		-xxi 1	20 7.	Mod	0.8*(8)			- TIN	100 -	- 00	M.r.	_T		
4.7μF( <b>475</b> )	K		1	Your			0.8*(8)	1.25*( <b>B</b> )		1100	1.0	Tir			
10μF( <b>106</b> )	K		WW.	In	7 CO	A.F.	a I		1.25*( <b>B</b> )	N - 3-	V C	DEAD	N		
22μF( <b>226</b> )	М		-787	1100		MI	4.4		-41	1.25*( <b>B</b> )	1.6*( <b>C</b> )	OM.	1		
47μF( <b>476</b> )	M	4	VIV	100	V.C				11/14	-7.4	101	1.6*( <b>C</b> )	TW	2.5*( <b>E</b> )	
100μF( <b>107</b> )	М			W.In.	-76	$O_{MT}$ .	-31		- 11	1111-7	~*1	$CO_{D}$	1.6*( <b>C</b> )		2.5*( <b>E</b> )

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

GRM21B Series  $4V/22\mu F$  (L:  $2.0\pm0.15$ , W:  $1.25\pm0.15$ , T:  $1.25\pm0.15$ mm)

GRM31C Series 4V/100 $\mu$ F (L: 3.2 $\pm$ 0.3, W: 1.6 $\pm$ 0.3, T: 1.6 $\pm$ 0.3mm)

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

Part Number	Mor	GRM 02	- 7	RM				M15		Τn	G	RM	18	MI		- 1	GR	M21		_ < 1	W	G	RM	31	7 (	NO.	G	RM	32	
L x W [EIA]		0.4x0.2 [01005]	0.6x	0.3 [0	0201]	1.0	0x0.5	5 [04	02]	11	.6x0	3.0	060	3]	(.)	2.0	x1.2	5 [0	305]		3	3.2x	1.6 [	120	5]	_;	3.2x2	2.5 [	1210	)]
Rated Volt.		10 ( <b>1A</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	10 ( <b>1 A</b> )	4 ( <b>0G</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b>
тс 100	¥.0	X7R ( <b>R7</b> )	X7U ( <b>E7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7U ( <b>E7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7T ( <b>D7</b> )	X7L ( <b>E7</b>																	
Capacitance, Ca	pacitar	nce To	olera	nce	and	T Di	mer	sion	1	- 1 T	W.	10	0 -	. 7 (	(0)	M	٦.					-1	√N	W.	In		57	10	MI	
68pF ( <b>680</b> )	K	0.2 ( <b>2</b> )		[.]	N	KT					W	1.1	00		C	ON	[.]		V			V		VV	1.1	00	M.	C	)N	1.7
100pF ( <b>101</b> )	K	0.2 ( <b>2</b> )	0.3 ( <b>3</b> )	M	1	W				W	W	N.	10	00	Į.C	0	M	. I	W				W	W	N	10	00	Z.C	0	
150pF ( <b>151</b> )	К	0.2 ( <b>2</b> )	0.3 ( <b>3</b> )		M	IJ				1	V	IV	N.	70	X	C		V	T	N			1	N		N.	70	V	C	J) -
220pF ( <b>221</b> )	К	0.2 ( <b>2</b> )	0.3 ( <b>3</b> )		DIV	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	6.1		0.8 ( <b>8</b> )	0.8 ( <b>8</b> )		IV	[.1	00		C	ON	I.T		N					V	[.1	90		
330pF ( <b>331</b> )	K	0.2 ( <b>2</b> )	0.3 ( <b>3</b> )		0	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	W		0.8 ( <b>8</b> )	0.8 ( <b>8</b> )		V	N.	10	n07	7.0	0	M	T	N									
470pF ( <b>471</b> )	K	0.2 ( <b>2</b> )	0.3 ( <b>3</b> )	X	C	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	TV	V	0.8 ( <b>8</b> )	0.8 ( <b>8</b> )		W	W	N. I	10	Y	C	) IA											

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

 $\mathsf{GRM21B} \; \mathsf{Series} \; 100 \mathsf{V} / 0.47 \mu\mathsf{F}, \; 25 \mathsf{V} / 2.2 \mu\mathsf{F}, \; 16 \mathsf{V} / 4.7 \mu\mathsf{F}, \; 10 \mathsf{V} / 10 \mu\mathsf{F}, \; 4 \mathsf{V} / 22 \mu\mathsf{F} \; (L: 2.0 \pm 0.15, \, W: \, 1.25 \pm 0.15, \, T: \, 1.25 \pm 0.15 \mathsf{mm}) \; \mathsf{M} = 0.00 \mathsf{M} + 0.00 \mathsf{M} +$ 

GRM31M Series 100V/0.68 $\mu$ F, 25V/2.2 $\mu$ F (L: 3.2 $\pm$ 0.2, W: 1.6 $\pm$ 0.2, T: 1.15 $\pm$ 0.15mm)

Continued on the following page.





<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

Part Number	GRM 02 0.4x0.2	G	RMO		1.0		M15	001			RM1		<u>, C</u>	<b>O</b> 3	0.0	4	M21	2051				RM3		. 1			RM3		
L x W [EIA]	1	0.6x 25		201]					130	.6x0		1	≤7				5 [08 16		Г	100	.2x1	.6 [ <sup>2</sup>	1206		100			1210	
Rated Volt.	(1A)	(1 <b>E</b> )	(1 <b>C</b> )	(1 <b>A</b> )	( <b>2A</b> )	( <b>1H</b> )	( <b>1E</b> )	(1 <b>C</b> )	( <b>2A</b> )	( <b>1H</b> )	(1E)	(1 <b>C</b> )	(1 <b>A</b> )	( <b>2A</b> )	( <b>1H</b> )	( <b>1E</b> )	(1 <b>C</b> )	(1A)	( <b>0G</b> )	( <b>2A</b> )	( <b>1H</b> )	( <b>1E</b> )	(1 <b>A</b> )	( <b>0G</b> )	( <b>2A</b> )	( <b>1H</b> )	( <b>1A</b> )	( <b>0J</b> )	(0G
тс	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7U ( <b>E7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7U ( <b>E7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7T ( <b>D7</b> )	Χ7ι ( <b>Ε7</b>															
Capacitance, Capacitan	ce To	olera	nce	and	T Di	men	sion			×13	N	N.	To,	~ <	· C	Oį	NT.		(X)										
680pF ( <b>681</b> ) <b>K</b>	003	0.3 ( <b>3</b> )	CC	M	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )			0.8 ( <b>8</b> )	0.8 ( <b>8</b> )	V	W	.10	טט ניטן	Y.	сC	M	.1											
1000pF ( <b>102</b> ) K	100	0.3 ( <b>3</b> )	.C	O	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	N		0.8 ( <b>8</b> )	0.8 ( <b>8</b> )	N	N	N.)	10	07	,C	$O_{\tilde{I}}$	W.	T	7									
1500pF ( <b>152</b> ) K	0 1 1	0.3 ( <b>3</b> )	Y.	CC	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )			0.8 ( <b>8</b> )	0.8 ( <b>8</b> )	V		<b>V</b> V	v.)	00	X.			1.		×1								
2200pF ( <b>222</b> ) K	W	.10	0.3 ( <b>3</b> )	.7	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	T	N	0.8 ( <b>8</b> )	0.8		N		W	70	0.2	J (	cC	M	1									
3300pF ( <b>332</b> ) K		v.1	0.3		0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	1.		0.8	0.8				N	V.)	00		.C	OI	1.		7							
4700pF ( <b>472</b> ) K	W	W	31	0.3 ( <b>3</b> )	0.5 ( <b>5</b> )	0.5 ( <b>5</b> )	7/3	17	0.8	0.8			V	N	W	. <u></u>	00	Y.	C		1.7								_
6800pF ( <b>682</b> )	W	N		0.3	03	0.5 ( <b>5</b> )		M	0.8	0.8			1	N			10	03	<u>.</u> C	- C	M	T	N						_
10000pF <b>K</b>				0.3	00	0.5 ( <b>5</b> )		01	0.8	0.8	x1			1			1.3	00			OD	1.5		N					_
(103) 15000pF (452) K		N	W	(3)	<del>10</del>	0.5 ( <b>5</b> )	V.(	20	(8)	0.8				1.25	1/1	W	V	<u>10</u>	00j	Y.	30	M	17						
(153) 22000pF K		1	N	N	<u>[] ]</u>	0.5	01	C		0.8	T	N		( <b>B</b> )	1	N	V		10	07	C		M	T	N				
(223) 33000pF K			V	N		(5)	0.5	<b>X</b> .		0.8	1.7		e T	( <b>B</b> )		V	1		1.1	00	7		OD	1.5		<b>6</b> 1			
(333) 47000pF	1		1		N Y	N	( <b>5</b> )	07	J (	0.8	M		N N	( <b>B</b> )		1	N	V	W	10	00.	7.0	O	M	7				_
(473) K				1	N	14	(5)	0.5	J.Y	( <b>8</b> )	Ą		- ' '	(B)				N	W	1.15	10	ON	C		7.		N		
(683) 0.10μF	W				W	W		( <b>5</b> )		( <b>8</b> )	<u> </u>	JAT.	(.)	W				W	W	(M)	11	00	Į.	<u>'0</u>	<i>11</i> /2	<u>.</u> T			
(104)	T	N					NN -st	(5)	(8)	(8)	0.8	10 A	M	TY	1.25			1	N	1.15	W.	10	)X	, U	0	M		N - 31	
(154)	LT	M	ĸĭ.			N	W.	TÝ	1.1	00	( <b>8</b> )	C	<u> </u>	1.0	( <b>B</b> )	Ú			1	(M)	W	1.1	00		C			/\\ \\\	V
(224)	M	T)						W	N.	70	(8)	0.8	O	(A)	( <b>B</b> )	W						7	10	70	7.0	Ó		, <u>}</u>	4
(334)	ON	7.3	TY	Ų				Q V	W	1.1	0.0*	(8)	C	( <b>A</b> )	(9)	T	V				V			10	V	C		<u> </u>	Ţ
0.47μF ( <b>474</b> ) <b>K</b>		34	L.T	W				W	N		0.8* ( <b>8</b> )	00	1.0	1.25 ( <b>B</b> )	( <b>B</b> )	0.05	W	cT		4.45	1 15			1.1	00	I.\			
0.68μF ( <b>684</b> ) <b>K</b>		0	M	TY					41	v v	N.	70	0.8 ( <b>8</b> )		0	0.85 ( <b>9</b> )	L	N <del>M</del>		1.15 ( <b>M</b> )	1.15 ( <b>M</b> )			N.	10	) X	7.0	0	M
1.0μF ( <b>105</b> ) <b>K</b>	N.	C(	DN	[.]	NN NN	Ţ			11		V	0.8* ( <b>8</b> )	00,	Y.	1.25 ( <b>B</b> )	)M	[.]		N	1.6 ( <b>C</b> )		1	W	M	[.1	<del>l U</del>	V	C	
2.2μF ( <b>225</b> ) Κ	007	7.0	0	M.	T	N				W	V	N.	0.8* ( <b>8</b> )	301	Į.C	1.25* ( <b>B</b> )	M	I	W			1.15 ( <b>M</b> )	W	W	2.5 ( <b>E</b> )	11	001	Į.C	C
4.7μF ( <b>475</b> ) <b>Κ</b>	10	N	C		М.	TV	N			1		IV.	N.	10	N.	C	1.25* ( <b>B</b> )	1	T		1.6 ( <b>C</b> )		1	W	1 4,	2.5 ( <b>E</b> )			
10μF ( <b>106</b> ) <b>K</b>	1.1	00	[.( 	<u>(</u> (	M	I.T	W	J			V	NN at VI	M	1.1	00		C(	1.25* ( <b>B</b> )	Į.T			1.6* ( <b>C</b> )							
22μF ( <b>226</b> ) <b>M</b>	W.	70(		7 C	O	M.	LA					N N		N.	TO	) F			1.25* ( <b>B</b> )				1.6* ( <b>C</b> )					1.35* ( <b>N</b> )	

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

 $GRM21B \ Series \ 100V/0.47\mu F, \ 25V/2.2\mu F, \ 16V/4.7\mu F, \ 10V/10\mu F, \ 4V/22\mu F \ (L: \ 2.0\pm0.15, \ W: \ 1.25\pm0.15, \ T: \ 1.25\pm0.15mm)$ 

muRata

GRM31M Series 100V/0.68 $\mu$ F, 25V/2.2 $\mu$ F (L: 3.2 $\pm$ 0.2, W: 1.6 $\pm$ 0.2, T: 1.15 $\pm$ 0.15mm)

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

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Part Number	GRN 02	1	G	RM	03		G	RN	115		N	1	RM	18		0		GR	M21				G	RM:	31			G	RM3	32	
L x W [EIA]	0.4x0. [01005	$\frac{2}{5}$ 0	6x0	).3 [0	)201	] 1	0x0	).5	[04	02]		1.6x	0.8	060	3]	a(	2.0	x1.2	5 [0	305]		3	3.2x <sup>2</sup>	1.6 [	1206	5]	3	3.2x2	2.5 [	1210	)]
Rated Volt.	10 ( <b>1A</b>	) (1	25 <b>E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b>	10 ( <b>2</b> /	0 5 (1)	0 <b>H</b> ) (	25 ( <b>1E</b> )	16 ( <b>1C</b> )	100 ( <b>2A</b>	50 ( <b>1H</b>	25 ( <b>1E</b>	16 ( <b>1C</b>	10 ( <b>1A</b>	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	4 ( <b>0</b> G
тс																											X7R ( <b>R7</b> )				

Capacitance, Ca	pacitan	ce To	olera	nce	and	T Di	men	sion		<13	N	N -		~	7. C	Oz	A P.		o I							
47μF ( <b>476</b> )	M	00	V.	cC	M					7		W	.10	00 10 3	Y.	CC	M					1	1.6* ( <b>C</b> )	- 1	2.5* ( <b>E</b> )	
100μF ( <b>107</b> )	M	10	07	.C	$O_J$	7.		N		4	N	N	N .	10	07	.C	O <sub>I</sub>	. V	T	N						2.5* ( <b>E</b> )

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

GRM21B Series  $100V/0.47\mu F$ ,  $25V/2.2\mu F$ ,  $16V/4.7\mu F$ ,  $10V/10\mu F$ ,  $4V/22\mu F$  (L:  $2.0\pm0.15$ , W:  $1.25\pm0.15$ , T:  $1.25\pm0.15$ mm)

GRM31M Series 100V/0.68 $\mu$ F, 25V/2.2 $\mu$ F (L: 3.2 $\pm$ 0.2, W: 1.6 $\pm$ 0.2, T: 1.15 $\pm$ 0.15mm)

## High Dielectric Constant Type Y5V(F5) Characteristics

Part Number		MAN	GR	M15		GF	RM18	GRM21	GRM31	GRM32
L x W [EIA]			1.0x0.5	5 [0402]	N	1.6x0.	8 [0603]	2.0x1.25 [0805]	3.2x1.6 [1206]	3.2x2.5 [1210
Rated Volt.		50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	50 ( <b>1H</b> )	6.3 ( <b>0J</b> )	100 ( <b>2A</b> )
TC		Y5V ( <b>F5</b> )	Y5V ( <b>F5</b> )							
Capacitance, Ca	pacitan	ce Tolerance a	nd T Dimens	ion	TW	W	110	OY.	TW	
1000pF( <b>102</b> )	Z	0.5( <b>5</b> )	M. To	- 1 CO	T. N.	0.8(8)	W.	COL		
2200pF( <b>222</b> )	Z	0.5( <b>5</b> )	-xx1 10	0.1.	M.T.	0.8(8)	-TVV.3	100	Mir	
4700pF( <b>472</b> )	Z	0.5( <b>5</b> )		MY.CO	Win	0.8(8)	MAN	1007	TIM	
10000pF( <b>103</b> )	Z	0.5( <b>5</b> )		~1 C	Dir	0.8(8)		· C	Division of the second	
22000pF( <b>223</b> )	Z		0.5( <b>5</b> )	1007.	OM.T.V	0.8(8)	-13	1100	OM	
47000pF( <b>473</b> )	Z	Ń	0.5( <b>5</b> )	. No.	O. T.	0.8(8)		1007.	TI	N
0.10μF( <b>104</b> )	Z	_1	0.5( <b>5</b> )	1.Ing	COMP.	0.8(8)		11.10	$CO_{Mr}$	1.35( <b>N</b> )
0.22μF( <b>224</b> )	Z	M	1114	0.5( <b>5</b> )		0.8(8)		100	Mos	1.4
0.47μF( <b>474</b> )	Z		WW	0.5( <b>5</b> )	Com	TW	0.8(8)	0.85( <b>9</b> )	I.Co.	TW
1.0μF( <b>105</b> )	Z	1		M. Jue	0.5*( <b>5</b> )	- 1		W. IV	PA COM	- VI
100μF( <b>107</b> )	Z			110	17.0	1.1.11		10	1.6*( <b>C</b> )	1.7.

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

## High Dielectric Constant Type X5R(R6) Characteristics Low Profile

Part Number		GRM15	GR	M18	100 -	GRM21		GR	M31
L x W [EIA]	00	1.0x0.5 [0402]	1.6x0.8	3 [0603]	11007	2.0x1.25 [0805]		3.2x1.	6 [1206]
Rated Volt.		4 ( <b>0G</b> )	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )
тс	. W.1	X5R ( <b>R6</b> )							
Capacitance, Ca	apacitan	ce Tolerance and	d T Dimension		-W.100	· MOD			
1.0μF( <b>105</b> )	K, M**	0.3*(3)	0.5*( <b>5</b> )		0.6*(6)	N.Co	0.85( <b>9</b> )		
2.2μF( <b>225</b> )	K	1.100	OM	0.5*( <b>5</b> )	0.85*( <b>9</b> )	~ COM		0.6*(6)	
4.7μF( <b>475</b> )	K	11007.	- OMITY		11	0.85*( <b>9</b> )		0.85*( <b>9</b> )	
10μF( <b>106</b> )	K		COPP	N			0.85*( <b>9</b> )		0.85*( <b>9</b> )

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

GRM219 Series 10V/10 $\mu$ F (L: 2.0 $\pm$ 0.2, W: 1.25 $\pm$ 0.2, T: 0.85 $\pm$ 0.1mm)

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

<sup>\*\*:</sup> In case of Rated Volt.4V, Capacitance Tolerance should be M.

## High Dielectric Constant Type X6S(C8) Characteristics Low Profile

Part Number		GRM	<b>/</b> 118	NN. TO CO	GRM21		GRM31
L x W [EIA]	100)	1.6x0.8	[0603]	1001.	2.0x1.25 [0805]		3.2x1.6 [1206]
Rated Volt.		10 ( <b>1A</b> )	4 ( <b>0G</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	16 ( <b>1C</b> )
тс	W.10	X6S ( <b>C8</b> )					
Capacitance, Cap	pacitano	e Tolerance and T D	imension	TWW.100	-1 COM-	T	
1.0μF( <b>105</b> )	K	0.5*( <b>5</b> )	TW	0.6*(6)	D. OWIT		
2.2μF( <b>225</b> )	K	· CO	0.5*( <b>5</b> )	0.85*( <b>9</b> )	N.Co	N	0.6*(6)
4.7μF( <b>475</b> )	K	V.100	1.1	T.W.I	0.85*( <b>9</b> )	-\$1	0.85*( <b>9</b> )
10μF( <b>106</b> )	K	1007	WILL		1001.	0.85*( <b>9</b> )	

GRM219 Series 6.3V/10µF (L: 2.0±0.2, W: 1.25±0.2, T: 0.85±0.1mm)

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

Part Number		MM, TOUR	GRM15		GRM18	GRM21
L x W [EIA]			1.0x0.5 [0402]		1.6x0.8 [0603]	2.0x1.25 [0805]
Rated Volt.	N	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	25 ( <b>1E</b> )
тсСОМ	W	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7T ( <b>D7</b> )	X7R ( <b>R7</b> )
Capacitance, Ca	pacitano	ce Tolerance and T Dimer	nsion	M MM	100X.CO	TITI
220pF( <b>221</b> )	K	0.25( <b>X</b> )	·In. COM.	-W -W	MAN CC	CIN
330pF( <b>331</b> )	K	0.25( <b>X</b> )	1100 J. OM	1.11	-TN 100	ONIT
470pF( <b>471</b> )	K	0.25( <b>X</b> )	. ON CO	TV V	M. TOOX.C	WILL
680pF( <b>681</b> )	K	0.25( <b>X</b> )	W.IOO	-31	WINN.	COMP
1000pF( <b>102</b> )	K	0.25( <b>X</b> )	11007	1.7	100 -	TOM:
1500pF( <b>152</b> )	K	0.25( <b>X</b> )	MAN. CO	W	WWW LOOK	
2200pF( <b>222</b> )	K	1	0.25( <b>X</b> )	DIVI.		CON.
3300pF( <b>332</b> )	K	TW	11007.	0.25( <b>X</b> )	100	OWIT
4700pF( <b>472</b> )	K		MINN.	0.25( <b>X</b> )	WWW	N.C.
6800pF( <b>682</b> )	K	$M_{-L}$	71W.100	0.25( <b>X</b> )	TWW.I	COM
10000pF( <b>103</b> )	K	TI	11007	0.25( <b>X</b> )	1	101. UM.1
1.0μF( <b>105</b> )	K	Divis.	ALWW.	COB TIN	0.5*( <b>5</b> )	0.85(9)

<sup>\*:</sup> Please refer to GRM Series Specifications and Test Methods (2) (P.29).

WWW.100Y.COM.TW WWW.100Y.COM.TW \*: Please refer to GRM Series Specifications and Test Methods (2) (P.29).

sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## **GRM Series Specifications and Test Methods (1)**

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

	-MAN.In.	Specif	ications	DIAM				
lo.	Item	Temperature Compensating Type	High Dielectric Type	OW.I		Test Method		
1	Operating Temperature Range	-55 to +125℃	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 ter (2 $\Delta$ , 3 $\Delta$ , 4 $\Delta$ , E				
2	Rated Voltage	See the previous pages.	MMM'T	may be applie When AC vol	ed continuo tage is supe larger, shou	ned as the maxusly to the caperimposed on I	acitor. DC voltage,	V <sup>p.p</sup> or V <sup>o.p</sup>
3	Appearance	No defects or abnormalities	LM MAIL	Visual inspec	tion	14		
4	Dimensions	Within the specified dimensions	s TIVE	Using caliper	s (GRM02 s	ize is based o	n Microscop	oe)
5	Dielectric Strength	No defects or abnormalities	M.TW WY	(temperature (high dielectri	compensati ic constant t for 1 to 5 se	erved when 30 ing type) or 25 ype) is applied conds, provide 3. *200% for	0% of the radius of the radius of the charged the char	ated voltag
6	Insulation Resistance	C≦0.047μF: More than 10,000l C>0.047μF: More than 500Ω ·		voltage not ex	xceeding the nin 2 minute	should be me e rated voltage s of charging, than 50mA.	e at 20/25℃	and 75%R
7	Capacitance	Within the specified tolerance	T.IV	W.	100 1.	T.Mo-	77	
80	Q/ Dissipation Factor	30pF and over: Q≥1000 30pF and below: Q≥400+20C	[R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≥10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF)			ΔC to 7U, 1X (more than 1000pF) R6, R7, C8, F5, B1, B3, F1		/25℃ at the
7	(D.F.)	C: Nominal Capacitance (pF)	: 0.1 max. (C≧3.3µF)	Frequency	1±0.1MHz	1±0.1kHz	120±24kHz	1±0.1kHz
1.		O. Norminal Capacitance (pr)	W.V.: 25Vmin: 0.025 max.		0.5 to 5Vrms	100	0.5± 0.1Vrms	0.5± 0.05Vrms
1		MIW WY	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.	N	MA	1W.100	A'COL	I.TW M.TV

Continued on the following page. WWW.100Y.COM.





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

. SIW	W.In.	Specif	fications	DIVE		_			
lo. I	tem	Temperature Compensating Type	High Dielectric Type	OM.		Test Me	ethod		
N	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)	each spec (1)Temper The temper capacitant When cycl 5 (5C: +28 +25 to +8 the specific capacitant The capacitation	5 to +125℃/ 5℃/+20 to - ed tolerance ce change a citance drift i	stage.  pensating Tylicient is det d in step 3 a perature se d\(\Delta\C: +20\) to +85\(\C)\) the 6 e for the ten s Table A-1 is calculated n and minim	ype termined as a refe quentiall +125°c capacital nperature I by divid	using trence.  y from stother trence sho e coefficient the coe	he step 1 through emp. coeffs.: uld be within
TW		W. 1001.CO.	( 66 16 1 100 6)		tep 1		emperatence Ten		
LTW	50% of the Rated	MMM:100X'CO.	B1: Within +10/–30% R1: Within +15/–40%	W.100	2	-55±3 (fo -30±3 -28		'U/1X/R 10±3 (fother T	6/R7/C8) for E4) C)
M	Voltage	My C	F1: Within +30/–95%	W.	4 0 1	125±3 (fo	r ΔC/R7)	, 105±3	3 (for C8)
Capacitance	-11	Y TO STATE OF THE PARTY OF THE	DMI		5		±3 (for c ence Tem		
9 Temperature Characteristics	TW TW	WWW.100X	CON.TW	The range value over be within t In case of measured	he specified	ance chang ature range I ranges.* Itage, the ca e min. with	je compa es shown apacitan applying	in the t	able should
Z.CO	W.	MAN	NY.CO. TW	Step	Temp	erature (°C)	)	Applyi	ng Voltage (V
-7 CC	M.	1	*Initial measurement for high	1	Reference	e Temperat	ture ±2		
ON.C	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.)	dielectric constant type Perform a heat treatment at 150+0/–10°C for one hour and then set for 24±2 hours	2	-25±3	(for R1, R7 (for B1, B3 r F5)/10±3	, F1)		No bias
100	Dill	*Do not apply to 1X/25V	at room temperature.	3	Reference	e Temperat	ture ±2		INO DIAS
1.700 X	COM	TW WW	Perform the initial measurement.	4	85±3	3 (for R1, R (for B1, B3, 1, F5, E4)			
1.100	COM	WW WY	M. T. COM.	5		e Temperat	$\alpha \rightarrow \cdot$		WT
N.100	CO1	V.T.	M.100 COM.	6		5±3 (for R1) 53 (for B1, F		E09/	of the reted
110	O.Y.C.	WII.W	1007. OM	7	-	e Temperat	4 1 1 1 1 7		of the rated voltage
M.	ON.C.	TW W	100 X CO.	8	125	5±3 (for R1) 3 (for B1, F	2/100		
MAN	A.100X.	No removal of the terminations	or other defect should occur.	Fig. 1a usi parallel with The solder reflow met soldering i	ng an eutec th the test jiç ring should b	etic solder. In the solder of	Then app sec. her with a ducted v efects su	oly 10N* an iron with care uch as h	or using the e so that the leat shock.
Adhesiv	e Strength			Ту	pe	а	b	$\propto 1.1$	OV c
of Term				GRM0		0.2	0.50		0.23
			Solder resist	GRM0 GRM1		0.3	0.9	- 1 - 1 -	0.3
1		100Y.	Baked electrode or copper foil	GRM1	8	1.0	3.0		1.2
		Fig. 1a	соррог юп	GRM2 GRM3		1.2 2.2	4.0 5.0		2.0
		V.IV TON.		GRM3	2	2.2	5.0	)	2.9
		W.100Y. COM.T.		GRM4 GRM5		3.5 4.5	7.0 8.0		3.7 5.6
	M.	M. 100 X. CO. W.	IM MM.			Co	ontinued c	on the fo	llowing page. [
4			muRata						



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

	bration	Appearance Capacitance  Q/D.F.	Temperature Compensating Type  No defects or abnormalities  Within the specified tolerance  30pF and over: Q≥1000 30pF and below: Q≥400+20C  C: Nominal Capacitance (pF)	High Dielectric Type	same manner and The capacitor shot having a total amp uniformly between frequency range, f be traversed in appaplied for a period perpendicular direction.	under the san uld be subjected litude of 1.5mr the approximator 10 to 55H proximately 1 rd of 2 hours in ctions (total of	ig (glass epoxyne conditions a sed to a simple him, the frequencate limits of 10 z and return to minute. This meach of 3 mutt 6 hours).	s (10). narmonic motio by being varied and 55Hz. The 10Hz, should otion should be ually			
		Capacitance	Within the specified tolerance  30pF and over: Q≥1000 30pF and below: Q≥400+20C C: Nominal Capacitance (pF)	W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF) W.V.: 50/25V: : 0.025 max. (C≥10μF) : 0.035 max. (C≥10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C≥3.3μF) : 0.1 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≥0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	same manner and The capacitor shot having a total amp uniformly between frequency range, f be traversed in appaplied for a period perpendicular direction.	under the san uld be subjected litude of 1.5mr the approximator 10 to 55H proximately 1 rd of 2 hours in ctions (total of	ne conditions a set to a simple hem, the frequence ate limits of 10 z and return to minute. This me each of 3 mutt 6 hours).	s (10). narmonic motion by being varied and 55Hz. The 10Hz, should otion should be ually			
		WWW WWW WWW	30pF and over: Q≥1000 30pF and below: Q≥400+20C C: Nominal Capacitance (pF)	W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF) W.V.: 50/25V: : 0.025 max. (C≥10μF) : 0.035 max. (C≥10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C≥3.3μF) : 0.1 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≥0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	same manner and The capacitor shot having a total amp uniformly between frequency range, f be traversed in appaplied for a period perpendicular direction.	under the san uld be subjected litude of 1.5mr the approximator 10 to 55H proximately 1 rd of 2 hours in ctions (total of	ne conditions a set to a simple hem, the frequence ate limits of 10 z and return to minute. This me each of 3 mutt 6 hours).	s (10). narmonic motic by being varied and 55Hz. The 10Hz, should otion should b ually			
		Q/D.F.	30pF and below: Q≥400+20C C: Nominal Capacitance (pF)	W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF) W.V.: 50/25V: : 0.025 max. (C≥10μF) : 0.035 max. (C≥10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C≥3.3μF) : 0.1 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.025 max. [F1, F5] W.V.: 25V min. : 0.05 max. (C<0.1μF) : 0.09 max. (C≥0.1μF) W.V.: 16/10V: 0.125 max. W.V.: 6.3V: 0.15 max.	same manner and The capacitor shot having a total amp uniformly between frequency range, f be traversed in appaplied for a period perpendicular direction.	under the san uld be subjected litude of 1.5mr the approximator 10 to 55H proximately 1 rd of 2 hours in ctions (total of	ne conditions a set to a simple hem, the frequence ate limits of 10 z and return to minute. This me each of 3 mutt 6 hours).	s (10). narmonic moticy being varied and 55Hz. The 10Hz, should be ually			
	M.T.	W.	No crack or marked defect show	TOW.TW	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 mot having a total amplitude of 1.5mm, the frequency being varie 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).  Solder the capacitor on the test jig (glass epoxy board) show in Fig. 2a using an eutectic solder. Then apply a force in the						
Y. 9			20 5 R230	0 Pressurizing speed : 1.0mm/sec.	direction shown in done by the reflow so that the solderin shock.	Fig. 3a for 5± method and s	1 sec. The solo	dering should bucted with care			
2 D	eflection	J.W.,	1220			Fig.		100 U.S. 1 0 0 1			
10				TOTAL	T	100	t: 1.6mm (GRM02				
J.W				Flexure : ≦1	Type GRM02	0.2	0.56	0.23			
14			Capacitance r	meter	GRM03	0.3	0.9	0.23			
(.)			45	45	GRM15	0.4	1.5	0.5			
			TW TO	-1001.	GRM18	1.0	3.0	1.2			
W			Fig. 33		GRM21	1.2	4.0	1.65			
			Fig. 3a		GRM31	2.2	5.0	2.0			
			DIAT.		GRM32	2.2	5.0	2.9			
			WITH W		GRM43	3.5	7.0	3.7			
<b>4 X</b> I			OM		GRM55	4.5	8.0	5.6			
MA			TITI					(in mm			
17	NW.	~<1	COM	MMM. TON CO.	Immerse the capa	citor in a soluti	on of ethanol (	JIS-K-8101\:			
	olderabi erminati		75% of the terminations are to be continuously.	be soldered evenly and	rosin (JIS-K-5902) Preheat at 80 to 12 After preheating, ir 2±0.5 seconds at for 2±0.5 seconds	(25% rosin in 20℃ for 10 to 3 mmerse in an 6 230±5℃ or Sn	weight proport 30 seconds. eutectic solder	ion) . solution for			
	471	11.	ON CONTRACTO	WWW.	TW	Ć	ontinued on the	following page			
						-	S	ooming page.			



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

lte	W.100	Temperature Compensating Type The measured and observed of	High Dielectric Type  naracteristics should satisfy the	OM	Test	Method		
MA	VW.10		naracteristics should satisfy the					
W		specifications in the following ta		CONT				
	Appearance	No defects or abnormalities	TANNIN .	I.COM				
4	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%	Y.COM				
Resistance to Soldering Heat	Q/D.F.	30pF and over: Q≥1000 30pF and below: Q≥400+20C	[B1, B3, R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF) W.V.: 50/25V: : 0.025 max. (C<10μF) : 0.035 max. (C≥10μF) W.V.: 16/10V: 0.035 max. W.V.: 6.3/4V : 0.05 max. (C<3.3μF) : 0.1 max. (C≥3.3μF)	Immerse the consoler solution temperature for Initial measur Perform a hear then set at roo	ement for high t treatment at 1 m temperature tial measureme	eutectic s 10±0.5 then mea dielectric 50+0/-1 for 24±2 ent.	older or Sn-3.0 seconds. Set a sure. c constant type 10℃ for one ho	it room
1. 1		C: Nominal Capacitance (pF)	[E4] W.V.: 25Vmin: 0.025 max.	Step	Temper		Tim	e
WILL		W 1007.	[F1, F5]	1 2	100 to 1 170 to 2	-	1 mi	
OM.TY	N VN ~XN	MMM.100X.C	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.	MMM'TO	00 X CO	M.I.	W TW	II.
LIMO.	I.R.	More than $10,000M\Omega$ or $500\Omega$	F (Whichever is smaller)	N AND AND AND AND AND AND AND AND AND AN				
COM	Dielectric Strength	No defects	Y.COM.TW					
V CO	W.T.M	The measured and observed ch specifications in the following ta		WW	N.100	I.CO	MI	
) }.	Appearance	No defects or abnormalities	COM	- 11				
100X.C	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%	Fix the capacit	or to the suppo	orting jig i	n the same	
100Y		TW WW	[B1, B3, R6, R7, C8] W.V.: 100V : 0.025 max. (C<0.068μF) : 0.05 max. (C≥0.068μF)	Perform the five shown in the form		ding to th	e four heat trea	
100	Y.CO	W	W.V.: 50/25V: : 0.025 max. (C<10µF)	Step	1	2	3	4
Temperature	OY.CO	30pF and over: Q≧1000	: 0.035 max. (C≧10µF) W.V.: 16/10V: 0.035 max.	Temp. (°C)	Min. Operating Temp. +0/-3	Room Temp.	Max. Operating Temp. +3/-0	Room Temp
Cycle	Q/D.F.	30pF and below: Q≧400+20C		Time (min.)	30±3	2 to 3	30±3	2 to 3
WW.	100X	C: Nominal Capacitance (pF)	W.V.: 6.3/4V   : 0.05 max. (C<3.3μF)   : 0.1 max. (C≥3.3μF)   E[E4]   W.V.: 25Vmin: 0.05 max.	•Initial measur Perform a head then set at roo Perform the init	t treatment at 1 m temperature	50+0/-1 for 24±2	0°C for one ho	ur and
WW	M.M.M	OY.COM.TW		COM.TY				
N	I.R.	More than $10,000 \text{M}\Omega$ or $500\Omega$	F (Whichever is smaller)	COM				
	Dielectric Strength	No defects		COM	TW			





Below GRM Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table.

Appearance Capacitance Change  tty // Q/D.F.  Appearance	Specifications in the following to No defects or abnormalities  Within ±5% or ±0.5pF (Whichever is larger)  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, R1, R6, R7, C8 : Within ±12.5% F1, F5, E4: Within ±30%  [R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≥3.3μF) : 0.125 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.  [Whichever is smaller)	Set the capacitor at 40±2℃ and in 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, ther measure.
Capacitance Change  ty /	Specifications in the following to No defects or abnormalities  Within ±5% or ±0.5pF (Whichever is larger)  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)  More than 1,000MΩ or 50Ω · F  The measured and observed of specifications in the following to	B1, B3, R1, R6, R7, C8 : Within ±12.5% F1, F5, E4: Within ±30%  [R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≥3.3μF) : 0.125 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.  (Whichever is smaller) haracteristics should satisfy the	500±12 hours. Remove and set for 24±2 hours at room temperature, the
Capacitance Change  ty /	Within ±5% or ±0.5pF (Whichever is larger)  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)  More than 1,000MΩ or 50Ω · F  The measured and observed ci specifications in the following ta	: Within ±12.5% F1, F5, E4: Within ±30%  [R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C<3.3μF) : 0.125 max. (C≥3.3μF)  [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.  [Whichever is smaller)	500±12 hours. Remove and set for 24±2 hours at room temperature, the
ty / Q/D.F.	(Whichever is larger)  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)  More than 1,000MΩ or 50Ω · F  The measured and observed of specifications in the following to	: Within ±12.5% F1, F5, E4: Within ±30%  [R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C<3.3μF) : 0.125 max. (C≥3.3μF)  [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.  [Whichever is smaller)	500±12 hours. Remove and set for 24±2 hours at room temperature, the
Q/D.F.	10pF and over 30pF and below: Q≥275+2.5C 10pF and below: Q≥200+10C C: Nominal Capacitance (pF)  More than 1,000MΩ or 50Ω · F  The measured and observed of specifications in the following to	W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≥3.3μF) : 0.125 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max. W.V.: 6.3V: 0.2 max.	500±12 hours. Remove and set for 24±2 hours at room temperature, the
LTW	The measured and observed of specifications in the following to	haracteristics should satisfy the	MMM.100X.COM.TM
Appearance	specifications in the following to		WWW.100Y.COM.TW
Appearance		M.Th	MALTINION. COMITA
WIN			
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%	WWW.100X.COM.TW
Q/D.F.	30pF and over: Q≥200 30pF and below: Q≥100+10C/3 C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≤3.3μF) : 0.125 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.	Apply the rated voltage at 40±2°C and 90 to 95% humidity 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.
I.R.	More than $500\text{M}\Omega$ or $25\Omega \cdot \text{F}$ (\)	Whichever is smaller)	W.IN W. W. 1003.
	A 1007. 1007. 1007. 1007.	30pF and over: Q≧200 30pF and below: Q≥100+10C/3 C: Nominal Capacitance (pF)	W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≤3.3μF) : 0.125 max. (C≥3.3μF)  [E4] W.V.: 25Vmin: 0.05 max.  [F1, F5] W.V.: 25V min. : 0.075 max. (C<0.1μF) : 0.125 max. (C≥0.1μF) W.V.: 6.3V: 0.2 max.





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

	- WWW		Specif	fications	DIA
No.	Ite	em 100	Temperature Compensating Type	High Dielectric Type	Test Method
		NW.10	The measured and observed c specifications in the following to	haracteristics should satisfy the able.	COMP
	- 1	Appearance	No defects or abnormalities	WWW.	(CONT.
		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]	Apply 200% (GRM21BR71H105, GRM21BR72A474, GRM31CR71H475: 150% of the rated voltage) of the rated
118 M. O.	High Temperature Load	Q/D.F.	30pF and over: Q≥350 10pF and over 30pF and below: Q≥275+2.5C 10pF and below: Q≥200+10C C: Nominal Capacitance (pF)	[B1, B3, R6, R7, C8] W.V.: 100V : 0.05 max. (C<0.068μF) : 0.075 max. (C≥0.068μF) W.V.: 50/25/16/10V : 0.05 max. W.V.: 6.3/4V : 0.075 max. (C≤3.3μF) : 0.125 max. (C≥3.3μF) [E4] W.V.: 25Vmin: 0.05 max. [F1, F5] W.V.: 25V min. : 0.075 max.(C<0.1μF) : 0.125 max.(C≥0.1μF) W.V.: 16/10V: 0.15 max. W.V.: 6.3V: 0.2 max.	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 DC voltage at the maximum operating temperature ±3°C for one hour. Remove and set for 24±2 hours at room temperature. Perform initial measurement.
	- OV	I.R.	More than 1,000M $\Omega$ or 50 $\Omega$ · F	1. T. V.	M. 100 r. COW. I.

## Table A-1

	I.K.	Wore than 1,000Wi2 or 50	12 · F (Whicheve	r is smaller)		N.	COP	XI.
able A-1								
00 >	W.		M.Ing	COMP	Capacitance Cha	nge from 25℃ (%)	- 41 COM	-XX
Char.	Nominal Values (ppm/°C)*1	Nominal Values (ppm/°C)*1	-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	1.0	-330± 60	4.09	2.16	2.81	1.49	1.79	0.95
6T	-7 C	-470± 60	5.46	3.28	3.75	2.26	2.39	1.44
7U. 4 (1)	0.1.	-750±120	8.78	5.04	6.04	3.47	3.84	2.21
1X	-7	+350 to -1000	-4-N W	~ CU	=11	- 47	-001	<u></u>

<sup>\*1:</sup> Nominal values denote the temperature coefficient within a range of 25℃ to 125℃ (for ∆C)/85℃ (for other TC).

(2)

	N. COM	WW	001.0	Capacitance Cha	ange from 20℃ (%		
Char.	Nominal Values (ppm/°C)*2	-55		-25		-10	
	TW.	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	1111 - 110	1.32	0.41	0.88	0.27
3P	-150±120			1.65	0.14	1.10	0.09
4P	-150±250	W -	W - 11	2.36	-0.45	1.57	-0.30
2R	-220± 60		- T-	1.70	0.72	1.13	0.48
3R	-220±120	(M -	M.T.	2.03	0.45	1.35	0.30
4R	-220±250		-1111	2.74	-0.14	1.83	-0.09
2S	-330± 60	111-	1/-	2.30	1.22	1.54	0.81
3S	-330±120		= 1	2.63	0.95	1.76	0.63
4S	-330±250	177	71	3.35	0.36	2.23	0.24
2T	-470± 60	- 21	_	3.07	1.85	2.05	1.23
3T	-470±120	- 1 I-N	_	3.40	1.58	2.27	1.05
4T	-470±250	) [1] -	_	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

<sup>\*2:</sup> Nominal values denote the temperature coefficient within a range of 20°C to 125°C (for ΔC)/85°C (for other TC).

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

No.	Item	Specifications	Test Method			
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 <sup>p,p</sup> or V <sup>O,p</sup> , 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	WW. CONTRACTOR	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 $50\Omega \cdot F$	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.			
	Capacitance	*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 1C/1A 335  GRM219 B3/R6 1C/1A 475, 106  GRM219 C8 1A 475  GRM21B B3/R6 1C/1A 106  GRM21B R7/C8 1A 106  GRM21B R7/C8 1A 106  GRM21B R7/C8 1A 106	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table.  Capacitance Frequency Voltage  C≦10µF (10V min.)*¹ 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  *1 However the voltage is 0.5±0.1Vrms about Table 1 items on the left side.			
8	Dissipation Factor (D.F.)	B1, B3, R6* <sup>2</sup> , R7* <sup>3</sup> , C7, C8, D8* <sup>2</sup> : 0.1 max. F1, F5: 0.2 max.	WWW.100Y.COM.TW			
	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 +125°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)	The capacitance change should be measured after 5 min. at each specified temp. stage.  The ranges of capacitance change compared with the reference temperature value over the temperature ranges shown in the table should be within the specified ranges.* In case of applying voltage, the capacitance change should be measured after 1 more min. with applying voltage in equilibration of each temp. stage.  *GRM43 B1/R6 0J/1A 336/476 only: 1.0±0.2Vrms			
	NN.1	D8 : Within +22/-33% (-55 to +105°C)	Step Temperature (°C) Applying Voltage (V			
	MM:100	COM. TWWW.100X.CO	1 25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5) 20±2 (for B1, B3, F1, R1)			
9	Capacitance Temperature	CONTA MAM. 100A.	-55±3 (for R1, R6, R7, C6, C7, C8, D7, D8, E7) 2 -30±3 (for F5) -25±3 (for B1, B3, F1) No bias			
	Characteristics	NY COM.TW WWW.100Y	3 25±2 (for R6, R7, C6, C7, C8, D7, D8, E7, F5) 20±2 (for B1, B3, F1, R1)			
	50% of	B1: Within +10/-30%	125±3 (for R1, R7, C7, D7, E7) 4 105±3 (for C8, D8) 85±3 (for B1, B3, F1, F5, R6, C6)			
	the Rated	R1: Within +15/-40%   F1: Within +30/-95%	5 20±2 (for B1, F1, R1)			
	Voltage	11. WILLIE 1307 3376	6 -55±3 (for R1) -25±3 (for B1, F1) 50% of the			
	NN.	TIOON. CALTY WY	7 20±2 (for B1, F1, R1) rated voltage			
	WW	W.T. COM.	8 125±3 (for R1) 85±3 (for B1, F1)			
	W	WW.100X.COM.TW WWW	•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.			

\*2: GRM31CR60J107, GRM31CD80G107: 0.15 max.

<sup>\*3:</sup> GRM31CR71E106: 0.125 max.

Below GRM Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table.

o. Item		em	Specifications	Test Method				
	WW	W.100 WW.10	No removal of the terminations or other defects should occur.	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				
				<1-				
	Adhesive	Strength	+ 2 2 2 2 4 +	Type GRM02	0.2	0.56	0.23	
)	of Termin			GRM03	0.3	0.9	0.23	
			* PA PA PA PA PA PA PA	GRM15	0.4	1.5	0.5	
1			Solder resist	GRM18	1.0	3.0	1.2	
			Baked electrode or	GRM21	1.2	4.0	1.65	
4			copper foil	GRM31	2.2	5.0	2.0	
V			Fig. 1a	GRM32	2.2	5.0	2.9	
			MM. TO COM	GRM43	3.5	7.0	3.7	
7			11001.	GRM55	4.5	8.0	5.6	
			MAN TO COMMENT	W. C.	O'L			
W	Appearance		No defects or abnormalities	Solder the capacit	tor on the test i	ia (aloss spay	, board) in the	
0								
	Capacitance		Within the specified tolerance	same manner and			, ,	
			COM	The capacitor sho				
			WW. JOSE TW	having a total amp				
7	Vibration		B1, B3, R1, R6*2, R7*3, C7, C8, E7, D7, D8*2: 0.1 max.	uniformly between	the approxima	ate limits of 10	and 55Hz. T	
		D.F.	C6: 0.125 max.	frequency range, f	from 10 to 55H	z and return to	10Hz, shoul	
			F1, F5: 0.2 max.	be traversed in ap	proximately 1	minute. This m	otion should	
V		KN	11,10.021100	applied for a perio	d of 2 hours in	each of 3 mut	ually	
		4	100 mm. 1	perpendicular dire			•	
7	UNE	-11	NA CO			TW.		
			No cracking or marking defects should occur.	Solder the capacit	/ 1 .	7 1		
r			TIM W. CO.	in Fig. 2a using ar		2 1 1 1 1		
_ 0			100	direction shown in	Fig. 3a for 5±	1 sec. The sol	dering should	
- 0			W. TON TOWN COM. I	done by the reflow	w method and s	hould be cond	ucted with ca	
			WWW.100Y.COM.ITW		w method and s	hould be cond	ucted with ca	
			20 , 50. Pressurizina	done by the reflow	w method and s	hould be cond	ucted with ca	
			20 50 Pressurizing speed: 1.0mm/sec.	done by the reflow so that the solderi	w method and s	hould be cond	ucted with ca	
				done by the reflow so that the solderi	w method and s	hould be cond	ucted with ca	
0			speed : 1.0mm/sec.	done by the reflow so that the solderi	w method and s	hould be cond	ucted with ca	
0			speed : 1.0mm/sec.	done by the reflow so that the solderi	w method and s	hould be cond	ucted with ca	
0			speed : 1.0mm/sec. Pressurize	done by the reflow so that the solderi	w method and s	hould be cond	ucted with ca	
			speed : 1.0mm/sec.	done by the reflow so that the solderi	w method and sing is uniform a	hould be cond	ucted with ca	
	COM Y.CO' 0Y.C' 100Y.C		speed : 1.0mm/sec. Pressurize	done by the reflow so that the solderi	w method and s	hould be cond	lucted with ca	
	Deflectio	COM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter	done by the reflow so that the solderi	w method and sing is uniform a	chould be conding free of defe	lucted with ca	
	Deflectio	COM	speed : 1.0mm/sec. Pressurize	done by the reflow so that the solderi	w method and sing is uniform a	chould be conding free of defe	ducted with ca ects such as h	
	Deflectio	M.TW OM.TV COM.T COM.T	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter	done by the reflow so that the soldering shock.	w method and sing is uniform a	ehould be conding free of defe	t: 1.6mm	
	Deflectio	M.TW OM.TV COM.T COM.T COM.T	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	done by the reflow so that the soldering shock.	w method and sing is uniform a by the single	ehould be conding free of defe	t: 1.6mm	
	Deflectio	M.TW OM.TV COM.T COM. M.COM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter	done by the reflow so that the soldering shock.  Type GRM02	w method and sing is uniform a begin in the single	ehould be conding free of defe	t: 1.6mm c c c c c c c c c c c c c c c c c c c	
	Deflectio	M.TW DM.TV COM. COM. Y.COM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03	w method and sing is uniform a sing is uniform. Sing is uniform a sing is uniform a sing is uniform a sing is uniform a sing is uniform. Sing is uniform a sing is uniform a sing is uniform a sing is uniform a sing is uniform. Sing is uniform a sing is uniform. Sing is uniform a sin	a (GRM02)	t: 1.6mm  2/03/15: t: 0.8mm  C  0.23	
	Deflectio	M.TW OM.TV COM.T COM. V.COM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15	w method and sing is uniform a sing is uniform a single si	a (GRM02) b 0.56 0.9 1.5	t: 1.6mm  c 0.23  0.5	
	Deflectio	M.TW OM.TY COM. COM. V.COM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18	w method and sing is uniform a sing is uniform a single si	a (GRM02) b 0.56 0.9 1.5 3.0	t: 1.6mm  C 0.23 0.3 0.5 1.2	
	Deflectio	M.TW OM.TV COM. COM. COM. COM. COM. COM.	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21	w method and sing is uniform a	a (GRM02) b 0.56 0.9 1.5 3.0 4.0	t: 1.6mm  2/03/15: t: 0.8mm  C 0.23  0.3  0.5  1.2  1.65	
	Deflectio	M.TW OM.TV COM.T COM.T COM.T COM.T COM.T COM.T COM.T COM.T	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0	t: 1.6mm  2/03/15: t: 0.8mm  C 0.23 0.3 0.5 1.2 1.65 2.0	
	Deflectio	M.TW OM.TV OM.TV COM A.COM OV.CO 100Y.CO	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0	t: 1.6mm  2/03/15: t: 0.8mm  C 0.23 0.3 0.5 1.2 1.65 2.0 2.9	
	Deflectio	1.1 Y OM.TW OM.TY COM.TY COM. TY.COM OV.CO 100Y.CO	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0 7.0	t: 1.6mm  2/03/15: t: 0.8mm  C 0.23 0.3 0.5 1.2 1.65 2.0 2.9 3.7	
	Deflectio	1.1 Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y Y	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0	t: 1.6mm  2/03/15: t: 0.8mm  c 0.23 0.5 1.2 1.65 2.0 2.9 3.7 5.6	
	Deflectio	M.TW  DM.TY  DM.TY  COM.  X.COM  X.COM  X.COM  100X.CM  1100X.CM	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0 7.0	t: 1.6mm  2/03/15: t: 0.8mm)	
	Deflectio	N.100Y N.100Y N.100Y N.100Y N.100Y	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM43	w method and sing is uniform a	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0 7.0	t: 1.6mm  2/03/15: t: 0.8mm)  C 0.23 0.3 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mm	
	Deflectio	M.TW  DM.TY  DM.TY  COM.  COM.  Y.COM  Y.COM  100Y.  1100Y  1100Y	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≤1  Capacitance meter  45  45	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM43 GRM55	w method and song is uniform a solution of the solutio	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0	t: 1.6mm  2/03/15: t: 0.8mm)	
	MMA. MMA. M.100. M.100.	17N.100 N.1007 1007.C NY.CON	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≦1  Capacitance meter 45  Fig.3a	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM43 GRM55	w method and song is uniform a solution of the control of the cont	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proport)	t: 1.6mm  2/03/15: t: 0.8mm)	
222	Solderab	ility of	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter 45  Fig.3a  75% of the terminations is to be soldered evenly and	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM43 GRM55	w method and sing is uniform a solution of the	a (GRM02 b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0 on of ethanol (weight proports)	t: 1.6mm  2/03/15: t: 0.8mm)	
	MMA. MMA. M.100. M.100.	ility of	speed : 1.0mm/sec. Pressurize  R230  Flexure : ≦1  Capacitance meter 45  Fig.3a	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM55	w method and song is uniform a solution of the	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mm  2/03/15: t: 0.8mm)	
	Solderab	ility of	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter 45  Fig.3a  75% of the terminations is to be soldered evenly and	Type GRM02 GRM03 GRM15 GRM15 GRM31 GRM31 GRM32 GRM43 GRM55	w method and song is uniform a solution of the	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mm  2/03/15: t: 0.8mm,  c 0.23 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mn	
3	Solderab Terminat	ility of ion	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter 45  Fig.3a  75% of the terminations is to be soldered evenly and continuously.	Type GRM02 GRM03 GRM15 GRM18 GRM21 GRM31 GRM32 GRM43 GRM55	w method and song is uniform a solution of the	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mm  2/03/15: t: 0.8mm)  C 0.23 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mn	
3	Solderab Terminat	ility of ion	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter  45  Fig.3a  75% of the terminations is to be soldered evenly and continuously.  SRM31CD80G107: 0.15 max.	Type GRM02 GRM03 GRM15 GRM15 GRM31 GRM31 GRM32 GRM43 GRM55	w method and song is uniform a solution of the	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mm  2/03/15: t: 0.8mm,  c 0.23 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mn	
3	Solderab Terminat	ility of ion	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter  45  Fig.3a  75% of the terminations is to be soldered evenly and continuously.  SRM31CD80G107: 0.15 max.	Type GRM02 GRM03 GRM15 GRM15 GRM31 GRM31 GRM32 GRM43 GRM55	w method and song is uniform a solution of the	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mm  2/03/15: t: 0.8mm  C	
<b>D</b>	Solderab Terminat	ility of ion	speed : 1.0mm/sec. Pressurize  Flexure : ≤1  Capacitance meter  45  Fig.3a  75% of the terminations is to be soldered evenly and continuously.  SRM31CD80G107: 0.15 max.	Type GRM02 GRM03 GRM15 GRM15 GRM31 GRM31 GRM32 GRM43 GRM55	method and song is uniform a solution of the s	a  (GRM02  b 0.56 0.9 1.5 3.0 4.0 5.0 7.0 8.0  on of ethanol (weight proports) sectored solutions and the conditions are conditions as the conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally conditionally conditions are conditionally	t: 1.6mn 2/03/15: t: 0.8mm	

<sup>\*2:</sup> GRM31CR60J107, GRM31CD80G107: 0.15 max.





WWW.100Y.COM.TW \*3: GRM31CR71E106: 0.125 max.

Below GRM Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table.

. Item		Specifications	TW	Tes	t Metho	d			
W	Appearance Capacitance Change	No defects or abnormalities  B1, B3, R1, R6*4, R7, C6, C7, C8, E7, D7, D8: Within ±7.5% F1, F5: Within ±20%	Preheat the capacitor at 120 to 150℃ for 1 minute.  Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Set at room						
Resistano	D.F.	B1, B3, R1, R6* <sup>2</sup> , R7* <sup>3</sup> , C7, C8, E7, D7, D8* <sup>2</sup> : 0.1 max. C6: 0.125 max. F1, F5: 0.2 max.	*Do not apply	temperature for 24±2 hours, then measure.  *Do not apply to GRM02.  •Initial measurement for high dielectric cons					
to	I.R.	More than $50\Omega \cdot F$	Perform a hea	t treatment at	150+0/-	-10℃ for one ho	one hour and		
Soldering Heat	A TOOL CONTINUE MANAGEMENT		- / ' N 1 2 '	m temperature itial measurem		z nours.			
I	Dielectric	No defects	10/11/2	*Preheating for GRM32/43/55					
1	Strength	TWO defects	27 7		erature o 120°C		ime		
N		W.100X.COM.TW	2	~ 1 1 - 2	0 200℃		min. min.		
M	Appearance	No defects or abnormalities	1 1 1 1 0	/ · / / / · · · · · · · · · · · · · · ·		in the same m	nanner and		
TW	Capacitance Change	B1, B3, R1, R6, R7, C6, C7, C8, D7, D8: Within ±7.5% E7: Within ±30% F1, F5: Within ±20%	Perform the five shown in the form	ollowing table.	rding to	the four heat tr			
Temperatur	D.F.	B1, B3, R1, R6* <sup>2</sup> , R7* <sup>3</sup> , C7, C8, E7, D7, D8* <sup>2</sup> : 0.1 max. C6: 0.125 max.	Step	1	2	3	4		
Sudden Change	I.R.	F1, F5: 0.2 max.  More than 50Ω · F	Temp. (℃)	Min. Operating Temp. +0/-3	Room Temp.	Max. Operating Temp. +3/-0	Room Temp.		
OM	c (V)	MAN, ON, CO. LA	Time (min.)	30±3	2 to 3	30±3	2 to 3		
COM	Dielectric Strength	No defects	•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.						
V.CO	Appearance	No defects or abnormalities	Apply the rated voltage at 40±2℃ and 90 to 95% humidity for						
High	Capacitance Change	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: Within ±12.5% F1, F5: Within ±30%	500±12 hours. The charge/discharge current is less than 50mA.  •Initial measurement						
High Temperature	D.F.	B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: 0.2 max. F1, F5: 0.4 max.	•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.						
Temperatur High									
High Humidity	- 1	IN WWW. 100Y. COM.TH	initial measure			•Measurement after test Perform a heat treatment at 150+0/−10℃ for one hour and then let sit for 24±2 hours at room temperature, then measure.			
High	I.R.	More than 12.5 $\Omega$ · F	•Measuremen Perform a hea	t treatment at					
High Humidity	I.R. Appearance	TW WWW.100 COM.	Measurement Perform a heat then let sit for Apply 150% of	t treatment at 7 24±2 hours at f the rated volta	room ter	mperature, the	n measure. at the		
High Humidity	V.CON	TW WWW.100 COM.	Measuremen Perform a hea then let sit for  Apply 150% of maximum ope room tempera	t treatment at a 24±2 hours at f the rated volta rating tempera ture, then mea	room ter age for 1 ture ±3°0 sure.	mperature, then 000±12 hours C. Let sit for 24	n measure. at the		
High Humidity (Steady)	Appearance Capacitance Change  D.F.	No defects or abnormalities  B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: Within ±12.5%	Measuremen     Perform a hea     then let sit for      Apply 150% of     maximum ope     room tempera     The charge/dis      Initial measurement	t treatment at 24±2 hours at f the rated volta rating tempera ture, then mea scharge currentement	age for 1 ture ±3% sure.	mperature, thei 000±12 hours C. Let sit for 24 than 50mA.	n measure. at the ±2 hours a		
High Humidity	Appearance Capacitance Change  D.F.	No defects or abnormalities  B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: Within ±12.5%  F1, F5: Within ±30%  B1, B3, R1, R6, R7, C6, C7, C8, E7, D7, D8: 0.2 max.	Measuremen Perform a hea then let sit for  Apply 150% of maximum ope room tempera The charge/dis      Initial measur Perform a hea	t treatment at a 24±2 hours at f the rated volta rating tempera ture, then mea scharge current treatment at a 24±2 hours at a	room ter age for 1 ture ±3°0 sure. It is less	mperature, then 000±12 hours C. Let sit for 24	at the ±2 hours a		

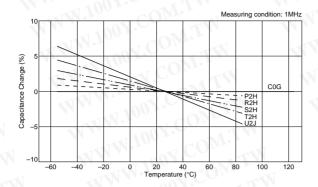
<sup>\*2:</sup> GRM31CR60J107, GRM31CD80G107: 0.15 max.

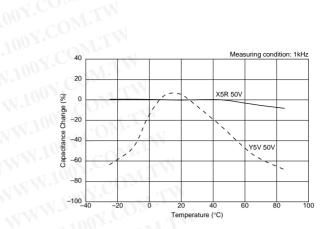
<sup>\*3:</sup> GRM31CR71E106: 0.125 max.

<sup>\*4:</sup> GRM153R60G105, GRM188R60J106: Within ±12.5% MMM.100X.COM

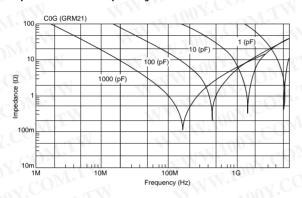
## **GRM Series Data**

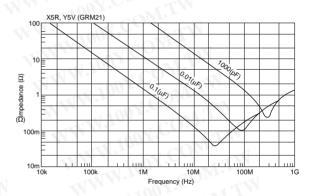
#### ■ Capacitance - Temperature Characteristics



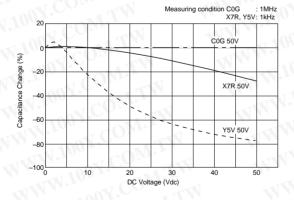


#### ■ Impedance - Frequency Characteristics

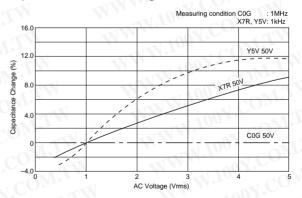




#### ■ Capacitance - DC Voltage Characteristics



#### ■ Capacitance - AC Voltage Characteristics



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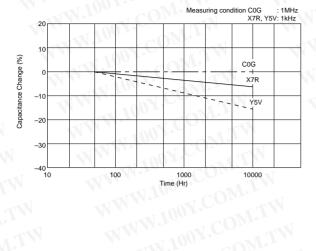




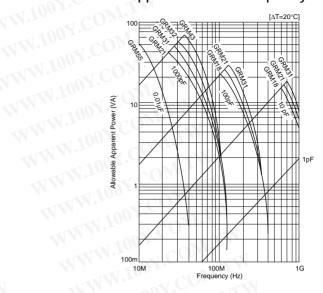
#### **GRM Series Data**

Continued from the preceding page

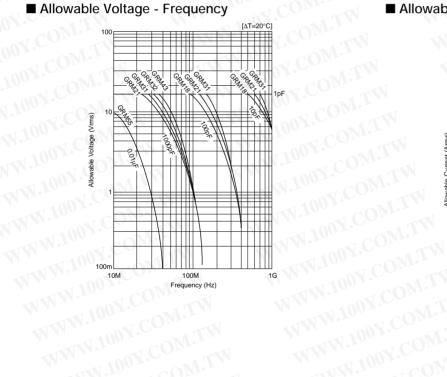
#### ■ Capacitance Change - Aging



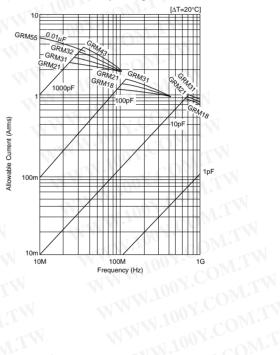
#### ■ Allowable Apparent Power - Frequency



# ■ Allowable Voltage - Frequency



#### ■ Allowable Current - Frequency



# **Chip Monolithic Ceramic Capacitors**



## **Capacitor Array GNM Series**

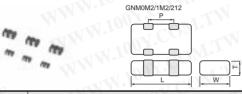
#### ■ Features

3

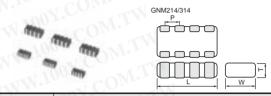
- 1. High density mounting due to mounting space saving
- 2. Mounting cost saving

#### ■ Applications

General electronic equipment



Dimensions (mm)						
L	W	J. CO	Р			
0.9 ±0.05	0.6 ±0.05	0.45 ±0.05	0.45 ±0.05			
		0.5 +0.05/-0.10	Jiv.			
1.37 ±0.15	1.0 ±0.15	0.6 ±0.1	0.64 ±0.05			
εT	131	0.8 +0/-0.15				
201015	1 25 10 15	0.6 ±0.1	10101			
2.0 ±0.15	1.25 ±0.15	0.85 ±0.1	1.0 ±0.1			
		L W 0.9 ±0.05 0.6 ±0.05 1.37 ±0.15 1.0 ±0.15	L W T  0.9 ±0.05 0.6 ±0.05 0.45 ±0.05  1.37 ±0.15 1.0 ±0.15 0.6 ±0.1  2.0 ±0.15 1.25 ±0.15  0.6 ±0.1  0.6 ±0.1  0.6 ±0.1			



Part Number	Dimensions (mm)						
Part Number	LJ C	W	N T	Р			
GNM214	2.0 ±0.15	1.25 ±0.15	0.6 ±0.1	0.5 ±0.05			
GINIVIZ 14	2.0 ±0.15	1.25 ±0.15	0.85 ±0.1	0.5 ±0.05			
	1 100 1	-oM.	0.8 ±0.1				
GNM314	2 2 10 15	1.6 ±0.15	0.85 ±0.1	0.0.10.1			
GNW314	3.2 ±0.15	1.6 ±0.15	1.0 ±0.1	0.8 ±0.1			
		A COP	1.15 ±0.1				

#### Temperature Compensating Type C0G(5C) Characteristics

Part Number	-1	GNM1M	GNM21	GI	NM31	
L x W [EIA]	TW	1.37x1.0 [0504]	2.0x1.25 [0805]	3.2x1.6 [1206]		
Rated Volt.	M.TW	50 ( <b>1H</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	
тс	JM.T	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	
Capacitance, Ca	pacitance	Tolerance and T Dimension	Tan COM.	I WWW.	COMP	
10pF( <b>100</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
15pF( <b>150</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
22pF( <b>220</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
33pF( <b>330</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
47pF( <b>470</b> )	K (	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
68pF( <b>680</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
100pF( <b>101</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
150pF( <b>151</b> )	K	0.6(2)	0.6(4)	0.8(4)	0.8(4)	
220pF( <b>221</b> )	K	0.6(2)	0.6(4)	M. I	0.8(4)	
330pF( <b>331</b> )	K	.Co	MM. TOUX		0.8(4)	



#### High Dielectric Constant Type X5R(R6) Characteristics

Part Number			<b>GNM0M</b>	I			GNM1M				GNM21		GN	M31
L x W [EIA]	100	0.0	9x0.6 [03	02]	11	1.3	7x1.0 [05	504]	1.7	2.0	x1.25 [08	805]	3.2x1.6	5 [1206]
Rated Volt.		16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )
тс	W.1	X5R ( <b>R6</b> )												
Capacitance, Ca	pacitan	ce Tolerar	ice and T	Dimensio	n	-15	M.W.	-7 (	COLAT	-4.81				ı
1000pF( <b>102</b> )	М	1100X		TW	0.6(2)		-31	001.		1.1.				
2200pF( <b>222</b> )	M		1 CO		V	0.6(2)	MAI.	· ooV	Co.	- TV				
4700pF( <b>472</b> )	М	W.100		Mir	-7	0.6(2)		Jac	700	M.	ss.T			
10000pF( <b>103</b> )	M	0.45*(2)	0.45*(2)	0.45*( <b>2</b> )		0.6(2)	MAG	sī 100	1.	TIME	17			
22000pF( <b>223</b> )	М	0.45*(2)	0.45*(2)	0.45*( <b>2</b> )	N		0.6(2)	0.6(2)	V.C	757	W			
47000pF( <b>473</b> )	М	0.45*(2)	0.45*(2)	0.45*( <b>2</b> )	1		0.6(2)	0.6(2)	-76	ODI.	- 1			
0.10μF( <b>104</b> )	M	0.45*(2)	0.45*(2)	0.45*( <b>2</b> )	WIT		11/1/	0.6(2)	001.	140	11/1			
0.22μF( <b>224</b> )	М			$CO_{D}$			0.8*(2)	M. A.	No.	COr.	W			
0.47μF( <b>474</b> )	М		700.		Mir			-TIN	Inn	0.85(2)	1. 1	T		
1.0μF( <b>105</b> )	М	WW	- 400	N.C.	- 1 T	N	0.8*(2)	0.5*( <b>2</b> )	0.8*(2)	0.85(2)	0.85*(4)	0.85*(4)	0.85(4)	0.85(4)
2.2μF( <b>225</b> )	М	-TVV	N.r.	- < 7 C	) Mr.	N. N.		0.8*(2)	0.8*(2)	V CU	0.85*(2)	0.85*(2)		

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

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

Part Number	TW		WW	GNM1M	V.Co			GNM21		001.	GNM31			
L x W [EIA]			1.3	37x1.0 [05	04]	DMr.	2.	0x1.25 [08	805]		3.2x1.6	5 [1206]		
Rated Volt.		50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )		0 <b>A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	
тс СО	M	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )						
Capacitance, Capacitan		ce Toleran	ce and T D	imension	. 007	I.Co.	W		WW	144.	WY.C.	-17	N	
470pF( <b>471</b> )	M	1		- 11	N'Inc	-1 00	0.6(4)	-16.T	- 411	$M_{1}$	~ 1	Ohr.	-XXI	
1000pF( <b>102</b> )	M	0.6(2)		41.	-TI 10	J. o	0.6(4)	17		-XXI 1	100 r.	Mor	TAL	
2200pF( <b>222</b> )	M		0.6(2)	-NV	14	V.C	DEL	0.6(4)	V	111 11.	A CONT	CO	W	
4700pF( <b>472</b> )	M	Mir	0.6(2)	41	1.W.T	00 -	OM.	0.6(4)			Too	COD	1.0	
10000pF( <b>103</b> )	M	TI	0.6(2)	W	1	1001.	1/4~	0.6(4)		M. J.	x1 100		W.I.	
22000pF( <b>223</b> )	M	$\Omega_{Mr}$	XXI	0.6(2)	0.6(2)		$Co_{\mu}$	W	0.85(4)		14.	V.Co		
47000pF( <b>473</b> )	M		- 1	0.6(2)	0.6(2)	700 -		1.1	0.85(4)	0.85(4)	M.In.	1.0(4)	DMr.	
0.10μF( <b>104</b> )	M		TW	0.6(2)	MAG	0.6(2)		TI	0.85(4)	0.85(4)	0.85(4)	1.0(4)	Mo.	
1.0μF( <b>105</b> )	M	$CO_{J_{A_2}}$			-wW	N. F.	V.CO	N	N	11	MAG	oov.	1.15( <b>4</b> )	
	IIIO		5-11-4-4			- 40	17 -					THE STATE OF THE S		

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

<sup>\*:</sup> Please refer to GNM Series Specifications and Test Methods (2)(P.40)

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• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

#### **GNM Series Specifications and Test Methods (1)**

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

	N N N	N.TOO.	In case '		ed in cap ification	-15	ce tab	ie, piease re	efer to GNM	Series	Specification	ons and T	est Metho	as (2) (P.40	
No.	Ite	em (	Temperature	Эрсс		1	io Turn	007.0	OM.T		Test	Method			
	-WW	71.5	Compensating Type	N	High	Dielectr	іс тур	e 001.1		W					
1	Operating Tempera Range	9	5C: -55 to +125°C		–55 to + to +85°				$CO_{N}$						
2	Rated Vo	oltage	See the previous pa	ges.			NN	W.100	may be ap	plied co oltage is large	is defined a ontinuously to is superimper, should be	to the capa osed on D	acitor. OC voltage,	V <sup>P-P</sup> or V <sup>O-P</sup> ,	
3	Appeara	nce	No defects or abnor	malities			<b>1</b> X	MM	Visual insp	ection	TW				
ı	Dimensio	ons	Within the specified	dimensio	าร			WW.	Using calip	ers	1.1				
5	Dielectric	Strength	No defects or abnor	malities	TY			WWA	(5C) or 250	0% of the	be observed he rated volt to 5 second in 50mA.	age (R7) i	is applied b	etween the	
5	Insulation Resistan		More than 10,000Ms (Whichever is smalle		P.F.				voltage not	excee	sistance sho ding the rate minutes of	ed voltage			
7	Capacita	nce	Within the specified	tolerance	OM,	TW		W	The capaci	itance/	Q/D.F. shou	ld be mea	sured at 25	°C at the	
	V.L.	<b>\$</b> 1	30pF min.: Q≧1000		OM	1	s I				ltage shown	in the tab	le.		
	Q/	Ν	30pF max.: Q≥400+20C	Char. R7, R6,	25V min. 0.025	16V 0.035	0.03		Item	Char.	5C	$W_{II}$	R	7	
3	(D.F.)	on Factor	C. Nominal	C7	max.	max.	max		Fragues at 10 AMIL						
d			C: Nominal Capacitance (pF)	10					Voltage	,	0.5 to 50	rms	1.0±0.	ZVIIIS	
r (	COM	WT.	WWI	Char. Temp. Reference Cap. Temp. Change ach specified temperature stage.  Char. Temp. Reference Cap. Change ach specified temperature stage.  (1) Temperature Compensating Type							asured after	5 min. at			
S		Capacitance Change	Within the specified tolerance (Table A)	R7 R6	-55°0 to +85	S°C	:5°C	Within ±15%	tance meas	mperature coefficient is determined using the neasured in step 3 as a reference. When cy rature sequentially from step1 through 5, the				cling the capacitan	
0		M.I	W W	C7	-55°0 to +125		OM.	Within ±22%	coefficient The capaci	and ca	hin the specified tolerance for the temperature d capacitance change as Table A. nce drift is calculated by dividing the difference maximum and minimum measured values in th				
,	Capacitance Temperature	Temperature Coefficent	Within the specified tolerance (Table A)		W.10	OX.	CO		steps 1, 3 a		imum and m by the cap. v			lues in the	
N	Characteristics	CON		- 11				(N)	Step 1		Te	emperatur 25±2	e (°C)		
			V.T.V	111		100)			2		–55±3 (for 5	C/R7/C7)		r F5)	
		Y.CO	Within ±0.2%	W					3 4		125±3 (for	25±2 5C/R7/C7		F5)	
N		Capacitance Drift	or ±0.05pF (Whichever is	4					5		WW	20±2	OY.CC		
		100X.C	larger.)		WW				The ranges 25°C value	of cap	c Constant T pacitance ch he temperat he specified	ange com ure range:			
	WWW	NN.100	No removal of the terminations or other defect should occur.  GNM 4 GNM 2  GNM 2					Fig.1 using the test jig the The soldering reflow methors.	a euter for 10± ng sho nod and	or to the test ctic solder. T d sec. uld be done d should be con m and free of	hen apply either with conducted	5N force in an iron or u with care so	parallel with sing the that the		
_	Adhesive	Strength				<b>1</b>	<u> </u>		COM.	, J.	1		MALL	ST C	
0		Termination							Ty GNM		a 0.5	1.6	0.32	0.32	
		Solder resist —Copper foil					111		GNN	1212	0.6	1.8	0.5	0.5	
			· To CON						GNM GNM		0.6	2.0 2.5	0.25	0.25 0.4	
			N.100 P.CO						00Y.CC	)Mr.		Fig. 1		(in mm)	
		TATA!	W. L. C	Divi	TIN		11	MAN				Continue	d on the follo	wing page.	
														3, 3	



#### **GNM Series Specifications and Test Methods (1)**

Below GNM Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table.

10	WW.	M. To	Y.COMP.	Specifications	1	V.C	Tool Mothod
0.	N ITE	em	Temperature Compensating Type	High Dielectr	с Туре	ory.	Test Method
	-44	Appearance	No defects or abnorr	nalities	WW.	UV ~1	Solder the capacitor to the test jig (glass epoxy board) in the
		Capacitance	Within the specified	olerance		100x	same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion
1	Vibration Resistance	Q/D.F.	30pF min.: Q≥1000 30pF max.: Q≥400+20C C: Nominal	Char.         25V min.         16V           R7, R6,         0.025         0.035           C7         max.         max.	10V 0.035 max.	6.3V 0.05 max.	having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should b applied for a period of 2 hours in each of 3 mutually perpendic
		M.	Capacitance (pF)	W.T.V	111.	1 L	ular directions (total of 6 hours).
1			No cracking or mark	ng defects should occur.	W	N 1	Solder the capacitor on the test jig (glass epoxy board) shown
	Deflectio  Solderab Terminat	ility of	GNM212 2 GNM214 2 GNM314 2	eGNM□□2  a b c 0.0±0.05 0.5±0.05 0.3±± 0.0±0.05 0.6±0.05 0.5±± 0.0±0.05 0.7±0.05 0.3±± Fig. 2  Prig. 2	0.05 0.32 0.05 0.52 0.05 0.22 0.05 0.42		in Fig. 2 using a eutectic solder.  Then apply a force in the direction shown in Fig. 3 for 5±1 set. The soldering should be done by the reflow method and shou be conducted with care so that the soldering is uniform and froof defects such as heat shock.  20 50 Pressurizing speed: 1.0mm/sec. Pressurize  Fig. 3  Immerse the capacitor in a solution of ethanol (JIS-K-8101) at rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat a 80 to 120°C for 10 to 30 seconds. After preheating, immerse is eutectic solder solution for 2±0.5 seconds at 230±5°C or
4	Resistanc			bserved characteristics s	nould sati	sfy the	Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5
•	Soldering	Appearance	specifications in the  No marking defects	ollowing table.	COn	TTV	WW. TOOX.CO.M.TW
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R7, R6, C7: Within ±7.5	%	M.T oM:	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
1		OY.C	30pF min.: Q≧1000	WW	OXIC	10	temperature for 24±2 hours, then measure.
		~ I C	30pF max.: Q≧400+20C	Char. 25V min. 16V	10V	6.3V	Initial measurement for high dielectric constant type  Perform a heat treatment at 150 (0) 1000 for one hour and
		Q/D.F.	C: Nominal Capacitance (pF)	R7, R6, 0.025 0.035 C7 max. max.	0.035 max.	0.05 max.	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.
4		I.R.	1	or 500Ω · F (Whichever	is smalle	M.C.	TW WWW.100Y.Co
		Dielectric Strength	No failure	V WW	10	oy.C	OM.TW WWW.IOOY.CO
•	W	MM.T	100Y.COM.T	W WY IW W LTW V	MM;	N.100 1007	Continued on the following page.



#### **GNM Series Specifications and Test Methods (1)**

Below GNM Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table.

			A.COMP.	Speci	fications				TW	_			
ο.	lt <sub>e</sub>	em	Temperature Compensating Type	N	High D	ielectric	Туре	ooy.C	OM	Tes	st Metho	d	
	Tempera Cycle	nture	The measured and of specifications in the			istics sh	ould sat	isfy the	Fix the capacit	tor to the supp	orting jig	in the same m	anner an
		Appearance	No marking defects			41	N	. 1	under the sam				-
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is	R7, R6,	C7: Withi	in ±7.5%	6		according to the table. Let sit for the contract of the table and the table according to the table. Let sit for the table according to table according to table according to table according to table accordin	or 24±2 hours (high dielectri	(tempera	ture compensa	ating type
			larger)		N	4		-311	Step	1111	2	3	4
		-VIV	30pF min.: Q≧1000 30pF max.:	My				111.	Temp. (°C)	Min. Operating	Room	Max. Operating	Room
		Q/D.F.	Q≧400+20C	Char. R7, R6,	25V min. 0.025	16V 0.035	10V 0.035	6.3V 0.05	remp. ( C)	Temp. +0/-3	Temp.	Temp. +3/–0	Temp.
1		Q/D.1.	O.N. mindl	C7	max.	max.	max.	max.	Time (min.)	30±3	2 to 3	30±3	2 to 3
			C:Nominal Capacitance (pF)	Olar	- TN	,		NW	Initial measu	rement for hig	h dielectr	ic constant typ	е
		I.R.	More than 10,000Mg	2 or 500Ω	· F (Whic	chever is	smalle	r)		at treatment a r 24±2 hours a		10°C for one h	our and
The same		Dielectric	177 1003		TI			Mar		nitial measure		imperature.	
0	-31	Strength	No failure	CO	Mr.	XXI		W	111.2	1.COn	W		
100	Humidity State	Steady	The measured and o specifications in the			istics sh	ould sat	isfy the	MM:100		TV		
7		Appearance	No marking defects	-7 (					WW.TO.				
7		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R7, R6,				Sit the capacit	or at 40±2°C a	and 90 to	95% humidity	for 500:	
0		LN	30pF and over: Q≥350 10pF and over,	1.100	Y.C	JM.	TW		hours. Remove and le measure.	et sit for 24±2	hours at	room tempera	ture, the
		Q/D.F.	30pF and below: Q≥275+5C/2 10pF and below: Q≥200+10C C: Nominal	Char. R7, R6, C7	0.05 max.	0.05 max	137	V/6.3V 0.05 max.	WW				
			Capacitance (pF)	11	100		11	In					
		I.R.	More than 1,000MΩ	or $50\Omega \cdot F$	(Whiche	ever is si	maller)	WT.			OOY!	1	W
	Humidity	Load	The measured and o specifications in the			istics sh	ould sat	isfy the					
1		Appearance	No marking defects	- 11	M.7.	~ J	CO	Mr.	N				
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	in ±12.5	%		Apply the rated voltage at 40±2°C and 90 to 95% humidit 500±12 hours.  Remove and let sit for 24±2 hours at room temperature, to						
		00 7.	30pF and over:		- 11	N.10	V -	COM	measure.			<b>₹1</b> C	
Ĭ		TOOY.C	Q≧200 30pF and below:	Char.	25V min	. 16V	10)	//6.3V	The charge/dis	scharge currer	nt is less	than 50mA.	
		Q/D.F.	Q≥100+10C/3	R7, R6,	0.05	0.05		0.05	W				
4		1700 7	C: Nominal Capacitance (pF)	<u>C7</u>	max.	max.	100 n	nax.	MITW				
		I.R.	More than 500MΩ or	250 · F /	Whichev	er is sm	aller)	N.C	OM				
	WA	WW.10	100X.COM.T	TW.		WW		100 A	COM.T	N	Continu	ued on the follow	ving page.

WWW.100Y.COM.TW Continued on the following page.



08.9.1

#### **GNM Series Specifications and Test Methods (1)**

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

N.		1.70	Y.COM.	Speci	fications			Took Makhad
No.	N ILE	em	Temperature Compensating Type	N	High Die	electric T	ype	Test Method
	High Tem Load	nperature	The measured and of specifications in the			tics shou	ld satisfy the	COMIN
		Appearance	No marking defects	-XXI		WIN	111.10	COM
J		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R7, R6, C7: Within ±12.5%		MM.10	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.	
18		MM	30pF and over: Q≧350 10pF and over,	er: Q≥350 er,	Initial measurement for high dielectric constant type.     Apply 200% of the rated DC voltage for one hour at the			
T.		Q/D.F.	30pF and below: Q≥275+5C/2 10pF and below: Q≥200+10C C: Nominal Capacitance (pF)	Char. R7, R6, C7	25V min. 0.04 max.	16V 0.05 max.	0.05 max.	maximum operating temperature ±3°C. Remove and let sit for 24±2 hours at room temperature. Perform initial measurement.
		I.R.	More than 1,000MΩ	or $50\Omega \cdot F$	(Whichev	er is sma	aller)	TW. Co. TW

OM. I	Name and Market XV	COM		Capacitance Cha	nge from 25℃ (%	6)	
Char.	Nominal Values (ppm/°C) Note 1	<u>-</u> -	55℃	-3	0℃	-10	c
COM.	(ppin/e) Note 1	Max.	Min.	Max.	Min.	Max.	Min.
5C	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.11

#### **GNM Series Specifications and Test Methods (2)**

Below GNM Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table. In case "\*" is not added in capacitance table, please refer to GNM Series Specifications and Test Methods (1) (P.36).

No.	Item	CON	1	cifications	(New York	se reier to Givini Series	•	t Method	oot moure	(1) (1 100)
	Operating		N.T.		1007.	COMM				
1	Temperature Range	R6: -55°C	C to +85°C	W	W 1007.	TIME				
2	Rated Voltage	See the pr	revious pages.			The rated voltage may be applied co When AC voltage whichever is larger voltage range.	ntinuously s superim	to the capa posed on D	citor. C voltage,	vp-p or V <sup>O-p</sup> ,
3	Appearance	No defects	s or abnormalities		W 1	Visual inspection				
4	Dimensions	Within the	specified dimension	on	MW	Using calipers	TW			
5	Dielectric Strength	No defects	s or abnormalities	TW	WWW.	No failure should be is applied between provided the charge	the termin	nations for 1	to 5 seco	nds,
6	Insulation Resistance	50Ω · F mi	in.	T.TW	WW	The insulation residual voltage not exceed max. and within 1	ling the rat	ed voltage		
7	Capacitance	Within the	specified toleranc	e TV	WW	The capacitance/D				at the
	Dissipation Factor (D.F.)	GNM1 GNM2 GNM2	M2 R6 103/223/ M2 R6 0J 105 M2 R6 1A 225 212 R6 0J 225	/225	s on the left side.	Table 2   GNM0M2 R6   GNM1M2 R6   GNM0M2 R6   GNM0M2 R6   GNM0M2 R6   GNM0M2 R6   GNM212 R6   GNM212 R6   GNM214 R6   GNM2	Ce // min.) // max.) // max.) // max.) // 1A 104 // 1A 105/ 1C 224/ OJ 103/ OJ 225	Frequenc: 1±0.1kHz 1±0.1kHz	y V	oltage :0.2Vrms :0.1Vrms
700						The capacitance of each specified tem  Step  1  2  3		tage. Temper: 25 -5	ature (°C) ±2 5±3 ±2	r 5 min.at
-46	Capacitance	Char.	Temp. Range	Reference	Cap. Change	4		85	±3	
9	Temperature Characteristics			Temp.		5		25	±2	TI
2 2 2	W 100 V CO	R6	_55 to +85°C	25°C	Within ±15%	The ranges of cap value over the tem within the specified • Initial measurement Perform a heat the set for 24±2 Perform the initial	perature ra I ranges. ent for high eatment at hours at ro	dielectric c 150+0/-10° com temper	n in the tab onstant typ C for one I	ole should be oe.
< N	WW. P	No remova	al of the terminatio	ns or other de	fects should occur.	Solder the capacito	r to the tes	t jig (glass e	poxy board	d) shown in
	Adhesive Strength	GNM	b	GNM	7 N.1001.	Fig. 1 using a eutec Then apply 5N (GN 10±1 sec. The sold using the reflow me the soldering is unif	ctic solder. IM0M2: 2N lering shou othod and s	I) force in pa Ild be done e hould be co	arallel with either with enducted w	the test jig for an iron or ith care so that
10	of Termination				- · · · · · · · · · · · · · · · · · · ·	Туре	а	b	C (	d
					THIN	GNM0M2 GNM1M2	0.2	0.96 1.6	0.25 0.32	0.2
		00			Solder resist Copper foil	GNM212	0.6	1.8	0.5	0.5
		COV.	Solder resist	Í	Copper toil	GNM214	0.6	2.0	0.25	0.25
			Соррег юп	Eig 1		GNM314	0.8	2.5	0.4	(in mm)
		× 100 Y	T	Fig. 1	MW.	007.				• • •
	Appearance	No defects	s or abnormalities	- 1	WW.	Solder the capacito		, , ,		*
	Capacitance	Within the	specified toleranc	е	NY Y	the same manner a The capacitor shou				. ,
	WW					having a total amp				
						1				

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).

11 Vibration

0.1 max.\*3

\*3 However 0.125 max. about Table 3 items on the left side.



#### **GNM Series Specifications and Test Methods (2)**

Below GNM Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table.

Continued from the preceding page. In case "\*" is not added in capacitance table, please refer to GNM Series Specifications and Test Methods (1) (P.36).

No.		1100		e refer to GNM Series Specifications and Test Methods (1) (P.36).  Test Method								
No.	Deflection	WW.10	Specifications  No cracking or marking defects should occur.  •GNM□□4  •GNM□□2  •GNM□2  •GNM□2	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.  20 50 Pressurizing speed: 1.0mm/sec. Pressurize  Capacitance meter								
I.I	TW TW		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. 3								
13	Solderab Terminati	-	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 Capacitance Change D.F. I.R. Dielectric Strength	No marking defects   R6: Within $\pm 7.5\%$ 0.1 max. *3   *3 However 0.125 max. about Table 3 items on the left side. $50\Omega \cdot F$ min.   No failure	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.								
1. N.	100X-	Appearance Capacitance Change D.F.	No marking defects  R6: Within ±12.5%  0.1 max. *3  *3 However 0.125 max. about Table 3 items on the left side.	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.								
15	Temperature Cycle	I.R.  Dielectric Strength	$50\Omega \cdot F$ min. No failure	Step     1     2     3     4       Temp. (°C)     Min. Operating Temp.     Room Temp.     Max. 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.								
16	High Temperature High Humidity (Steady)	Appearance Capacitance Change D.F.	No marking defects R6: Within $\pm 12.5\%$ 0.2 max. $12.5\Omega \cdot \text{F min.}$	Perform the initial measurement.  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								
17	Durability	Appearance Capacitance Change D.F.	No marking defects $R6: \mbox{Within $\pm 12.5\%}$ $0.2 \mbox{ max.}$ $25\Omega \cdot \mbox{F min.}$	measure.  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.								

# **Chip Monolithic Ceramic Capacitors**



#### Low ESL LLL/LLA/LLM Series

- Features (Reversed Geometry Low ESL Type)
- 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)	
Fait Number	Y DIVIL	W	T
LLL153	0.5 ±0.05	1.0 ±0.05	0.3 ±0.05
LLL185	0.8 ±0.1	1.6 ±0.1	0.6 max.
LLL215	COE	(1	0.5 +0/-0.15
LLL216	1.25 ±0.1	2.0 ±0.1	0.6 ±0.1
LLL219			0.85 ±0.1
LLL315			0.5 +0/-0.15
LLL317	1.6 ±0.15	3.2 ±0.15	0.7 ±0.1
LLL31M		-1	1.15 ±0.1

#### **Reversed Geometry Low ESL Type**

Part Number L x W [EIA]		LLL15	-781	110	LLL18	707	1.1			LL	L21	1.10	0 -	CO	11.7	LLI	L31		
L x W [EIA]		0.5x1.0 [0204]	M.	0.8	x1.6 [0	306]		N	1	.25x2.	0 [050	8]	00X		11	1.6x3.2	2 [0612	!]	
Rated Volt.		6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6 ( <b>0</b>	.3 <b>)J</b> )
тс	N	X6S ( <b>C8</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X5R ( <b>R6</b> )								
Capacitance, Ca	pacitan	ce Tole	rance a	and T D	imens	ion		M.I	.44			1	N.11	10 -		$M^{i}$	. 1		
2200pF ( <b>222</b> )	M		0.5 ( <b>5</b> )		W.1	001	1 C	M.			1	NV.	W.	003		OM.	I.M		
4700pF ( <b>472</b> )	М		0.5 ( <b>5</b> )	W	NW	100	1. C	OM		N		W	WW	100	M.	ON	1. T	N	
10000pF ( <b>103</b> )	M			0.5 ( <b>5</b> )	W	1.10	00.A	0.6 ( <b>6</b> )	W	W		1	W	0.7 ( <b>7</b> )	00X	CO	M.	IM	
22000pF ( <b>223</b> )	M	TW	7	0.5 ( <b>5</b> )	NN	W.	100	0.6 ( <b>6</b> )	OM	TW	ĸT		WW	0.7 ( <b>7</b> )	100	4.U	OM	TV	N.
47000pF ( <b>473</b> )	M	I.T.	N CN		0.5 ( <b>5</b> )	WV	1.10		0.6 ( <b>6</b> )	1.1	N		W W	0.7 ( <b>7</b> )	1.10	oux.	COJ	1.1	W
0.10μF ( <b>104</b> )	MC	0.3* ( <b>3</b> )	CM			0.5 ( <b>5</b> )	W.1	1005	0.6 ( <b>6</b> )	Mr.	TW			1.15 ( <b>M</b> )	0.7 ( <b>7</b> )	100	I.CC	OM Mr.	TW
0.22μF ( <b>224</b> )	MC	0.3* ( <b>3</b> )	TV			0.5 ( <b>5</b> )		100	y.C	0.85 ( <b>9</b> )	0.6 ( <b>6</b> )	1		W	1.15 ( <b>M</b> )	0.7 ( <b>7</b> )	Y.C	-01	LT
0.47μF ( <b>474</b> )	OOM.	CO	A.T	(N		1	0.5 ( <b>5</b> )	N.10	0.7.	CO	0.85 ( <b>9</b> )				1.15 ( <b>M</b> )	0.7 ( <b>7</b> )	002.	.co	$M_{i,j}$
1.0μF ( <b>105</b> )	M	V.CC	M	TV			0.5* ( <b>5</b> )	W.	100	Y.C	DM.	0.85 ( <b>9</b> )			WV	1.15 ( <b>M</b> )	0.7 ( <b>7</b> )	y.C	$O_{MT}$
2.2μF ( <b>225</b> )	M	07.C		1.T	N		0.5* ( <b>5</b> )	NN	V.10	07.9		M.T	0.85 ( <b>9</b> )		V		1.15 ( <b>M</b> )	0.7 ( <b>7</b> )	
4.7μF ( <b>475</b> )	M	001.		M.T	W.		1		W.1	001	J.C	M					W.1	1.15 ( <b>M</b> )	
10μF ( <b>106</b> )	M	700	v.C	OM	T.A.	N		W	NN	700	Y.C	OM		N					1.15* ( <b>M</b> )

The part numbering code is shown in ().

<sup>\*:</sup>Please refer to LLL/LLA/LLM Series Specifications and Test Method (2)(P.47). WWW.100Y.COM

Note

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• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

#### **Reversed Geometry Low ESL Type Low Profile**

Part Number	Inc		LL	L18			.10	LL	L21				LL	L31	
L x W [EIA]	100		0.8x1.6	5 [0306]		V 1	N 10	1.25x2.	0 [0508]	1.4			1.6x3.2	2 [0612]	
Rated Volt.		25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	4 ( <b>0G</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )
тс	W.1	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )				
Capacitance, Ca	pacitan	ce Tolera	nce and	T Dimens	sion		TININ	Ton	-1 C.C	Mr.	- XXI	1	1	1	
10000pF( <b>103</b> )	M	0.5( <b>5</b> )		TI		0.5( <b>5</b> )		st 100	7.0		- 11	0.5( <b>5</b> )			
22000pF( <b>223</b> )	M		0.5( <b>5</b> )	TA =	N		0.5( <b>5</b> )	14	N.C	Or		0.5( <b>5</b> )			
47000pF( <b>473</b> )	M	1.100	0.5( <b>5</b> )	$M_{ij}$	_ 7		- 18.7	0.5( <b>5</b> )	-7	$\sqrt{OM}$	-31		0.5( <b>5</b> )		
0.10μF( <b>104</b> )	M	10	DY.C	0.5( <b>5</b> )	IN		10.4	0.5( <b>5</b> )	00x.		(1,1,1)		0.5( <b>5</b> )		
0.22μF( <b>224</b> )	M	Mir	037	Ohr	0.5( <b>5</b> )				0.5( <b>5</b> )	Cor	- 177	N		0.5( <b>5</b> )	
0.47μF( <b>474</b> )	М	TVN.1	00 -		F. F.	7		- XIVI	Ino.	0.5( <b>5</b> )	Mrs	- 1			0.5( <b>5</b> )
1.0μF( <b>105</b> )	М		1007		TT	N			1100	Y.	0.5( <b>5</b> )	M			

The part numbering code is shown in ().

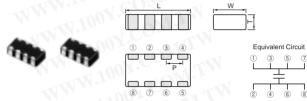
Dimensions are shown in mm and Rated Voltage in Vdc.

#### ■ Features (Eight Terminals Low ESL Type)

- 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	1111.1	Dimensions (mm)						
Part Number	L	W	T	Р				
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				

#### **Eight Terminals Low ESL Type**

Part Number		LLA18			LLA21			1111.10	LLA31	
L x W [EIA]		1.6x0.8 [0603]	11/1	×1 10 <sup>2</sup>	2.0x1.25 [080	5]		10	3.2x1.6 [120 <i>6</i>	[o]
Rated Volt.		4 ( <b>0G</b> )		25 (1E) 16 (1C)	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	( <b>0G</b> )
TC 1007.00		X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )
Capacitance, Ca	pacitan	ce Tolerance ar	nd T Dimensi	on	1.100	OM	~T	TANY	1.100	$CO_{MT}$
10000pF( <b>103</b> )	M		0.85( <b>9</b> )	MAN	-1 100 Y.	TIME		M. A.	VI 100 X.	Mo
22000pF( <b>223</b> )	M	COMP	0.85( <b>9</b> )	W.	N.F	$CO_{D_{2}}$			14.	Co
47000pF( <b>473</b> )	M		0.85( <b>9</b> )	111	W.100.	COM	1		111.100	-7 COI
0.10μF( <b>104</b> )	M	0.5( <b>5</b> )	TW	0.85( <b>9</b> )	1 100	1.00	TW	0.85( <b>9</b> )	100	
0.22μF( <b>224</b> )	М	0.5( <b>5</b> )		0.85( <b>9</b> )	M. I.	A COA	TIN	0.85( <b>9</b> )	M. M.	N.Cu
0.47μF( <b>474</b> )	M	0.5( <b>5</b> )	1.1.4		0.85( <b>9</b> )	0.01	M. I.	0.85( <b>9</b> )	11/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1	7 (1
1.0μF( <b>105</b> )	М	0.5*( <b>5</b> )	W	T.		0.85( <b>9</b> )	WILL	1.15( <b>M</b> )	0.85(9)	001.
2.2μF( <b>225</b> )	M	0.5*( <b>5</b> )	Mr.			ast C	0.85( <b>9</b> )		1.15( <b>M</b> )	0.85(9)
4.7μF( <b>475</b> )	M	1001.	717		-31	100 -	0.85*(9)			

The part numbering code is shown in ().

<sup>\*:</sup> Please refer to LLL/LLA/LLM Series Specifications and Test Method (2)(P.47).

#### **Eight Terminals Low ESL Type Low Profile**

Part Number		COM	CONTRACTOR LLA21					LLA31		
L x W [EIA]	100)	·	A	2.0x1.25 [0805	5] <b>10</b> 0 <sup>3</sup> .	OM:I'I		3.2x1.6 [1206]		
Rated Volt.		25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	( <b>0G</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	
тс	W.10	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	
Capacitance, Ca	pacitano	ce Tolerance and	d T Dimension		M.100	-1 CONI.	-41			
10000pF( <b>103</b> )	М	0.5( <b>5</b> )	TIME	N.	100	Mo.	21			
22000pF( <b>223</b> )	M	0.5( <b>5</b> )	JII.			W.Co.	TW			
47000pF( <b>473</b> )	М	1.100	0.5( <b>5</b> )	7	T.W.Y.	-1 COP	1.			
0.10μF( <b>104</b> )	M	1007.	0.5( <b>5</b> )	N	1	001.	17.7			
0.22μF( <b>224</b> )	М	W.F	COM	0.5( <b>5</b> )		COV.CO	0.5( <b>5</b> )			
0.47μF( <b>474</b> )	М	-TVI 100 -	COM	- 7	0.5( <b>5</b> )	Jan -	DMI	0.5 <b>(5</b> )		
1.0μF( <b>105</b> )	M	100	1.0		11111	0.5( <b>5</b> )	OM.T.W		0.5( <b>5</b> )	
2.2μF( <b>225</b> )	M	W. Lo	A COM.	TIN	WIN	0.5*( <b>5</b> )	CO TO		0.5( <b>5</b> )	
4.7μF( <b>475</b> )	М	10 XX				0.5*( <b>5</b> )	COMP	-1		

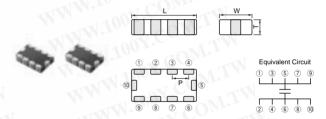
The part numbering code is shown in ().

#### ■ Features (Ten Terminals Low ESL Type)

- 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)						
Part Number	W.L.	W	IM	Р			
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			

#### Ten Terminals Low ESL Type Low Profile

Ten Term	inals	Low ESL	Type Low F	Profile					
Part Number	COS	N.T.V	LL	M21	OMITI		LLM31	OMT	
L x W [EIA]	Y.Cu	WILL	2.0x1.2	25 [0805]	MIN	11/1	3.2x1.6 [1206]	[1206]	
Rated Volt.		25 ( <b>1E</b> )	16 ( <b>1C</b> )	6.3 ( <b>0J</b> )	4 ( <b>0G</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	
TC 100 Y.		X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7S ( <b>C7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	
Capacitance, Ca	pacitance	e Tolerance and	T Dimension	TW.100	COM		W.In	-1 C.C	
10000pF( <b>103</b> )	M	0.5( <b>5</b> )	N	MAN	07.0	L.M.	111	101.	
22000pF( <b>223</b> )	M	0.5( <b>5</b> )		-1111	Of COM.		MIN W.	any.C	
47000pF( <b>473</b> )	M	Mo	0.5( <b>5</b> )	-TXV.1	00		W.	100	
0.10μF( <b>104</b> )	М	W.Co.	0.5( <b>5</b> )		1007.00	0.5( <b>5</b> )		100%	
0.22μF( <b>224</b> )	M	-1 CON	1	0.5( <b>5</b> )	CO	0.5( <b>5</b> )			
0.47μF( <b>474</b> )	M	001.	M.T.V	0.5( <b>5</b> )	1.100 -	JA:I	0.5( <b>5</b> )		
1.0μF( <b>105</b> )	М	. OOY.CO	W	MIN	0.5 <b>(5</b> )	WILL			
2.2μF( <b>225</b> )	M	Jan	Mr.	- 131	0.5*( <b>5</b> )	Ohr.		0.5( <b>5</b> )	

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

<sup>\*:</sup> Please refer to LLL/LLA/LLM Series Specifications and Test Method (2)(P.47).

Dimensions are shown in mm and Rated Voltage in Vdc.

<sup>\*:</sup> Please refer to LLL/LLA/LLM Series Specifications and Test Method (2)(P.47). WWW.100Y.COM.T

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

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No.	Ite	em	Specifications		UL T	Test Method	
1	Operating Temperat Range		R7, C7: -55 to +125°C	W.100Y.	$co_{M_{1}}$	LM.	
2	Rated Vo	ltage	See the previous pages.	NW.100	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 <sup>p-p</sup> or V <sup>q</sup> whichever is larger, should be maintained within the rated voltage range.		
3	Appearar	nce	No defects or abnormalities	TIN W. A.	Visual insp		
4	Dimensio	<del>- 11 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - </del>	Within the specified dimension		Using calipers		
5		: Strength	No defects or abnormalities	M MMM		should be observed when 250% of the rated voltage between the terminations for 1 to 5 seconds, ne charge/discharge current is less than 50mA.	
6	Insulation Resistant		C≦0.047μF: More than 10,000MΩ C>0.047μF: More than 500Ω · F C: Normal Capacitance	WW	The insulation resistance should be measured with not exceeding the rated voltage at 25°C and 75%R within 2 minutes of charging.		
8	Dissipation Factor		W:thin the specified tolerance  W.V.: 25V min.; 0.025 max.  W.V.: 16V/10V max.; 0.035 max.  W.V.: 6.3V max.; 0.05 max.	N	frequency Frequency Voltage: 1:	itance/D.F. should be measured at 25°C at the and voltage shown in the table.  1: 1±0.1kHz ±0.2Vrms the voltage is 0.5±0.1Vrms about LLA185C70G474.	
\ \ \	M.TV	N -XI	WWW.100Y.COM.TW	N		itance change should be measured after 5 min. at ified temperature stage.	
			M. 1001. COMIT.		Step	Temperature (°C)	
	Capacitar	200	WW. TOOX.CO.T.T.		1 2	25±2 -55±3	
9	Temperat		Town Dance Deference		3	25±2	
	Character	ristics	Char. Temp. Range Reference (°C) Temp.	Cap.Change	5	125±3 25±2	
10	Adhesive of Termin	Strength	No removal of the terminations or other defect s	hould occur.	value over the temperature ranges shown in the table sho be within the specified ranges.  Solder the capacitor to the test jig (glass epoxy board) us eutectic solder. Then apply 10N* force in parallel with the jig for 10±1 sec. The soldering should be done either with iron or using the reflow method and should be conducted care so that the soldering is uniform and free of defects sheat shock.  *LLL18 and LLA/LLM Serie		
		Appearance	No defects or abnormalities	COM		capacitor to the test jig (glass epoxy board) in	
	Vibration Resistance	Capacitance 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.	ON.COM	the same manner and under the same conditions as (10 capacitor should be subjected to a simple harmonic mo having a total amplitude of 1.5mm, the frequency being uniformly between the approximate limits of 10 and 55H frequency range, from 10 to 55Hz and return to 10Hz, s be traversed in approximately 1 minute. This motion she applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).		
12	Solderab Terminati		75% of the terminations are to be soldered evenly and continuously.	W.100Y.C	Immerse the capacitor in a solution of ethanol (JIS-K-81 rosin (JIS-K-5902) (25% rosin in weight proportion). Prel 80 to 120°C for 10 to 30 seconds. After preheating, immeutectic solder solution for 2±0.5 seconds at 230±5°C, Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 24		
	11/1	Appearance	No marking defects	W.100	COM	TOWN TOWN	
		Capacitance Change	Within ±7.5%	WW.100	the capaci	e capacitor at 120 to 150°C for 1 minute. Immerse tor in a eutectic solder or Sn-3.0Ag-0.5Cu solder 270±5°C for 10±0.5 seconds. Let sit at room	
13	Resistance to Soldering Heat	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.		V.CO	re for 24±2 hours, then measure. asurement.	
		I.R. Dielectric	More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is	smaller)		a heat treatment at $150^{+0}_{-0}$ °C for one hour and then 24 $\pm$ 2 hours at room temperature. Perform the initial ment.	
		Strength	MAN TOOK TAN	N		Continued on the following page.	
			MMM.100X.COM.TV	D_+_		4	





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

Below LLL/LLA/LLM Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table. Continued from the preceding page. In case "\*" is added in capacitance table, please refer to LLL/LLA/LLM Series Specifications and Test Methods (2) (P.47).

No.	ITE	em	Specifications	TIN		t Metho			
		Appearance Capacitance Change	No marking defects  Within ±7.5%	under the sam Perform the fiv	tor to the support one conditions as we cycles accor	s (10). rding to t	he four heat tre	eatments	
		D.F.	W.V.: 25V min.; 0.025 max. W.V.: 16V/10V max.; 0.035 max.	7 - 1	llowing table. Lathen measure.	et sit for	3	room 4	
14	Temperature Cycle	N N	W.V.: 6.3V max.; 0.05 max.		Min. Operating	Room	Max. Operating	Room	
	Oyele	I.R.	More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is smaller)	Time (min.)	Temp. ±3 30±3	Temp.	Temp. ±3 30±3	Temp.	
N		Dielectric Strength No failure  Appearance No marking defects		<ul> <li>Initial measurement.</li> <li>Perform a heat treatment at 150<sup>±o</sup><sub>10</sub>°C for one hour and the let sit for 24±2 hours at room temperature. Perform the inimeasurement.</li> </ul>					
		Appearance	No marking defects	100 COM.					
7	Humidity	Capacitance Change	Within ±12.5%		Sit the capacitor at 40±2°C and 90 to 95% humidity for 500± hours. Remove and let sit for 24±2 hours at room temperatur				
15	(Steady State)	D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	then measure		24±2 n	ours at room te	mperati	
V		I.R.	More than 1,000M $\Omega$ or $50\Omega \cdot F$ (Whichever is smaller)	TW.100					
17,	WT	Appearance	No marking defects	100	DY.	TY			
O	Humidity Load	Capacitance Change	Within ±12.5%		Apply the rated voltage at 40±2°C and 90 to 95 500±12 hours. Remove and let sit for 24±2 hours.				
16		D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	temperature, t	temperature, then measure. The charge/discharge less than 50mA.				
	COM	I.R.	More than $500M\Omega$ or $25\Omega \cdot F$ (Whichever is smaller)	WW.100Y.COM.TW					
X.		Appearance	No marking defects		f the rated volta	•			
0	I.CON	Capacitance Change	Within ±12.5%		erating tempera erature, then me than 50mA.				
17	High Temperature Load	D.F.	W.V.: 10V min.; 0.05 max. W.V.: 6.3V max.; 0.075 max.	•Initial measur	rement.	y.c csi C	OM.TW	V.	
19	OOX.C	I.R.	More than 1,000M $\Omega$ or 50 $\Omega$ · F (Whichever is smaller)	maximum op 24±2 hours	Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and 24±2 hours at room temperature.  Perform initial measurement.				

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

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1 Te Ra 2 Ra 3 Ap 4 Di 5 Di 6 In Ra 7 Ca 8 Di (D	Operating Comperature Range  Rated Voltage  Appearance Dimensions  Dielectric Stren  Resistance  Capacitance  Dissipation Fac  D.F.)	Se S	6: -55 to +85°C 7, C7: -55 to +125°C 8: -55 to +105°C ee the previous pages.  o defects or abnormalities //ithin the specified dimension o defects or abnormalities  0Ω · F min.	M.M. 100 X. M.M. 1	4 (M) F	sly to the capacitorimposed on DC vd be maintained wd be maintained wd verved when 250% of minations for 1 to large current is less	or.  roltage, VPP or VOP,  vithin the rated  of the rated voltage 5 seconds,		
3 Al	Appearance Dimensions Dielectric Stren Insulation Resistance Capacitance Dissipation Fac	No W	o defects or abnormalities  /ithin the specified dimension  o defects or abnormalities  0Ω · F min.	MMM:100 MMM:100 MMM:100 MMM:100	may be applied continuous. When AC voltage is super whichever is larger, should voltage range. Visual inspection Using calipers No failure should be obset is applied between the terprovided the charge/disch The insulation resistance of	sly to the capacitorimposed on DC vd be maintained wd be maintained wd verved when 250% of minations for 1 to large current is less	or.  roltage, VP-P or VO-P,  vithin the rated  of the rated voltage 5 seconds,		
4 Di 5 Di 6 In Ro 7 Ca 8 Di (D	Dimensions Dielectric Stren Insulation Resistance Capacitance Dissipation Fac	W Sth	o defects or abnormalities  0Ω · F min.	MMM.	Using calipers  No failure should be obset is applied between the terprovided the charge/disch  The insulation resistance seemed.	minations for 1 to arge current is les	5 seconds,		
5 Di Garago de la composición del composición de la composición de	Dielectric Stren  Assulation  Resistance  Capacitance  Dissipation Factors	gth No	o defects or abnormalities $0\Omega \cdot F \; min.$	WWW.	No failure should be obset is applied between the ter provided the charge/disch  The insulation resistance stance stance.	minations for 1 to arge current is les	5 seconds,		
6 In Re 7 Ca 8 Di (D	nsulation Resistance Capacitance Dissipation Fac D.F.)	50 W	$0\Omega\cdotF$ min.	WWW	is applied between the ter provided the charge/disch The insulation resistance	minations for 1 to arge current is les	5 seconds,		
6 Re 7 Ca 8 Di (D	Resistance Capacitance Dissipation Fac	W	WW. TO COM		4 (M) F	should be measur			
8 Di (D	Dissipation Fac	or	/ithin the specified tolerance	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.		
Ca 9 Te Cr	D.F.)	or D			The capacitance/D.F. sho frequency and voltage sho		at 25°C at the		
9 Te Ch	anacitance	R6, R7, C7, C8: 0.120 max.		Capacitance C≤10µF (10V min.) C≤10µF (6.3V max.) C>10µF	Frequency 1±0.1kHz 1±0.1kHz 120±24Hz	Voltage 1.0±0.2Vrms 0.5±0.1Vrms 0.5±0.1Vrms			
9 Te Ch	anacitance		M 100 - OM.1			120124112	0.5±0.1 VIIIIS		
Ac Ac	emperature characteristics	N	Char.         Temp. Range (°C)         Reference Temp.           R6         -55 to +85         -55 to +125           C7         -55 to +125         25°C           C8         -55 to +105	Within ±15% Within ±22% Within ±22% Within ±22% Within ±22% Within ±22% Within ±20% Within		re stage. e change compare e ranges shown ir nges.	ed with the 25°C n the table should		
	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 eutectic solder. Then apply 10N* force in parallel with the tes jig for 10±1 sec. The soldering should be done either with ar iron or using the reflow method and should be conducted wit care so that the soldering is uniform and free of defects such heat shock.  *5N (LLL15, LLL18, LLA,LLM Ser				
10	Appea	ance No	o defects or abnormalities	TI	Solder the capacitor to the				
1.10	Capaci	ance W	/ithin the specified tolerance	COMP	the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion				
11 Vik	ibration D.F.	R	6, R7, C7, C8: 0.120 max.	Y.COM. F OY.COM. T	capacitor should be subjected to a simple narmonic motion having a total amplitude of 1.5mm, the frequency being variuniformly between the approximate limits of 10 and 55Hz. T frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).				
	Solderability of ermination	75% of the terminations are to be soldered evenly and continuously.		Immerse the capacitor in a solution of ethanol (JIS-K-8101) a rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat 80 to 120°C for 10 to 30 seconds. After preheating, immerse 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					
W	Appea	ance No	o marking defects	-1100Y.C	Preheat the capacitor at 1				
Ra	Capaci Change	- R	6, R7, C7, C8: Within ±7.5%	100Y.	the capacitor in a eutectic solution at 270±5°C for 10  Let sit at room temperatur	0±0.5 seconds.	1007.		
13 to 9	Soldering D.F.	R	6, R7, C7, C8: 0.120 max.	A A	WITH.	5 101 Z Z 110u15,	alon modoure.		
Hea	I.R.	50	$0\Omega\cdotF$ min.	M.In.	Initial measurement.  Perform a heat treatment.	t at 150 + 2 °C for	one hour and the		
	Diele Stren	N	o failure	VWW.100	let sit for 24±2 hours at r measurement.				
	11	W.1	ON.	TWW.IU	COM	Continued on	the following page.		





WWW.100Y.COM.TW

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

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No.	Ite	em	Specifications	Test Method					
	- 31	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner a					
		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	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,					
		D.F.	R6, R7, C7, C8: 0.120 max.	then measure.					
	Temperature	I.R.	$50Ω \cdot F$ min.	Step 1 2 3 4					
14	Sudden Change	WW	ON COMMENT	Temp. (°C) Min. Operating Room Temp. ±3 Temp. Temp.					
7	onango		1.100 COM. 1	Time (min.) 30±3 2 to 3 30±3 2 to 3					
V VV		Dielectric Strength No failure		<ul> <li>Initial measurement         Perform a heat treatment at 150±9°°C for one hour and the let sit for 24±2 hours at room temperature. Perform the init measurement.     </li> </ul>					
U		Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity					
T	High	Capacitance Change	R6, R7, C7, C8: Within ±12.5%	500±12 hours. The charge/discharge current is less than 50mA. Apply the rated DC voltage.					
K	High Temperatue	D.F.	R6, R7, C7, C8: 0.2 max.	Apply the fated bo voltage.					
15	High Humidity (Steady State)	I.R.	12.5Ω · F min.	<ul> <li>Initial measurement         Perform a heat treatment at 150<sup>+o</sup><sub>10</sub>°C for one hour and the let sit for 24±2 hours at room temperature. Perform the init measurement.</li> <li>Measurement after test         Perform a heat treatment at 150<sup>+o</sup><sub>10</sub>°C for one hour and the let sit for 24±2 hours at room temperature, then measure.</li> </ul>					
	OM.,	Appearance	No marking defects	Apply 150% of the rated voltage for 1000±12 hours at the					
J		Capacitance Change	R6, R7, C7, C8: Within ±12.5%	maximum operating temperature ±3°C. The charge/discharge current is less than 50mA.					
7.		D.F.	R6, R7, C7, C8: 0.2 max.	•Initial measurement					
16	Durability	I.R.	$25\Omega \cdot F$ min.	Perform a heat treatment at 150± $^{\circ}_{10}$ °C for one hour and the let sit for 24±2 hours at room temperature. Perform the init measurement.  •Measurement after test Perform a heat treatment at 150± $^{\circ}_{10}$ °C for one hour and the let sit for 24±2 hours at room temperature, then measure.					

# **Chip Monolithic Ceramic Capacitors**



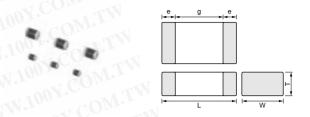
#### **High-Q Type GJM Series**

#### ■ 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	of COP	Dimensions (mm)						
Part Number	7 · L	W	T	е	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			

Part Number		N 1007.	GJM15		
L x W [EIA]		CO	1.0x0.5 [0402]		
Rated Volt.		WWW.1007.C	25 I <b>E</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )
		C0G ( <b>5C</b> )	C0H ( <b>6C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )
Capacitance, C	apacitance	e Tolerance and T Dimension	.Co. TW	MM 100Y.C	TITY
0.10pF( <b>R10</b> )	W, B	TIMM. In-	COMP.	MAN ON C	0.5( <b>5</b> )
0.20pF( <b>R20</b> )	W, B	0.3( <b>3</b> )	M.I.	W. 100 P	0.5( <b>5</b> )
0.30pF( <b>R30</b> )	W, B	0.3(3)	Y.CO. TVI	1/	0.5( <b>5</b> )
0.40pF( <b>R40</b> )	W, B	0.3(3)	COMP		0.5( <b>5</b> )
0.50pF( <b>R50</b> )	W, B	0.3(3)	M.I.	W 100	0.5( <b>5</b> )
0.60pF( <b>R60</b> )	W, B	0.3(3)	MY.CO.	11/11/11/11	0.5( <b>5</b> )
0.70pF( <b>R70</b> )	W, B	0.3(3)	In TCOM.	ol vinnin	0.5( <b>5</b> )
0.80pF( <b>R80</b> )	W, B	0.3(3)	1007. OM.T	11	0.5( <b>5</b> )
0.90pF( <b>R90</b> )	W, B	0.3(3)	. ON COR	W WWW	0.5( <b>5</b> )
1.0pF( <b>1R0</b> )	W, B, C	0.3(3)	N.Ing. COM.	TWW.	0.5( <b>5</b> )
1.1pF( <b>1R1</b> )	W, B, C	0.3(3)	-1100Y.	The Man	0.5( <b>5</b> )
1.2pF( <b>1R2</b> )	W, B, C	0.3(3)	M. Cop	WWW WWW	0.5( <b>5</b> )
1.3pF( <b>1R3</b> )	W, B, C	0.3(3)	M. Jun CO	VI.	0.5( <b>5</b> )
1.4pF( <b>1R4</b> )	W, B, C	0.3(3)	11007.0	21 [[]	0.5( <b>5</b> )
1.5pF( <b>1R5</b> )	W, B, C	0.3(3)	MM. CC	WW WW	0.5( <b>5</b> )
1.6pF( <b>1R6</b> )	W, B, C	0.3(3)	1W.100	011.1	0.5( <b>5</b> )
1.7pF( <b>1R7</b> )	W, B, C	0.3(3)	MM. 1001.0	TIN W	0.5( <b>5</b> )
1.8pF( <b>1R8</b> )	W, B, C	0.3(3)	THE STATE OF THE S	CONTRACTOR	0.5( <b>5</b> )
1.9pF( <b>1R9</b> )	W, B, C	0.3(3)	100	COMP.	0.5( <b>5</b> )
2.0pF( <b>2R0</b> )	W, B, C	0.3(3)	11111		0.5( <b>5</b> )
2.1pF( <b>2R1</b> )	W, B, C	0.3(3)	TIWW.IO	A COMP.	0.5( <b>5</b> )
2.2pF( <b>2R2</b> )	W, B, C	0.3(3)	100	COMPLE	0.5( <b>5</b> )
2.3pF( <b>2R3</b> )	W, B, C	0.3(3)	MM	OTION	0.5 <b>(5)</b>
2.4pF( <b>2R4</b> )	W, B, C	0.3(3)	TWW.I	COM	0.5( <b>5</b> )
2.5pF( <b>2R5</b> )	W, B, C	0.3(3)	777	On CONT.	0.5( <b>5</b> )
2.6pF( <b>2R6</b> )	W, B, C	0.3(3)	MM	TIN TO THE	0.5 <b>(5</b> )
2.7pF( <b>2R7</b> )	W, B, C	0.3(3)		· ra COM	0.5 <b>(5</b> )
2.8pF( <b>2R8</b> )	W, B, C	0.3(3)	W.	(1)07.	0.5 <b>(5</b> )
2.9pF( <b>2R9</b> )	W, B, C	0.3(3)	N WW		0.5 <b>(5</b> )
3.0pF( <b>3R0</b> )	W, B, C	0.3(3)	.<1		0.5 <b>(5</b> )
3.1pF( <b>3R1</b> )	W, B, C	0.3(3)			0.5( <b>5</b> )

The part numbering code is shown in ().

Part Number GJM03 GJM15 0.6x0.3 [0201] 1.0x0.5 [0402] LxW[EIA] 25 (**1E**) 6.3 (**0J**) **Rated Volt** (1H) C0G (**5C**) C0G (**5C**) C0H (**6C**) COG TC (**5C**) Capacitance, Capacitance Tolerance and T Dimension 3.2pF(3R2) W, B, C 0.3(3)0.5(5) 3.3pF(3R3) W, B, C 0.3(3)0.5(5) 3.4pF(3R4) W, B, C 0.3(3) 0.5(5) 3.5pF(3R5) W, B, C 0.3(3) 0.5(5) 3.6pF(3R6) 0.3(3) W, B, C 0.5(5) 3.7pF(3R7) W, B, C 0.3(3) 0.5(5) W, B, C 3.8pF(3R8) 0.3(3) 0.5(5) 3.9pF(3R9) W, B, C 0.3(3)0.5(5) 4.0pF(4R0) W, B, C 0.3(3) 0.5(5) 4.1pF(4R1) 0.3(3)W, B, C 0.5(5) 4.2pF(4R2) W, B, C 0.3(3) 0.5(5) 4.3pF(4R3) W, B, C 0.3(3)0.5(5) 4.4pF(4R4) W, B, C 0.3(3) 0.5(5) 4.5pF(4R5) W, B, C 0.3(3) 0.5(5) 4.6pF(4R6) W, B, C 0.3(3)0.5(5) 4.7pF(4R7) **W**, **B**, **C** 0.3(3) 0.5(5) 4.8pF(4R8) 0.3(3)0.5(5) W, B, C 4.9pF(4R9) 0.3(3) **W**, **B**, **C** 0.5(5) 5.0pF(5R0) W, B, C 0.3(3)0.5(5) 5.1pF(5R1) 0.3(3) 0.5(5) W, B, C, D 5.2pF(5R2) W, B, C, D 0.3(3)0.5(5) 0.3(3)0.5(5) 5.3pF(5R3) W, B, C, D 5.4pF(5R4) 0.3(3) 0.5(5) W, B, C, D 5.5pF(5R5) W, B, C, D 0.3(3)0.5(5)5.6pF(**5R6**) 0.3(3) 0.5(5) W, B, C, D 5.7pF(5R7) W, B, C, D 0.3(3) 0.5(5) 5.8pF(5R8) 0.3(3) 0.5(5)W, B, C, D 5.9pF(5R9) 0.3(3) W, B, C, D 0.5(5) 6.0pF(6R0) W, B, C, D 0.3(3) 0.5(5)6.1pF(6R1) W, B, C, D 0.3(3) 0.5(5)6.2pF(6R2) W, B, C, D 0.3(3) 0.5(5)6.3pF(6R3) W, B, C, D 0.3(3) 0.5(5)6.4pF(6R4) W, B, C, D 0.3(3) 0.5(5) 6.5pF(6R5) W, B, C, D 0.3(3) 0.5(5)6.6pF(6R6) W, B, C, D 0.3(3) 0.5(5) W, B, C, D 0.3(3) 6.7pF(6R7) 0.5(5) W, B, C, D 0.3(3) 6.8pF(6R8) 0.5(5)6.9pF(6R9) W, B, C, D 0.5(5) 0.3(3)7.0pF(7R0) W, B, C, D 0.3(3)0.5(5)W, B, C, D 0.3(3) 7.1pF(**7R1**) 0.5(5) 7.2pF(7R2) W, B, C, D 0.3(3)0.5(5)7.3pF(7R3) W, B, C, D 0.3(3)0.5(5) 7.4pF(7R4) W, B, C, D 0.3(3)0.5(5)7.5pF(**7R5**) W, B, C, D 0.3(3)0.5(5) W, B, C, D 0.5(5) 7.6pF(**7R6**) 0.3(3)7.7pF(**7R7**) W, B, C, D 0.3(3)0.5(5) W, B, C, D 7.8pF(**7R8**) 0.3(3) 0.5(5) 7.9pF(**7R9**) 0.3(3) W, B, C, D 0.5(5) 8.0pF(8R0) W, B, C, D 0.3(3) 0.5(5)

The part numbering code is shown in ().

W, B, C, D

8.1pF(8R1)

Dimensions are shown in mm and Rated Voltage in Vdc.

0.3(3)

0.5(5)

r	

Part Number	A.C.		GJM03	W	GJM15	
L x W [EIA]	00 2	OM.I	0.6x0.3 [0201]	VI.	1.0x0.5 [0402]	
Rated Volt.		COM.TW	25 ( <b>1E</b> )	6.3 ( <b>0J</b> )	50 ( <b>1H</b> )	
тс	1.7003	C0G ( <b>5C</b> )	C0H ( <b>6C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	
Capacitance, C	apacitance	Tolerance and T Dimensio	n	COMPA		
8.2pF( <b>8R2</b> )	W, B, C, D	Y. TW	0.3(3)	-oM.1	0.5 <b>(5</b> )	
8.3pF( <b>8R3</b> )	W, B, C, D	N.Com TVI	0.3(3)	.Co TN	0.5 <b>(5</b> )	
8.4pF( <b>8R4</b> )	W, B, C, D	COM	0.3(3)	of COM.	0.5 <b>(5</b> )	
8.5pF( <b>8R5</b> )	W, B, C, D	OOY.	0.3(3)	J. OM. I	0.5 <b>(5</b> )	
8.6pF( <b>8R6</b> )	W, B, C, D	ON COM	0.3(3)	N.CO.	0.5 <b>(5</b> )	
8.7pF( <b>8R7</b> )	W, B, C, D	100 COM.	0.3 <b>(3)</b>	COMP	0.5 <b>(5</b> )	
8.8pF( <b>8R8</b> )	W, B, C, D	11001.	0.3 <b>(3</b> )	001.	0.5 <b>(5</b> )	
8.9pF( <b>8R9</b> )	W, B, C, D	N. T. COM	0.3(3)	ON CON	0.5( <b>5</b> )	
9.0pF( <b>9R0</b> )	W, B, C, D	W.100 COM	0.3(3)	Jan	0.5 <b>(5</b> )	
9.1pF( <b>9R1</b> )	W, B, C, D	1100Y.	0.3(3)	11001. M.TV	0.5 <b>(5</b> )	
9.2pF( <b>9R2</b> )	W, B, C, D		0.3(3)	V. COM. TVI	0.5 <b>(5</b> )	
9.3pF( <b>9R3</b> )	W, B, C, D	-1W.100 - CO	0.3(3)	M.In. COM.	0.5( <b>5</b> )	
9.4pF( <b>9R4</b> )	W, B, C, D	M. 1001.Co	0.3 <b>(3</b> )	1100Y.	0.5( <b>5</b> )	
9.5pF( <b>9R5</b> )	W, B, C, D	TWW.	0.3 <b>(3</b> )	MM. COL	0.5( <b>5</b> )	
9.6pF( <b>9R6</b> )	W, B, C, D	M. 100 r.	0.3 <b>(3</b> )	M.Ing. COM.	0.5( <b>5</b> )	
9.7pF( <b>9R7</b> )	W, B, C, D	MM	0.3(3)	11007.0	0.5( <b>5</b> )	
9.8pF( <b>9R8</b> )	W, B, C, D		0.3(3)	M. COL	0.5( <b>5</b> )	
9.9pF( <b>9R9</b> )	W, B, C, D	100 1	0.3(3)	CON TOWN	0.5( <b>5</b> )	
10pF( <b>100</b> )	G, J	11/11/11	0.3( <b>3</b> )	1001.00	0.5( <b>5</b> )	
11pF( <b>110</b> )	G, J	TINN.IO	0.3(3)	MINN. POLCO	0.5( <b>5</b> )	
12pF( <b>120</b> )	G, J	101	0.3(3)	100	0.5( <b>5</b> )	
13pF( <b>130</b> )	G, J	WW.	0.3(3)	411111111111111111111111111111111111111	0.5( <b>5</b> )	
15pF( <b>150</b> )	G, J	TANN.I	0.3(3)	TINN.	0.5( <b>5</b> )	
16pF( <b>160</b> )	G, J	N TO	0.3(3)	W 100 1	0.5( <b>5</b> )	
18pF( <b>180</b> )	G, J	MMM.	0.3(3)	11/1/11/11	0.5( <b>5</b> )	
20pF( <b>200</b> )	G, J	T TOTAL W	0.3(3)	TIWW.IO	0.5( <b>5</b> )	
22pF( <b>220</b> )	G, J	M. M.	1007. M.TW	0.3(3)	OWITH	
24pF( <b>240</b> )	G, J	WW WW	A. CO. TAN	0.3(3)	Y.C. TY	
27pF( <b>270</b> )	G, J	A. A.	M. Jun . COM. T	0.3(3)	COM	
30pF( <b>300</b> )	G, J	IN W	1100X.	0.3(3)	M.I	
33pF( <b>330</b> )	G, J	-11	M. M. COM	0.3(3)	MY.CO.	

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc. WWW.100Y.CO

## GJM Series Specifications and Test Methods(1)

	M.100	Specifications	COMP. TW
No.	Item	Temperature Compensating Type	Test Method
1	Operating Temperature Range	-55 to +125℃	Reference Temperature: 25°C (2C, 3C, 4C: 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, VP-P or VO-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.)	10,000M $\Omega$ min. or 500 $\Omega$ · 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°C at the frequency and voltage shown in the table.
8	QTW	30pF and over: Q≥1000 30pF and below: Q≥400+20C	Frequency 1±0.1MHz
Ö	W. T.	C: Nominal Capacitance (pF)	Voltage 0.5 to 5Vrms
9	Capacitance Temperature Coefficient  Capacitance Temperature Capacitance Capacitance Capacitance Capacitance Capacitance Capacitance Capacitance	Within the specified tolerance (Table A)  Within ±0.2% or ±0.05pF	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°C: other temp. coeffs.: +20 to 125°C) 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.
.19	Drift	(Whichever is larger.)	Step Temperature (°C)  1 Reference Temp. ±2
V.1	TOOM.	M. M. M. Loov COM.	2 — 55±3
< X	100 x	111, M. 100 . COW:1	3 Reference Temp. ±2
11	TOOM CO.	TW WWY 100Y.Com.	4 125±3
V	N. Too	M. W. W. COM.	5 Reference Temp. ±2
777		OM.TW WWW.100Y.COM COM.TW WWW.100Y.COM COM.TW WWW.100Y.COM	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)
10	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	
		OOY.COM. TW WWW.100	Solder resist  Baked electrode or copper foil
		100X.COM.TW WWW.10	Type a b c GJM03 0.3 0.9 0.3 GJM15 0.4 1.5 0.5
		N.100X.COM.TW WW.1	GJM15 0.4 1.5 0.5 (in mm)
	4111	TI 100X. ON. THE	Continued on the following page.
			Continued on the following page. [2



WWW.100Y.COM.TW

Note • This PDF catalog is downloaded from the website of Murata Manufacturing co., ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

#### **GJM Series Specifications and Test Methods(1)**

Continued from the preceding pag
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lo.	Ite	m oo	Specifications	Test Method				
10.	ite	11.100	Temperature Compensating Type	V CONTROL TEST INICITION				
		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).				
	oration sistance	Q 30pF and over: Q≥1000 30pF and below: Q≥400+20C C: Nominal Capacitance (pF)		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).				
N		WW	No cracking or marking defects should occur.	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig. 2 using a eutectic solder.  Then apply a force in the direction shown in Fig. 3.  The soldering should be done by the reflow method and shoul				
12 D€	2 Deflection		\$4.5	be conducted with care so that the soldering is uniform and free of defects such as heat shock.  20 50 Pressurizing speed: 1.0mm/sec. Pressurize				
OM.TW COM.TW			Type a b c GJM03 0.3 0.9 0.3 GJM15 0.4 1.5 0.5  Fig. 2	Capacitance meter 45 45 (in mm)  Fig. 3				
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° or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C				
00.2 00.3	V.CC	MIT	The measured and observed characteristics should satisfy specifications in the following table.	the WWW.com.				
$I_{0\alpha}$	_1 (	Appearance	No marking defects	MAN. TO COM. TAN				
	_ // // //	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	Preheat the capacitor at 120 to 150℃ for 1 minute.  Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu				
	· · · · ·	Q ON	30pF and over: Q≧1000 30pF and below: Q≥400+20C C: Nominal Capacitance (pF)	solder solution at 270±5°C for 10±0.5 seconds.  Let sit at room temperature for 24±2 hours.				
	- 100	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$ · F (Whichever is smaller)	TON WWW. TOOK. COM. TV				
	Dielectric		No failure	M.TW WWW.100Y.COM.T				
14/	vv vvi.1	100 Y.C	The measured and observed characteristics should satisfy specifications in the following table.	ON TO THE TWW. TO COM.				
	Resistance to Soldering Heat	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				
W		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	according to the four heat treatments listed in the following table  Let sit for 24±2 hours at room temperature, then measure.				
		M - 2 00	30pF and over: Q≧1000	Step 1 2 3 4				
	WW	Q	30pF and below: Q≧400+20C C: Nominal Capacitance (pF)	Temp. (°C) Min. Operating Room Temp. ±3 Temp. Temp.				
	VV	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$ · F (Whichever is smaller)	Time (min.) 30±3 2 to 3 30±3 2 to 3				
	W	Dielectric Strength	No failure	ON COW! TAN MAMY TOO				
		NWW	The measured and observed characteristics should satisfy specifications in the following table.	the				
		Appearance	No marking defects	MY.COM				
	ımidity, eady	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Let the capacitor sit at 40±2°C and 90 to 95% humidity for 500±12 hours.				
Sta	, I	Q W	30pF and below: Q≥350 10pF and over, 30pF and below: Q≥275+ ½ C 10pF and below: Q≥200+10C C: Nominal Capacitance (pF)	Remove and let sit for 24±2 hours (temperature compensatin type) at room temperature, then measure.				
		I.R.	More than $10,000M\Omega$ or $500\Omega \cdot F$ (Whichever is smaller)					

#### **GJM Series Specifications and Test Methods(1)**

No.	Ite	em (	Specifications	Test Method
	Wire	M.r.	Temperature Compensating Type	TW
	MW.10		The measured and observed characteristics should satisfy the specifications in the following table.	COM.
	Appearance		No marking defects	A COM.
17	Humidity Load	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	Apply the rated voltage at 40±2°C and 90 to 95% humidity fo 500±12 hours.  Remove and let sit for 24±2 hours at room temperature, there
	Loud	Q	30pF and over: Q≥200 30pF and below: Q≥100+½ C C: Nominal Capacitance (pF)	measure. The charge/discharge current is less than 50mA.
N		I.R.	More than $500M\Omega$ or $25\Omega \cdot F$ (Whichever is smaller)	100Y. OM.TW
N	N W		The measured and observed characteristics should satisfy the specifications in the following table.	100Y.CON.TW
		Appearance	No marking defects	1007.00
18	High Temperature	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours (temperature compensating type) at room temperature, then
M	Load	Q	30pF and over: Q≥350 10pF and over, 30pF and below: Q≥275+ ½ C 10pF and below: Q≥200+10C C: Nominal Capacitance (pF)	measure.  The charge/discharge current is less than 50mA.
()		I.R.	More than 1,000M $\Omega$ or 50 $\Omega$ · F (Whichever is smaller)	TW TOOK CONTEN
19	ESR		0.1pF≤C≤1pF: $350m\Omega \cdot pF$ below 1pF <c≤5pf: <math="">300m\Omega below 5pF<c≤10pf: <math="">250m\Omega below</c≤10pf:></c≤5pf:>	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<="" td=""><td>The ESR should be measured at room temperature, and frequency 500±50MHz with the equivalent of HP8753B.</td></c≦33pf:>	The ESR should be measured at room temperature, and frequency 500±50MHz with the equivalent of HP8753B.

# Table A

Гable A 1)							
-1 CON	4 0 m x1	NW.	Cap	acitance Chang	e from 25℃ Value	(%)	TV
Char. Code	Temp. Coeff. (ppm/°C) *1	100 -5	5℃	— <u>:</u>	30℃		10℃
· r CO	(ppiii/ c) · i	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

<sup>\*1:</sup> Nominal values denote the temperature coefficient within a range of 25 to 125°C.

2C         0±60         0.82         -0.45         0.49         -0.27         0.33         -0.1           3C         0±120         1.37         -0.90         0.82         -0.54         0.55         -0.3           4C         0±250         2.56         -1.88         1.54         -1.13         1.02         -0.7			Capacitance Change from 20°C Value (%)						
Max.         Min.         Max.         Min.         Max.         Min.         Max.         Min.           2C         0±60         0.82         -0.45         0.49         -0.27         0.33         -0.7           3C         0±120         1.37         -0.90         0.82         -0.54         0.55         -0.3	Char.		-55°C -25°C			5℃	-10℃		
3C         0±120         1.37         -0.90         0.82         -0.54         0.55         -0.3           4C         0±250         2.56         -1.88         1.54         -1.13         1.02         -0.7	1003	(ppin/ c) · 2	Max.	Min.	Max.	Min.	Max.	Min.	
4C 0±250 2.56 -1.88 1.54 -1.13 1.02 -0.7	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	
ominal values denote the temperature coefficient within a range of 20 to 125℃.	4C	0±250	2.56	-1.88	1.54	-1.13	1.02	-0.75	
					1.54	-1.13	1.02	√ ()-0.1	

<sup>\*2:</sup> Nominal values denote the temperature coefficient within a range of 20 to 125°C. WWW.100Y.COM.TW

# **Chip Monolithic Ceramic Capacitors**

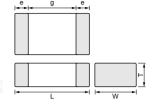


#### **High Frequency GQM Series**

#### ■ Features

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





#### ■ Applications

High frequency circuit (Mobile telecommunication, etc.)

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

Part Number		1 100 X . C	GQM18	W 1 100)	GC	QM21
L x W [EIA]		WWW.	1.6x0.8 [0603]	WWW.	2.0x1.2	25 [0805]
Rated Volt.		250 ( <b>2E</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )
тс		C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )
Capacitance, Ca	pacitance	Tolerance and T Dimensi	on .	NW.	1007.	IN
0.10pF( <b>R10</b> )	В	0.7 <b>(7</b> )	-21 COM.	WW.	· r COM	TW .
0.20pF( <b>R20</b> )	В	0.7( <b>7</b> )	01. W.I.		N.100	1.1
0.30pF( <b>R30</b> )	B, C	0.7( <b>7</b> )	ODY.CO	W WW	11007	WELL
0.40pF( <b>R40</b> )	B, C	0.7( <b>7</b> )	ST CONT.	ALC: NO.	W. CO	
0.50pF( <b>R50</b> )	B, C	0.7( <b>7</b> )	0.8(8)	I. A.	0.85 <b>(9)</b>	M.,
0.75pF( <b>R75</b> )	B, C	0.7( <b>7</b> )	0.8(8)	TV VI	0.85 <b>(9)</b>	WILL
1.0pF( <b>1R0</b> )	B, C	0.7( <b>7</b> )	0.8(8)	- 3	0.85( <b>9</b> )	Ohr.
1.1pF( <b>1R1</b> )	B, C	0.7( <b>7</b> )	0.8(8)	VII.	0.85 <b>(9)</b>	CON.
1.2pF( <b>1R2</b> )	В, С	0.7(7)	0.8(8)	W	0.85( <b>9</b> )	. TIN
1.3pF( <b>1R3</b> )	B, C	0.7( <b>7</b> )	0.8(8)		0.85( <b>9</b> )	COM.
1.5pF( <b>1R5</b> )	B, C	0.7( <b>7</b> )	0.8(8)	MITW	0.85( <b>9</b> )	. TOM.I
1.6pF( <b>1R6</b> )	B, C	0.7( <b>7</b> )	0.8(8)	, TW	0.85( <b>9</b> )	Y.Co
1.8pF( <b>1R8</b> )	B, C	0.7( <b>7</b> )	0.8(8)	COM.	0.85( <b>9</b> )	-7 CONI
2.0pF( <b>2R0</b> )	B, C	0.7( <b>7</b> )	0.8(8)	MITH	0.85( <b>9</b> )	10x. 2011.1
2.2pF( <b>2R2</b> )	B, C	0.7( <b>7</b> )	0.8(8)	COPY	0.85( <b>9</b> )	MY.CO
2.4pF( <b>2R4</b> )	В, С	0.7( <b>7</b> )	0.8(8)	COM	0.85( <b>9</b> )	Too ST CONT
2.7pF( <b>2R7</b> )	B, C	0.7( <b>7</b> )	0.8(8)	Y.C.	0.85( <b>9</b> )	1001.
3.0pF( <b>3R0</b> )	B, C	0.7( <b>7</b> )	0.8(8)	ON COM	0.85( <b>9</b> )	. ON CO
3.3pF( <b>3R3</b> )	B, C	0.7( <b>7</b> )	0.8(8)	COM.	0.85( <b>9</b> )	N.100
3.6pF( <b>3R6</b> )	B, C	0.7( <b>7</b> )	0.8(8)	00Y.	0.85( <b>9</b> )	-1100Y
3.9pF( <b>3R9</b> )	B, C	0.7( <b>7</b> )	0.8(8)	of CON	0.85(9)	M. C.
4.0pF( <b>4R0</b> )	B, C	0.7( <b>7</b> )	0.8(8)	100 . COM.	0.85 <b>(9)</b>	V. 100
4.3pF( <b>4R3</b> )	В, С	0.7( <b>7</b> )	0.8(8)	-100X.	0.85( <b>9</b> )	100X.
4.7pF( <b>4R7</b> )	B, C	0.7(7)	0.8(8)	N. LODA	0.85(9)	WW.
5.0pF( <b>5R0</b> )	B, C	0.7( <b>7</b> )	0.8(8)	W.100 CON	0.85( <b>9</b> )	
5.1pF( <b>5R1</b> )	C, D	0.7(7)	0.8(8)	1007.00	0.85( <b>9</b> )	
5.6pF( <b>5R6</b> )	C, D	0.7(7)	0.8(8)	MM·IO	0.85(9)	
6.0pF( <b>6R0</b> )	C, D	0.7(7)	0.8(8)	1001.	0.85(9)	
6.2pF( <b>6R2</b> )	C, D	0.7(7)	0.8(8)		0.85 <b>(9)</b>	
6.8pF( <b>6R8</b> )	C, D	0.7(7)	0.8(8)		0.85(9)	
7.0pF( <b>7R0</b> )	C, D	0.7(7)		0.8(8)	0.85(9)	

The part numbering code is shown in ().

08.9.1

Continued from the preceding page.

Part Number	-7 (	Olyr.	GQM18	V CUIT	GQI	
L x W [EIA]	01.	-OM.TV	1.6x0.8 [0603]	COM	2.0x1.2	5 [0805]
Rated Volt.	00Y.	250 ( <b>2E</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )
тс	100)	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C00 ( <b>5C</b>
Capacitance, Ca	pacitanc	e Tolerance and T Dime	nsion	To COM	-33	
7.5pF( <b>7R5</b> )	C, D	0.7( <b>7</b> )	N. T.	0.8(8)	0.85( <b>9</b> )	
8.0pF( <b>8R0</b> )	C, D	0.7( <b>7</b> )	I WW	0.8(8)	0.85(9)	
8.2pF( <b>8R2</b> )	C, D	0.7( <b>7</b> )	-1	0.8(8)	0.85( <b>9</b> )	
9.0pF( <b>9R0</b> )	C, D	0.7( <b>7</b> )		0.8(8)	0.85( <b>9</b> )	
9.1pF( <b>9R1</b> )	C, D	0.7( <b>7</b> )	rw w	0.8(8)	0.85( <b>9</b> )	
10pF( <b>100</b> )	G, J	0.7(7)		0.8(8)	0.85( <b>9</b> )	
11pF( <b>110</b> )	G, J	0.7(7)	TW	0.8(8)	0.85( <b>9</b> )	
12pF( <b>120</b> )	G, J	0.7(7)		0.8(8)	0.85( <b>9</b> )	
13pF( <b>130</b> )	G, J	0.7(7)	1.1	0.8(8)	0.85( <b>9</b> )	
15pF( <b>150</b> )	G, J	0.7( <b>7</b> )	TIN	0.8(8)	0.85( <b>9</b> )	
16pF( <b>160</b> )	G, J	0.7(7)	) No.	0.8(8)	0.85( <b>9</b> )	
18pF( <b>180</b> )	G, J	0.7( <b>7</b> )	OWIT	0.8(8)	0.85( <b>9</b> )	
20pF( <b>200</b> )	G, J ◀	0.7( <b>7</b> )	WILL	0.8(8)	Y.O. TIN	0.85(
22pF( <b>220</b> )	G, J	0.7(7)	COMP	0.8(8)	ON COM	0.85(
24pF( <b>240</b> )	G, J	0.7 <b>(7</b> )	COM:	0.8(8)	COM	0.85(
27pF( <b>270</b> )	G, J	0.7( <b>7</b> )	.Co	0.8(8)	001.	0.85(
30pF( <b>300</b> )	G, J	0.7(7)	COM.	0.8(8)	CO CO	0.85(
33pF( <b>330</b> )	G, J	0.7( <b>7</b> )	J. CONT.	0.8(8)	Jan , COM.,	0.85(
36pF( <b>360</b> )	G, J	0.7( <b>7</b> )	OY.CO	0.8(8)	1007.	0.85(
39pF( <b>390</b> )	G, J	0.7( <b>7</b> )	COM	0.8(8)	V. P. COM	0.85(
43pF( <b>430</b> )	G, J	0.7 <b>(7</b> )	001. UM'I	0.8(8)	W.100 . CON	0.85(
47pF( <b>470</b> )	G, J	0.7 <b>(7</b> )	1007.00	0.8(8)	11007.0	0.85(
51pF( <b>510</b> )	G, J	William	· Too ST COM.	0.8(8)	MAN CO	0.85(
56pF( <b>560</b> )	G, J	W.	V 1007.	0.8(8)	-11V.10V	0.85(
62pF( <b>620</b> )	G, J	N WW	L. Co.	0.8(8)	M. 1001.	0.85(
68pF( <b>680</b> )	G, J	-1	W.IV TCO	0.8(8)	WWW.I	0.85(
75pF( <b>750</b> )	G, J		1007	0.8( <b>8</b> )	11001	0.85(
82pF( <b>820</b> )	G, J	TW W	N W. CC	0.8(8)	MM. TOUX	0.85(
91pF( <b>910</b> )	G, J		W.In	0.8(8)		0.85(
100pF( <b>101</b> )	G, J	TW V	1100 X-	0.8(8)	100	0.85(

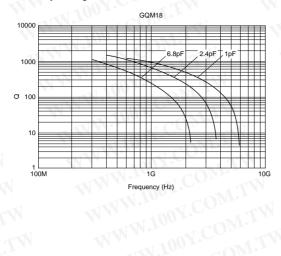
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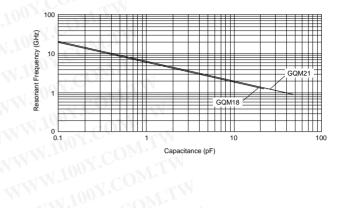
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#### **GQM Series Data**

#### Q - Frequency Characteristics



#### ■ Resonant Frequency - Capacitance



6

#### **GQM Series Specifications and Test Methods**

О.	ite	m	Specifications	Y.CU. TVI	Test Me	ethod			
	Operating Temperatu	ire	−55 to 125°C	Reference Tempera	ture: 25℃				
Rated Voltage  Appearance		d Voltage See the previous page.		may be applied cont When AC voltage is	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor.  When AC voltage is superimposed on DC voltage, V <sup>p-p</sup> or V <sup>o</sup> whichever is larger, should be maintained within the rated voltage range.				
3 .	Appearar	ice	No defects or abnormalities	Visual inspection	**				
	Dimensio	n	Within the specified dimensions	Using calipers					
Ī	Dielectric Strength		No defects or abnormalities	is applied between t	No failure should be observed when 300%* of t is applied between the terminations for 1 to 5 se provided the charge/discharge current is less the		econds,		
T.	Insulation	Resistance	More than 10,000M $\Omega$ (Whichever is smaller)	The insulation resist voltage not exceedir max. and within 2 m	ng the rated v	oltage at 25℃			
	Capacitance		Within the specified tolerance	The capacitance/Q strequency and voltage			at the		
N	7		30pF min.: Q≥1400 30pF max.: Q≥800+20C	Frequency	ON	1±0.1MHz			
	Q TV		W. 1007.	Voltage		0.5 to 5Vrm			
	1.	J	C: Nominal Capacitance (pF)	Janago	Tu.	2.5 .5 0 7 1111	<u> </u>		
Ó	M.T.	Capacitance Change	Within the specified tolerance (Table A)	measured in step 3	coefficient is determined using the cap 3 as a reference. temperature sequentially from step 1				
3(	OW:	Temperature Coefficient	Within the specified tolerance (Table A)	the capacitance shows temperature coefficients	uld be within ent and capac	the specified to citance change	lerance for the as in Table A.		
	Capacitance Temperature		WWW.100Y.COM.TW	between the maximu	t is calculated by dividing the difference im and minimum measured values in the he capacitance value in step 3.				
- 1	Characteristics	$V_{i,f,f,f}$		Step		emperature (°	4 1		
1	Y.CO	Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	1111	Reference Temp. ±2				
	-1 C	Dilit	(Whitehever is larger)	2	OIE!	-55±3	10		
0	Di.		M. M. 100 J. COM: J	3 4	Re	ference Temp. 125±3	±2		
	O.Y.C		LM MM 100X.CO	5	Re	ference Temp.	±2		
-117	- < 7	$c_{O_{M_1}}$	Mark I and A State of the Control of	ur. Solder the capacitor	444	A CU			
	Adhesive Strength				Fig. 1 using a eutectic solder. Then apply 10N* force in paralliwith 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 (GQN)				
1	of Termin	allon		Туре	а	b	C		
				GQM18	1.0	3.0	1.2		
			Solder resist  Baked electrode copper foil	GQM21	1.2 Fig.	1	1.65 (in mm)		
	WW	Appearance	No defects or abnormalities	Solder the capacitor	to the test jig	g (glass epoxy	board) in the		
	-111	Capacitance	Within the specified tolerance	same manner and u	nder the sam	e conditions a	s (10).		
	/ibration Resistance	Q	30pF min.: Q≥1400 30pF max.: Q≥800+20C C: Nominal Capacitance (pF)	having a total amplit uniformly between the frequency range, from the traversed in appropriate the straversed in approximate t	The capacitor should be subjected to a simple harm having a total amplitude of 1.5mm, the frequency be uniformly between the approximate limits of 10 and frequency range, from 10 to 55Hz and return to 10H be traversed in approximately 1 minute.  This motion should be applied for a period of 2 hours.				
		WW	N.100X.COM.TW WW	N. L. CO		ontinued on the			



WWW.100Y.COM.TW

#### **GQM Series Specifications and Test Methods**

Continued from the preceding page Specifications No Item Test Method Solder the capacitor on the test jig (glass epoxy board) shown No crack or marked defect should occur. 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. 50 Pressurizing speed : 1.0mm/sec. Pressurize Deflection 100 t: 1.6mm Flexure : ≤1 Type a h С GQM18 1.0 3.0 1.2 GQM21 4.0 1.65 45 (in mm) Fig. 2 Fig. 3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at Solderability of 75% of the terminations are to be soldered evenly 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in and continuously. Termination 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. The measured and observed characteristics should satisfy the specifications in the following table. No marking defects Appearance Capacitance Within  $\pm 2.5\%$  or  $\pm 0.25$  pF (Whichever is larger) Change Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the Resistance capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution 30pF min.: Q≥1400 to Soldering at 270 $\pm5$ °C for 10 $\pm$ 0.5 seconds. Let sit at room temperature for 30pF max.: Q≥800+20C Heat Q 24±2 hours. C: Nominal Capacitance (pF) I.R. More than  $10,000M\Omega$ Dielectric No failure Strength 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.

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

	M.M.T.	ON.C	C: Nominal Capacitance (pF)
	WW.	I.R.	More than 10,000M $\Omega$
7	NW	Dielectric Strength	No failure
	WW	N.100	The measured and observed characteristics should satisfy the specifications in the following table.
		Appearance	No marking defects
	Humidity	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)
16	Steady State	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 1,000M $\Omega$

Appearance

Capacitance

Change

Q

Temperature

15 Cycle No marking defects

(Whichever is larger)

30pF min.: Q≥1400

Within  $\pm 2.5\%$  or  $\pm 0.25$ pF

30pF max.: Q≥800+20C

Let the capacitor sit at 40±2°C and 90 to 95% humidity for

Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.

Continued on the following page.





sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

#### **GQM Series Specifications and Test Methods**

Continued from the preceding page.

No.	Ite	em	Specifications	Test Method
	WW	W.100	The measured and observed characteristics should satisfy the specifications in the following table.	OMITW
	- 11	Appearance	No marking defects	COM
17	Humidity	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room
ı,	Load	Q	30pF min.: Q≧200 30pF max.: Q≥100+10C/3 C: Nominal Capacitance (pF)	temperature then measure. The charge/discharge current is less than 50mA.
		I.R.	More than 500M $\Omega$	ON.
	J		The measured and observed characteristics should satisfy the specifications in the following table.	TOON COM.
	High	Appearance	No marking defects	·Jos. COM.
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C.
18	Temperature Load	ad 10pF an 10pF ma	30pF min.: Q≥350 10pF and over, 30pF and below: Q≥275+5C/2 10pF max.: Q≥200+10C C: Nominal Capacitance (pF)	Let sit for 24±2 hours (temperature compensating type) room temperature, then measure.  The charge/discharge current is less than 50mA.
	NI.	I.R.	More than 1,000M $\Omega$	WT TOOY.CO

COM.	Nominal Values		1.1	Capacitance Cha	nge from 25℃ (%	)OM.	
Char.	(ppm/°C) *1	-5	55°C	—3	10°C	<u>-1</u>	10℃
COM	(ppin/c) 1	Max.	Min.	Max.	Min.	Max.	Min.
5C	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.1

<sup>\*1:</sup> Nominal values denote the temperature coefficient within a range of 25 to 125°C. WWW.100 WWW.100Y.COM

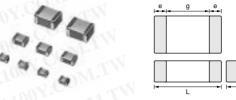
# **Chip Monolithic Ceramic Capacitors**



#### **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.



Part Number	COh	Dimen	sions (mm)		
Part Number	Mdo	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

#### ■ Applications

High frequency and high-power circuits

Part Number		ERB18		ERB21	N	ERB32					
L x W [EIA]		1.6x0.8 [0603]	2	.0x1.25 [080	5]	3.2x2.5 [1210]					
Rated Volt.	250 250 100 50 500 (2E) (2A) (1H) (2H) (YD)	250 ( <b>2E</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )							
тс	N	C0G ( <b>5C</b> )	COG (5C)	COG COG ( <b>5C</b> )	C0G ( <b>5C</b> )						
Capacitance, C	apacitano	ce Tolerance ar	nd T Dimensi	on C	T. T.	47	MW.F	ON CO	TW.		
0.50pF( <b>R50</b> )	B, C	0.9(8)	1.35( <b>B</b> )	01.	W.T.	N.	- TVI.1	10 1	Mil		
0.75pF( <b>R75</b> )	B, C	0.9(8)	1.35( <b>B</b> )	MY.C		1		001	TIM		
1.0pF( <b>1R0</b> )	B, C	0.9(8)	1.35( <b>B</b> )	×1 C	Dir			N/C	Ohr.	(	
1.1pF( <b>1R1</b> )	B, C	0.9(8)	1.35( <b>B</b> )	1001.	OM.T.		111	700 -	OWIT		
1.2pF( <b>1R2</b> )	B, C	0.9(8)	1.35( <b>B</b> )	. NOV.	O. T.	N	MAN	1007	TI	11	
1.3pF( <b>1R3</b> )	B, C	0.9(8)	1.35( <b>B</b> )	1.Ing	COMP.	-1		1.10	COM.	- NA	
1.5pF( <b>1R5</b> )	B, C	0.9(8)	1.35( <b>B</b> )	1 100 X	· oM.			W.100	MOD		
1.6pF( <b>1R6</b> )	В, С	0.9(8)	1.35( <b>B</b> )	14.	(Co.	TW	W	100	V.C	TW	
1.8pF( <b>1R8</b> )	B, C	0.9(8)	1.35( <b>B</b> )	M. Inc	-1 CON	- 1	- 411	MN.To	47 CON	-XXI	
2.0pF( <b>2R0</b> )	B, C	0.9(8)	1.35( <b>B</b> )	110	17.0	1.77		11/10	101	1.7	
2.2pF( <b>2R2</b> )	B, C	0.9(8)	1.35( <b>B</b> )	M.M.	V.Co.	TW	V	M. A.	MY.CO	W	
2.4pF( <b>2R4</b> )	B, C	0.9(8)	1.35( <b>B</b> )	T.W.T	100	M			- 1 CC	Mi.	
2.7pF( <b>2R7</b> )	B, C	0.9(8)	1.35( <b>B</b> )		1001	TIME		11 1.	100 x.	ON'TY	
3.0pF( <b>3R0</b> )	B, C	0.9(8)	1.35( <b>B</b> )	THE WAY	OV.C	Oh.	1	WWW	LOOY.C		
3.3pF( <b>3R3</b> )	В, С	0.9(8)	1.35( <b>B</b> )	-111	700	1.7( <b>Q</b> )	.«1	TIN	1.100	$CO_{Mr}$ .	
3.6pF( <b>3R6</b> )	B, C	0.9(8)	1.35( <b>B</b> )	MAN	-1100X.	1.7( <b>Q</b> )		1/1/1/	1 100 x.	-oW.	
3.9pF( <b>3R9</b> )	B, C	0.9(8)	1.35( <b>B</b> )	WIN	N.F	1.7( <b>Q</b> )		WW	11.	Co	
4.0pF( <b>4R0</b> )	B, C	0.9(8)	1.35( <b>B</b> )		W.100	1.7( <b>Q</b> )		- 1	M.In.	COM	
4.3pF( <b>4R3</b> )	B, C	0.9(8)	1.35( <b>B</b> )		100	1.7( <b>Q</b> )	TW		100	1.0	
4.7pF( <b>4R7</b> )	B, C	0.9(8)	1.35( <b>B</b> )	*XI	M	1.7( <b>Q</b> )		11	WW.	M.Co.	
5.0pF( <b>5R0</b> )	B, C	0.9(8)	1.35( <b>B</b> )	11	10	1.7( <b>Q</b> )	Mil		TAIN.II	-1 (0	
5.1pF( <b>5R1</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	V		1.7( <b>Q</b> )	WILL	1	11	001.	
5.6pF( <b>5R6</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )			1.7( <b>Q</b> )	Diagram				
6.0pF( <b>6R0</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )		-177	1.7( <b>Q</b> )	W.				
6.2pF( <b>6R2</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )		M	1.7( <b>Q</b> )					
6.8pF( <b>6R8</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	- 1		1.7( <b>Q</b> )	$CO_{Mr}$				
7.0pF( <b>7R0</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	14		1.7( <b>Q</b> )					
7.5pF( <b>7R5</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	TW	WW	1.7( <b>Q</b> )					
8.0pF( <b>8R0</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	-31		1.7( <b>Q</b> )					
8.2pF( <b>8R2</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	11/1		1.7( <b>Q</b> )					

The part numbering code is shown in ().

Continued from the preceding page.

Part Number	C	ERB18	<u> </u>	ERB21	- ANA		N.	ERB32		-
L x W [EIA]	00 7.	1.6x0.8 [0603]		2.0x1.25 [0805	5] 1	COM-1	1	3.2x2.5 [1210]		1
Rated Volt.	100X	250 ( <b>2E</b> )	250 ( <b>2E</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )	500 ( <b>2H</b> )	300 ( <b>YD</b> )	250 ( <b>2E</b> )	100 ( <b>2A</b> )	50 ( <b>1H</b> )
гс		C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )	C0G ( <b>5C</b> )
Capacitance, Ca	apacitan	ce Tolerance a	nd T Dimens	ion	MM.In		NI.			
9.0pF( <b>9R0</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )		1	1.7( <b>Q</b> )	M.J.			
9.1pF( <b>9R1</b> )	B, C, D	0.9(8)	1.35( <b>B</b> )	1	MM	1.7( <b>Q</b> )	WILL			
10pF( <b>100</b> )	G, J	0.9(8)	1.35( <b>B</b> )	ſ		1.7( <b>Q</b> )	OMr.	(I		
11pF( <b>110</b> )	G, J	0.9(8)	1.35( <b>B</b> )		111	1.7( <b>Q</b> )	$-0$ $M_{\odot}$ $^{-1}$	`		
12pF( <b>120</b> )	G, J	0.9(8)	1.35( <b>B</b> )	N		1.7( <b>Q</b> )	1	N		
13pF( <b>130</b> )	G, J	0.9(8)	1.35( <b>B</b> )	ATT.		1.7( <b>Q</b> )	COM			
15pF( <b>150</b> )	G, J	0.9(8)	1.35( <b>B</b> )			1.7( <b>Q</b> )	Loo			
16pF( <b>160</b> )	G, J	0.9(8)	1.35( <b>B</b> )	TV		1.7( <b>Q</b> )	V.			
18pF( <b>180</b> )	G, J	0.9(8)	1.35( <b>B</b> )	-311		1.7( <b>Q</b> )	CON			
20pF( <b>200</b> )	G, J	0.9(8)	1.35( <b>B</b> )	17.11	N1	1.7( <b>Q</b> )	01	1.1		
22pF( <b>220</b> )	G, J	0.9(8)	1.35( <b>B</b> )	WP		1.7( <b>Q</b> )	101.0			
24pF( <b>240</b> )	G, J	0.9(8)	1.35( <b>B</b> )	Mr.		1.7( <b>Q</b> )	C C	) IAT.		
27pF( <b>270</b> )	G, J	0.9(8)	1.35( <b>B</b> )	MITT		1.7( <b>Q</b> )	100 2.	OM	-1	
30pF( <b>300</b> )	G, J	0.9(8)	1.35( <b>B</b> )			1.7( <b>Q</b> )	11001.			
33pF( <b>330</b> )	G, J	0.9(8)	1.35( <b>B</b> )	OM	CN CN	1.7( <b>Q</b> )	1.1	COMP.	NA .	
36pF( <b>360</b> )	G, J	0.9(8)	1.35( <b>B</b> )	COM.		1.7( <b>Q</b> )	1100 1.	COM	-1	
39pF( <b>390</b> )	G, J	0.9(8)	1.35( <b>B</b> )	CO	TVI	1.7( <b>Q</b> )	1100			
43pF( <b>430</b> )	G, J	0.9(8)	1.35( <b>B</b> )	of COM		1.7( <b>Q</b> )		A.COM		
47pF( <b>470</b> )	G, J	0.9(8)	1.35( <b>B</b> )	7.0		1.7( <b>Q</b> )	100			
51pF( <b>510</b> )	G, J	0.9(8)	1.35( <b>B</b> )	M.Co.		1.7( <b>Q</b> )	11	OX	T	
56pF( <b>560</b> )	G, J	0.9(8)	1.35( <b>B</b> )	×1 CO	11.2	1.7( <b>Q</b> )		CO	Mr.	
62pF( <b>620</b> ) 68pF( <b>680</b> )	G, J	0.9(8)	1.35( <b>B</b> )	007.		1.7( <b>Q</b> )	- 1 ( N )	00 1.	M. T.	4
75pF( <b>750</b> )	G, J	0.9( <b>8</b> ) 0.9( <b>8</b> )	1.35( <b>B</b> )	A ON Y.C.	) × ( 1 V	1.7( <b>Q</b> ) 1.7( <b>Q</b> )	MW.	1001.0		\
82pF( <b>820</b> )	G, J	0.9(8)	1.35( <b>B</b> )	<u> </u>	OM:	1.7( <b>Q</b> )		.10	OM	N
91pF( <b>910</b> )	G, J	0.9(8)	1.35( <b>B</b> )	1 100 1.		1.7( <b>Q</b> )		1.100	CONT	-7
100pF( <b>101</b> )	G, J	0.9(8)	1.35( <b>B</b> )	1007	COP	1.7( <b>Q</b> )	THE STATE OF THE S	11003	- 11	
	JAN:	0.7(0)	1.33( <b>b</b> )	1 25/ <b>P</b> )	TON.		-31/1	41.10	1 COM.	
110pF( <b>111</b> ) 120pF( <b>121</b> )	G, J	I.M.	1/1/1/	1.35( <b>B</b> ) 1.35( <b>B</b> )		1.7( <b>Q</b> ) 1.7( <b>Q</b> )		-1XV-100	COM	
130pF( <b>131</b> )	G, J	W	W	1.35( <b>B</b> )	A.Co.	1.7(%)	1.7( <b>Q</b> )	-110	N. Co	
150pF( <b>151</b> )	G, J	- 41		1.33( <b>B</b> )	1.35( <b>B</b> )	1. ×	1.7( <b>Q</b> )	WW	CO	17.
160pF( <b>161</b> )	G, J	11.5		- AN 1	1.35( <b>B</b> )	M.T.Y.	1.7(4)	1.7( <b>Q</b> )	<del>m.</del> ~(	W.
180pF( <b>181</b> )	G, J	TW	4	MAN	1.55(2)	TW		1.7( <b>Q</b> )	1001.	T10-
200pF( <b>201</b> )	G, J	DM-,			-<1 C	OW.	N	1.7( <b>Q</b> )	- NV.C	Ohr.
220pF( <b>221</b> )	G, J			1	100	· M.T.		1.7( <b>Q</b> )	100 1	OM
240pF( <b>241</b> )	G, J		N		- 100X	11	N .		1.7( <b>Q</b> )	- 11
270pF( <b>271</b> )	G, J	COMP.			N.340	COpp.	-XX	- TIN	1.7( <b>Q</b> )	COM
300pF( <b>301</b> )	G, J		11/1	1111	XX 1003	Mod			1.7( <b>Q</b> )	- c0
330pF( <b>331</b> )	G, J	(CO)	TW	W	400	Y.CO	TW	W	1.7( <b>Q</b> )	1.0
360pF( <b>361</b> )	G, J	COM	- 1	- 11	NN.1	41 CON	TXN.	- T	1.7( <b>Q</b> )	V.C
390pF( <b>391</b> )	G, J	0.7	1.11	1	10	03.	VI.		1.7( <b>Q</b> )	0
430pF( <b>431</b> )	G, J	ON CO	W	V		MY.CO	WTI		1.7( <b>Q</b> )	001.
470pF( <b>471</b> )	G, J	7.00	Mir			~ C	DIAT.		1.7( <b>Q</b> )	
510pF( <b>511</b> )	G, J	1001.	MIL		1	100 1.	W.T.		77	1.7( <b>Q</b> )
560pF( <b>561</b> )	G, J	CONV.C	Or TI	V	MAN	JONY.	171	N		1.7( <b>Q</b> )
620pF( <b>621</b> )	G, J	Jan	OM	- 1		1.10	COMP.			1.7( <b>Q</b> )
680pF( <b>681</b> )	G, J	11 100 Y.	CMA	M	M. A.	N 100 Y				1.7( <b>Q</b> )
750pF( <b>751</b> )	G, J	W.	Com	TV	WW	44				1.7( <b>Q</b> )
820pF( <b>821</b> )	G, J	W.100	COM	- 41						1.7( <b>Q</b> )
910pF( <b>911</b> )	G, J	100	X.	TW						1.7( <b>Q</b> )
1000pF( <b>102</b> )	G, J	MM	N.COR							1.7( <b>Q</b> )

The part numbering code is shown in ().

#### **ERB Series Specifications and Test Methods**

Э.	Ite	em	Specifications	COMME	Test Met	hod	
	Operating Temperati	ure Range	−55 to +125℃	Reference Temperat	ure: 25°C		
	Rated Vo	oltage	See the previous pages.	The rated voltage is may be applied conti When AC voltage is whichever is larger, s voltage range.	nuously to the superimposed	capacitor. on DC volta	ge, V <sup>p.p</sup> or V <sup>o</sup>
	Appearai	nce	No defects or abnormalities	Visual inspection			
	Dimensio	ons	Within the specified dimension	Using calipers	W		
	Dielectric	: Strength	No defects or abnormalities	No failure should be age is applied betwe provided the charge/ (*) 300V: 250%, 500'	en the termina discharge cur	ations for 1 to	5 seconds,
V V	Insulation (I.R.)	Resistance	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°C and standhumidity and within 2 minutes of charging.			
0	Capacita	nce	Within the specified tolerance  C≦ 220pF : Q≥10,000	The capacitance/Q s frequency and voltage	hould be mea	sured at 25℃	at the
	Q		220pF <c≦ 470pf="" 5,000<br="" :="" q≥="">470pF<c≦1,000pf 3,000<br="" :="" q≥="">C: Nominal Capacitance (pF)</c≦1,000pf></c≦>	Frequency 1±0.1MHz Voltage 1±0.2Vrms			
V	M.T.	Capacitance Change	Within the specified tolerance (Table A-6)	The temperature coe capacitance measure the temperature sequence.	ed in step 3 as	a reference.	When cycli
7	Capacitance	Temperature Coefficent	Within the specified tolerance (Table A-6)	capacitance should be temperature coefficient The capacitance drift between the maximum 1, 3 and 5 by the capacitance capacitance drift between the maximum 1, 3 and 5 by the capacitance	ent and capaci t is calculated Im and minimu	tance change by dividing thum measured	e as Table A ne difference
	Temperature Characteristics	W	WWW. OOX.CO. TW	Step		mperature (°	C)
	Onuracionstics	Capacitance	Within ±0.2% or ±0.05pF	1	-<1 C	25±2	-, < XI
		Drift	(Whichever is larger)	2	100 }-	-55±3	
		Dir	A COM.	3	- N	25±2	
		Time	M. 1001. CONT.	4	N.100	125±3	-1
		On	TW WY TOOY. CO. TV	5	100	25±2	TW
	Adhesive	· Strength	No removal of the terminations or other defects should occur.	Solder the capacitor in Fig. 1 using an eur Then apply 10N* forc The soldering should reflow method and significant soldering is uniform a	tectic solder. ce in parallel v I be done eithe hould be cond	vith the test ji er with an irou ucted with ca	g for 10±1s n or using the are so that t
	of Termir	701		Туре	а	b	С
			VA VA VA VA VA Solder Resist	ERB18	1.0	3.0	1.2
			Solder Resist  Baked Electrode or	ERB21	1.2	4.0	1.65
			Fig.1 Copper Foil	ERB32	2.2	5.0	2.9 (in mm) 5N (ERB18
	NV	-100	CONTRACTOR OF THE PROPERTY OF	WI:MO	Cor	tinued on the	1
							0

Continued on the following page. WWW.100Y.COM.TW



#### **ERB Series Specifications and Test Methods**

Continued from the preceding page

Vo.	Ite	em	Specification	ons	WT	Test Met	hod		
	- TAI	Appearance	No defects or abnormalities	M. Jun	Solder the capacitor	to the test jig (	glass epoxy	board) in the	
	MAN	Capacitance	Within the specified tolerance	M., 100 J.	same manner and ur The capacitor should			` '	
11	Vibration Resistance Q Satisfies the initial value. $C \leq 220 pF : Q \geq 10,000$ $220 pF < C \leq 470 pF : Q \geq 5,000$ $470 pF < C \leq 1,000 pF : Q \geq 3,000$ G: Nominal Capacitance (nF)				having a total amplitude of 1.5mm, the frequency being varie 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 mutuall perpendicular directions (total of 6 hours).				
12	Deflection	MM MM	No crack or marked defect should o	o4.5	Solder the capacitor in Fig. 2a using an et direction shown in Fig. the reflow method an the soldering is uniform.	utectic solder. g. 3a. The sol d should be c	Then apply a lidering should onducted with	a force in the d be done by n care so that	
	()		Flexure : ≦	9	Type	а	b	С	
			Flexure . ≦		ERB18	1.0	3.0	1.2	
			Capacitance meter	a	ERB21	1.2	4.0	1.65	
			45 45	100 t:1.6mm	ERB32	2.2	5.0	2.9	
			Fig.3a	Fig. 2a				(in mm)	

Solderability of 95% of the terminations are to be soldered evenly and Termination continuously.

rosin (25% rosin in weight proportion). Preheat at 80 to 120°C 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℃.

Item Specifications No marked defect Appearance Within  $\pm 2.5\%$  or  $\pm 0.25$ pF Capacitance Resistance Change (Whichever is larger) to Soldering Heat C≦ 220pF : Q≥10,000 220pF<C≦ 470pF : Q≥ 5,000 Ω 470pF<C≦1,000pF : Q≥ 3,000 No failure Dielectric Strength C: Nominal Capacitance (pF)

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.

Chip Size	Preheat Condition
2.0×1.25mm max.	1minute at 120 to 150°C
3.2×2.5mm	Each 1 minute at 100 to 120℃ and then 170 to 200℃
	7 1110

The measured and observed characteristics should satisfy the specifications in the following table.

The measured and observed characteristics should satisfy the

Item	Specifications
Appearance	No marked defect
Capacitance	Within ±5% or ±0.5pF
Change	(Whichever is larger)
	C≧30pF : Q≧350
Q	10pF≦C<30pF : Q≥275+ ½ C
	C<10pF : Q≥200+10C
I.R.	1,000MΩ min.
Dielectric Strength	No failure

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.

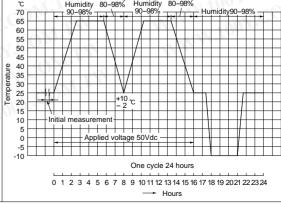
Step	1	2	3	4
Temp. (℃)	Min. Operating Temp. +0/-3	Room Temp.	Max. Operating Temp. +3/-0	Room Temp.
Time (min.)	30±3	5 max.	30±3	5 max.

The measured and observed characteristics should satisfy the

Item	Specifications
Appearance	No marked defect
Capacitance	Within ±5% or ±0.5pF
Change	(Whichever is larger)
001.	C≥30pF : Q≥350
Q	10pF≦C<30pF : Q≥275+ <del>5</del> C
	C<10pF : Q≥200+10C
I.R.	1,000MΩ min.
	C: Nominal Capacitance (p

treatment shown below, 10 consecutive times. Remove, let sit for 24±2 hours at room temperature, and measure.

Apply the 24-hour heat (-10 to +65°C) and humidity (80 to 100%)



C: Nominal Capacitance (pF)

Temperature Cycle

Humidity



#### **ERB Series Specifications and Test Methods**

Continued from the preceding page.

No.	Item	Y.COM.	Specifications	Test Method
	High Temperature Load	The measured and of specifications in the fo	oserved characteristics should satisfy the llowing table.	OME
17		Item Appearance Capacitance Change  Q  I.R.	Within ±5% of ±0.5pr (Whichever is larger) hours at 125±3°C. Remove and let sit for ±0.5pr	Apply 200% (500V only 150%) of the rated voltage for 1,000±12 hours at 125±3°C.  Remove and let sit for 24±2 hours at room temperature, then measure The charge/discharge current is less than 50mA.
		M.Ing CO	C: Nominal Capacitance (pF)	ON COM.

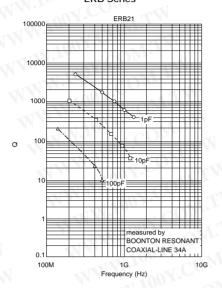
# Table A-6

7.	Nominal Values (ppm/°C) Note 1	Capacitance Change from 25℃ (%)					
Char.		-55		-30		-10	
1.1		Max.	Min.	Max.	Min.	Max.	Min.
5C	0±30	0.58	-0.24	0.40	-0.17	0.25	-0.1

#### **ERB Series Data**

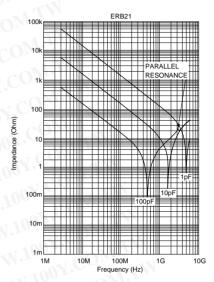
#### ■ Q - Frequency Characteristics

#### **ERB Series**



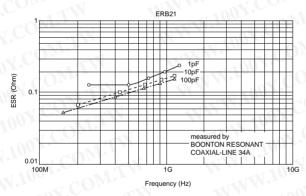
#### ■ Impedance - Frequency Characteristics

#### ERB Series



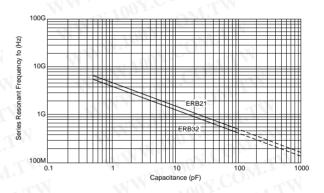
#### **■** ESR - Frequency Characteristics

#### **ERB Series**

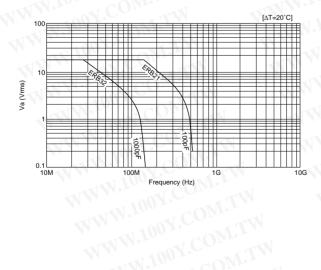


#### ■ Resonant Frequency - Capacitance

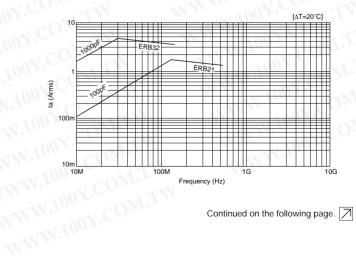
**ERB Series** 



#### ■ Allowable Voltage - Frequency



#### ■ Allowable Current - Frequency



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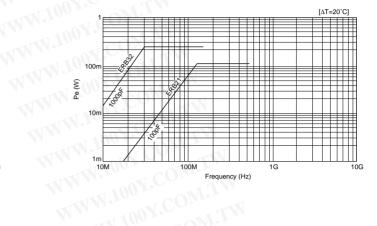
#### **ERB Series Data**

Continued from the preceding page

#### ■ Allowable Apparent Power - Frequency

# 100 [AT=20'C] 10 (AT=20'C) 10 (

#### ■ Allowable Effective Power - Frequency





# **Chip Monolithic Ceramic Capacitors**



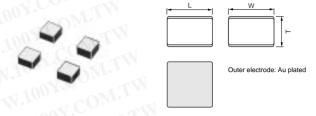
#### **Monolithic Microchip GMA Series**

#### ■ 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)					
Part Number	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			

Part Number GMA0D			GMA05			GMA08				
L x W [EIA]		0.38x0.38 [015015]	0.5x0.5 [0202]			0.8x0.8 [0303]				
Rated Volt.		10 ( <b>1A</b> )	100 ( <b>2A</b> )	25 ( <b>1E</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )	100 ( <b>2A</b> )	25 ( <b>1E</b> )	10 ( <b>1A</b> )	6.3 ( <b>0J</b> )
TC TV		X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X5R ( <b>R6</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X5R ( <b>R6</b> )
Capacitance, Cap	oacitan	ce Tolerance a	nd T Dimensi	on	WT	W	1100	A.C.	TW	,
100pF( <b>101</b> )	М	- 1	0.35( <b>X</b> )	at CON	- XXI	431	M.	COp	W	
150pF( <b>151</b> )	М		0.35( <b>X</b> )	0.7.	1.7	-	-TV.1	00	Mil	
220pF( <b>221</b> )	М	V	0.35( <b>X</b> )	any.Co	WT	1	MAN .	001.	TIT	
330pF( <b>331</b> )	М	1	0.35( <b>X</b> )	×1 C	)Mr.			N.C.	Jins.	ĺ
470pF( <b>471</b> )	M		0.35( <b>X</b> )	1001.	OM.T.		71	700 .	OM	
680pF( <b>681</b> )	М	V	0.35( <b>X</b> )	. May		N	MW	-1007.	TIL	N
1000pF( <b>102</b> )	M	-1	0.35( <b>X</b> )	Too	$CO_{Mr}$ .	1		1.10	$CO_{Mr}$	OXN
1500pF( <b>152</b> )	М	IN	M. A.	0.35( <b>X</b> )	-oM.		0.5( <b>5</b> )	XI.100 x	Mo.	
2200pF( <b>222</b> )	М	TV		0.35( <b>X</b> )	Co	TW	0.5( <b>5</b> )	100	Y.C.	TW
3300pF( <b>332</b> )	M	1.1		0.35( <b>X</b> )	-1 COM	-41	0.5( <b>5</b> )	111.10	47 CON	-31
4700pF( <b>472</b> )	М	TW		0.35( <b>X</b> )	) Y	LIW	0.5( <b>5</b> )	10	11.	1.7
6800pF( <b>682</b> )	M		11	M.M.	0.35( <b>X</b> )	W	0.5( <b>5</b> )		my.Co	WT
10000pF( <b>103</b> )	М	0.3(3)			0.35( <b>X</b> )	Mer		0.5( <b>5</b> )	- ×1 CC	Mr.
15000pF( <b>153</b> )	M	WILL			0.35( <b>X</b> )	TIME		0.5( <b>5</b> )	100 1.	OM.
22000pF( <b>223</b> )	М	$O_{N_{P}}$		WIN.	0.35( <b>X</b> )	Oh.	V.	0.5( <b>5</b> )	ANY.C	T
33000pF( <b>333</b> )	М	OWIT			700	OM	- <b>4</b> 1	TANN	0.5( <b>5</b> )	$CO_{Mr}$ .
47000pF( <b>473</b> )	M	TI	N	Al An	-1100X.	Time		M	0.5 <b>(5</b> )	· M.
68000pF( <b>683</b> )	М	$CO_{Mr.}$	XXI	WIN	11.5	COL	CVV	WW	0.5( <b>5</b> )	Co
0.10μF( <b>104</b> )	M	· Moo		- X	W.100.	0.35*( <b>X</b> )	1		0.5( <b>5</b> )	of COM
0.47μF( <b>474</b> )	M	1.00	TW		100	1.0	TW	1111	100	0.5*( <b>5</b> )

68

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#### **GMA Series Specifications and Test Methods(1)**

Below GMA Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table. In case "\*" is added in capacitance table, please refer to GMA Series Specifications and Test Methods (2) (P.71).

No.	Ite	em	Specifications	Test Method				
1	Operating Temperature R7: -55 to +125°C Range		R7: −55 to +125°C	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 <sup>p-p</sup> or V <sup>c-p</sup> , whichever is larger, should be maintained within the rated voltage range.				
3	Appearai	nce	No defects or abnormalities	Visual inspection				
4	Dimensio		Within the specified dimersions	Using calipers				
5		c 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 10,000M $\Omega$ or 500 $\Omega$ F (Whichever is smaller)	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at normal temperate and humidity and within 2 minutes of charging.				
7	Capacita	nce	Within the specified tolerance	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table.				
8	Dissipation (D.F.)	on Factor	R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	Frequency         1±0.1kHz           Voltage         1±0.2Vrms				
 C.C	OM.T	L <sub>M</sub>	MMM.100X.COW.TM	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.*				
	COS	TW	WW. TOOX.COMITY	Step Temperature (°C)				
9	Capacitance Temperature	No bias	R7: Within +/–15% (–55 to +125°C)	125±2				
7	Characteristics	INO DIAS	R7: Within +/-15% (-55 to +125°C)	2 -55±3				
	V.CO		WWW.TODY.CO.T.TH	3 25±2 4 125±3				
	07.CO	OM.T	M. M.M.W.TOOX'COW'LA	*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	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.				
	Strength	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.				
N	N Ass.	Appearance	No defects or abnormalities	Ramp frequency from 10 to 55Hz then return to 10Hz all within				
11	Vibration	Capacitance	Within the specified tolerance	1 minute. Amplitude: 1.5 mm (0.06 inch) max. total excursion.				
1	Resistance	D.F.	R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).				
	N I	Appearance	No defects or abnormalities	The capacitor should be set for 24±2 hours at room				
	WW	Capacitance Change	R7: Within ±7.5%	temperature after one hour heat of treatment at 150+0/-10°C, then measure for the initial measurement. Fix the capacitor to				
	Temperature	D.F.	R7: W.V.: 25V min.; 0.025 max. W.V.: 16V/10V; 0.035 max.	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				
12	Cycle	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$ F (Whichever is smaller)	24±2 hours at room temperature, then measure.  Step 1 2 3 4				
		Dielectric	No defects	Temp. (°C) Min. Operating Room Temp. Holms. Room Temp. Holms. Room Temp. Holms.				
		Strength	W. CON'CON TAN MAN	Time (min.) 30±3 2 to 3 30±3 2 to 3				

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.



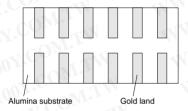
#### **GMA Series Specifications and Test Methods(1)**

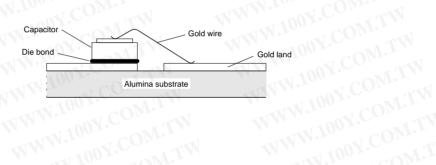
Below GMA Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table.

Continued from the preceding page. In case "\*" is added in capacitance table, please refer to GMA Series Specifications and Test Methods (2) (P.71).

No.	Ite	em	Specifications	Test Method
	- 1	Appearance	No defects or abnormalities	ST COM.
13	Humidity	Capacitance Change	R7: Within ±12.5%	Set the capacitor for 500±12 hours at 40±20°C, in 90 to 95% humidity.
13	(Steady State)	D.F.	R7: W.V.: 10V min.; 0.05 max.	Take it out and set it for 24±2 hours at room temperature, then
	I.F	I.R.	More than 1,000M $\Omega$ or $50\Omega$ F (Whichever is smaller)	measure.
	Humidity Load	Appearance	No defects or abnormalities	N.100 COM:11.
		Capacitance Change	R7: Within ±12.5%	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
14		D.F.	R7: W.V.: 10V min.; 0.05 max.	temperature, then measure. The charge/discharge current is
		I.R.	More than $500M\Omega$ or $25\Omega$ F (Whichever is smaller)	less than 50mA.
	W	Appearance	No defects or abnormalities	A voltage treatment should be given to the capacitor, in which a
	High	Capacitance Change	R7: Within ±12.5%	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
15	Temperature	D.F.	R7: W.V.: 10V min.; 0.05 max.	should be conducted.
O,	Load	I.R.	More than 1,000M $\Omega$ or $50\Omega$ F (Whichever is smaller)	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.

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.





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## **GMA Series Specifications and Test Methods(2)**

Below GMA Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table. In case "\*" is not added in capacitance table, please refer to GMA Series Specifications and Test Methods (1) (P.69).

Ite	em	Specifications	Test Method
Operating Temperat Range	5	R6: -55°C to 85°C	Reference Temperature : 25°C
Rated Vol	oltage	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, VP-P or Vo-P, whichever is larger, should be maintained within the rated voltage range.
Appearan	nce	No defects or abnormalities.	Visual inspection.
Dimensio	ons	Within the specified dimensions.	Using calipers.
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.
nsulation Resistanc		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.
Capacitar	nce	Within the specified tolerance.	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table.
Dissipatio Factor (D.		R6: 0.1 max.	CapacitanceFrequencyVoltageC≤10µF (6.3Vmax.)1±0.1kHz0.5±0.1Vrms
T.M.T.	LM M	WWW.100Y.COM.TW WWW.100Y.COM.TW	The capacitance change should be measured after 5min. at each specified temp. 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.*
apacitance emperature haracteristics	No bias	R6 : Within ±15% (–55°C to +85°C)	Step         Temperature (°C)           1         Reference temperature ±2           2         −55±3           3         Reference temperature ±2
1.CO 54.CO	OM.T	WWW.100X.COM.T	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.
Mechanical	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.
Strength	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.
W.11	Appearance	No defects or abnormalities.	OM. TOWN. TOWN. TOWN.
ibration	Capacitance	Within the specified tolerance.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minute. Amplitude: 1.5 mm (0.06 inch) max. total excursion.
Resistance	D.F.	R6 : 0.1 max.	Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
	Appearance	No defects or abnormalities.	The capacitor should be set for 24±2 hours at room
MM.	Capacitance Change	R6 : Within ±7.5%	temperature after one hour heat of treatment at 150+0/-10°C, then measure for the initial measurement. Fix the capacitor to
MA	D.F.	R6: 0.1 max.	the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the
emperature	I.R.	More than 50Ω · F	temperatures and time shown in the following table. Set it for
	MIN.	CONT.	7 (1)
	Dielectric Strength	No defects	Temp. (°C) Min. Room Amax. Operating Tomp.
	WW	N. O. COM. THE WAY	Time (min.) 30±3 2 to 3 30±3 2 to 3
emperature udden hange	I.R. Dielectric	More than $50\Omega \cdot F$	temperatures and time shown in the following 48±4 hours at room temperature, then meas   Step 1 2

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.





## **GMA Series Specifications and Test Methods(2)**

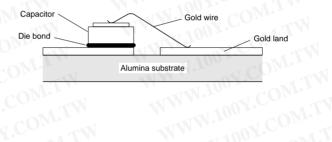
Below GMA Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table.

Continued from the preceding page. In case "\*" is not added in capacitance table, please refer to GMA Series Specifications and Test Methods (1) (P.69).

No.	Ite	em	Specifications	Test Method
	- 1	Appearance	No defects or abnormalities.	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to
		Capacitance Change	R6 : Within ±12.5%	95% humidity and set it for 24±2 hours at room temprature, then muasure. The charge/discharge current is less than 50mA.
H	ligh	D.F.	R6: 0.2 max.	COM.
13 F	Femperature High Humidity Steady)	I.R.	More than 12.5 $\Omega$ · F	<ul> <li>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.</li> <li>• 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.</li> </ul>
V		Appearance	No defects or abnormalities.	Apply 150% of the rated voltage for 1000±12 hours at the
41	N	Capacitance Change	R6 : Within ±12.5%	maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure.  The charge/ discharge current is less than 50mA.
	N.	D.F.	R6 : 0.2 max.	IN TOTAL CONTRACTOR
14 [	Durability	I.R.	More than $25\Omega \cdot F$	<ul> <li>Initial measurement</li> <li>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.</li> <li>Measurement after test</li> </ul>
-(1)	M.TY		WWW.100X.COM.TW	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.

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.





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# **Chip Monolithic Ceramic Capacitors**



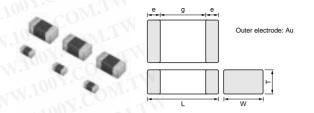
## for Bonding GMD Series

### ■ Features

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

### ■ Applcation

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



Part Number		Din	nensions (n	nm)	
Part Number	L	W	T	е	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

## High Dielectric Constant Type X5R(R6) Characteristics

Part Number		GMD03	GM	D15
L x W [EIA]		0.6x0.3 [0201]	1.0x0.5	[0402]
Rated Volt.		6.3 ( <b>0J</b> )	10 (1 <b>A</b> )	6.3 ( <b>0J</b> )
тс	N	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )	X5R ( <b>R6</b> )
Capacitance, Ca	pacitanc	e Tolerance and T Dimension	W.T. 10	or CONT.
56000pF( <b>563</b> )	K	0.3*( <b>3</b> )	TW WW	007.00
68000pF( <b>683</b> )	K	0.3*( <b>3</b> )	ON.	COMP
82000pF( <b>823</b> )	K	0.3*( <b>3</b> )	OM.TY	700 - COM: 1
0.10μF( <b>104</b> )	K	0.3*( <b>3</b> )	Co. TAI MINI	1007.0
0.12μF( <b>124</b> )	K	W.Ioo	0.5*( <b>5</b> )	V. TON
0.15μF( <b>154</b> )	K	W 100	0.5*( <b>5</b> )	27 TOO . CONT. I
0.18μF( <b>184</b> )	K	THE WAY	0.5*( <b>5</b> )	100Y.CO TW
0.22μF( <b>224</b> )	K	T. W. To.	0.5*( <b>5</b> )	NW. TO COM
0.27μF( <b>274</b> )	К	TW WY	0.5*( <b>5</b> )	100 - OM:1
0.33μF( <b>334</b> )	(K)	THE WAY	0.5*( <b>5</b> )	W. O. CO. TW
0.39μF( <b>394</b> )	K	M. T. W.	0.5*( <b>5</b> )	TANN TO COME
0.47μF( <b>474</b> )	K	TW WW	0.5*( <b>5</b> )	M. 1003. ONLIA
1.0μF( <b>105</b> )	K	DIA.	· COTTO	0.5* <b>(5</b> )

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

## High Dielectric Constant Type X7R(R7) Characteristics

Part Number		NY.COM	GMD03	MM	COLUMN	GMD15	-1100X.
L x W [EIA]	I.WW	21 COMP.	0.6x0.3 [0201]	TINN .	CON	1.0x0.5 [0402]	11
Rated Volt.		25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )
TC	WWV	X7R ( <b>R7</b> )					
Capacitance, C	apacitano	ce Tolerance and T D	imension	MM			
100pF( <b>101</b> )	K	0.3(3)	DM				
120pF( <b>121</b> )	K	0.3(3)					

The part numbering code is shown in ().

Dimensions are shown in mm and Rated Voltage in Vdc.

<sup>\*:</sup> Please refer to GMD Series Specifications and Test Method (2)(P.77).

Continued from the preceding page.

Part Number	~1.C	U	GMD03	· CO		GMD15	
x W [EIA]	Or.	OMIL	0.6x0.3 [0201]	N.100 . CO	M· ,	1.0x0.5 [0402]	
Rated Volt.	00.A.	25 ( <b>1E</b> )	16 ( <b>1C</b> )	10 ( <b>1A</b> )	50 ( <b>1H</b> )	25 ( <b>1E</b> )	16 ( <b>1C</b> )
гс	700)	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )	X7R ( <b>R7</b> )
Capacitance, Cap	oacitanc	e Tolerance and T D	imension	WW.IOS	COMP.	,	
150pF( <b>151</b> )	K	0.3(3)		1001			
180pF( <b>181</b> )	K	0.3(3)	rW v	NWW.			
220pF( <b>221</b> )	K	0.3(3)		TANN TO	0.5( <b>5</b> )		
270pF( <b>271</b> )	K	0.3(3)	TW	10	0.5( <b>5</b> )	1	
330pF( <b>331</b> )	K	0.3(3)	TW	MINI	0.5( <b>5</b> )		
390pF( <b>391</b> )	K	0.3(3)	V. I	I.W.I	0.5( <b>5</b> )	-31	
470pF( <b>471</b> )	K	0.3(3)	TIN	W. A.	0.5( <b>5</b> )		
560pF( <b>561</b> )	K	0.3(3)	TIN	MIN III	0.5( <b>5</b> )	TW	
680pF( <b>681</b> )	K	0.3(3)	OW.	VIX	0.5( <b>5</b> )	1	
820pF( <b>821</b> )	K	0.3(3)	WILL	11/1/	0.5( <b>5</b> )	M.T.W	
1000pF( <b>102</b> )	K	0.3(3)	COMP	Wir	0.5( <b>5</b> )		
1200pF( <b>122</b> )	K	0.3( <b>3</b> )	COM:		0.5( <b>5</b> )	ONI	
1500pF( <b>152</b> )	K	0.3(3)	TW TW	N.V	0.5( <b>5</b> )	TITI	
1800pF( <b>182</b> )	K	1111111.10	0.3(3)		0.5( <b>5</b> )	$C_{O_{M_{2}}}$	
2200pF( <b>222</b> )	K	11 100	0.3 <b>(3</b> )	1	0.5( <b>5</b> )	COMP	
2700pF( <b>272</b> )	K	MAN	0.3(3)	W V	0.5( <b>5</b> )	TI	
3300pF( <b>332</b> )	K		0.3(3)		0.5( <b>5</b> )	COMP	
3900pF( <b>392</b> )	K	711	001.	0.3(3)	0.5( <b>5</b> )	COMPLET	
4700pF( <b>472</b> )	Κ	M. W.	ON CON	0.3(3)	0.5( <b>5</b> )	OY. CTIV	
5600pF( <b>562</b> )	K	With	100 TCON	0.3( <b>3</b> )	TIM W.L	0.5 <b>(5</b> )	ĸ.
6800pF( <b>682</b> )	K	Mar.	11007	0.3( <b>3</b> )	111111111111111111111111111111111111111	0.5 <b>(5</b> )	
8200pF( <b>822</b> )	K	William	V. CO	0.3(3)	4/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1	0.5( <b>5</b> )	
10000pF( <b>103</b> )	K		W.100	0.3(3)		0.5( <b>5</b> )	-XX
12000pF( <b>123</b> )	K	1/1/1	11007	ONI.TH		0.5 <b>(5</b> )	1
15000pF( <b>153</b> )	K	U w	NW.	One		0.5 <b>(5</b> )	TW
18000pF( <b>183</b> )	K		71W.100	COM		0.5( <b>5</b> )	- 1
22000pF( <b>223</b> )	K	W W	11007	OM.TW		0.5( <b>5</b> )	M.T.V
27000pF( <b>273</b> )	К	-XXI	NWW.	COM	I W	0.5(5)	TW
33000pF( <b>333</b> )	K	7 1	TIN.100	COM		0.5( <b>5</b> )	DIAI.,
39000pF( <b>393</b> )	К		WWW	TIME	1	0.5 <b>(5</b> )	· OVET
47000pF( <b>473</b> )	K		WWW.	COM.		0.5(5)	The state of the s
56000pF( <b>563</b> )	K	17.7	W.I	ON.	1	TAN W. IOU	0.5( <b>5</b> )
68000pF( <b>683</b> )	K		MM	1001.	TW	WW 1003	0.5( <b>5</b> )
82000pF( <b>823</b> )	K	DIVI-	TINW.	COM		TANN.	0.5( <b>5</b> )
0.10μF( <b>104</b> )	K	OM.TW	141	1007.	1.7	101.104	0.5( <b>5</b> )
The part numbering	code is s	hown in (). and Rated Voltage in Vo	dc.	M.100X.CC	MIN	WWW.100	ov.CO

Dimensions are shown in mm and Rated Voltage in Vdc. WWW.100Y.COM.

Note

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## **GMD Series Specifications and Test Methods (1)**

Below GMD Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table. In case "\*" is added in capacitance table, please refer to GMD Series Specifications and Test Methods (2) (P.77).

No.	Ite	em	Specifications			Tes	st Metho	d	
1	Operating Tempera Range	•	R7 : -55°C to 125°C	Reference	Ten	nperature : 25	°C		
2	Rated Vo	ltage	See the previous pages.	may be ap When AC	plied volta is la	d continuously age is superim	to the ca	aximum voltag pacitor. DC voltage, V ined within the	7P-P or VO-P,
3	Appearar	nce	No defects or abnormalities.	Visual insp	ectio	on.			
4	Dimensio	$\rightarrow \rightarrow \rightarrow \rightarrow$	Within the specified dimensions.	Using calip	oers.	VI.			
5	Dielectric	Strength	No defects or abnormality.	is applied	betw		nations fo	250% of the rate or 1 to 5 seconds than 50mA.	
6	Insulation Resistant		More than 10,000M $\Omega$ or 500 $\Omega$ · F (Whichever is smaller)	voltage no	t exc		ted volta	neasured with a ge at normal te charging.	
7	Capacita	nce	Within the specified tolerance.  R7:					sured at refere age shown in t	
8	Dissipation Factor (D.		W.V. 25Vmin. : 0.025 max. W.V. 16/10V : 0.035 max.	Freque		F.COM		).1kHz ).2Vrms	
	M.TV OM.T	LM M	WWW.100Y.COM.TW	each spec The range value over	ified s of the	temp. stage.	hange co	easured after sompared with the	ne 25°C
9	Capacitance Temperature Characteristics	No bias	R7 : Within ±15% (–55°C to +125°C)	Step 1 2		Refer	-55	perature ±2 ±3	
	<1 CO	NT	I MAN. IO. COM.	3 4	W.	Refer	ence tem	perature ±2	
	07.CG	OM.T	W WWW.100X.COM.TW	*Initial me Perform a then let sit	heat for 2	· · · · · · · · · · · · · · · · · · ·	h dielectr 150 +0/- room ter	ic constant type -10°C for one h	
10	Mechanical Strength	Bond Strength	Pull force : 0.03N min.	Mount the Au-Sn (80/	capa (20) a	and bond a 25	d metallize μm (0.00°	D ed alumina sub 1 inch) gold wir oall bond. Then	e to the
	Strength	Die Shear Strength	Die Shear force : 2N min.	Mount the	сара	- 4		zed alumina su arallel to the su	
	-TXV.11	Appearance	No defects or abnormalities.	11.2		-414	MW.	of Co	) in in
11	Vibration Resistance	Capacitance D.F.	Within the specified tolerance.  R7: W.V. 25Vmin.: 0.025 max. W.V. 16/10V: 0.035 max.	1 minute. Apply this	Ampl moti	litude : 1.5 mr	ท (0.06 in d of 2 hoเ	n return to 10H ch) max. total urs in each of 3 s).	excursion.
	11	Appearance	No defects or abnormalities.	The capac	itors	should be set	for 24±2	hours at room	CON
	MM,	Capacitance Change	R7 : Within ±7.5%	then meas	ure f	for the initial n	neasuren	eatment at 150- nent. Fix the ca r and under the	pacitor to
12	Temperature Cycle	D.F.	R7 : W.V. 25Vmin. : 0.025 max. W.V. 16/10V : 0.035 max.	conditions temperatu	as ( res a	11) and condu	uct the fiv n in the f	e cycles accorollowing table.	ding to the
	- Cycle	LP	More than 10,000M $\Omega$ or 500 $\Omega$ · F	Step	. «	TVY	2	3	4
		I.R. Dielectric	(Whichever is smaller)	Temp. (		Min. Operating Temp.+0/–3	Room Temp.	Max. Operating Temp.+3/–0	Room Temp.
		Strength	No defects	Time (m		30+/-3	2 to 3	30+/–3	2 to 3

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. .... OI WWW.100Y.COM





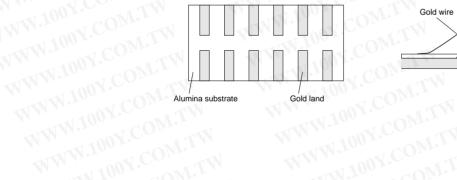
## **GMD Series Specifications and Test Methods (1)**

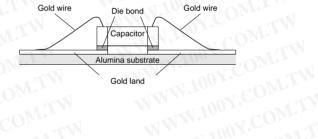
Below GMD Series Specifications and Test Methods (1) are applied to Non "\*" PNs in capacitance table.

Continued from the preceding page. In case "\*" is added in capacitance table, please refer to GMD Series Specifications and Test Methods (2) (P.77).

No.	Ite	em	Specifications	Test Method
	NN T	Appearance	No defects or abnormalities.	A COMP.
		Capacitance Change	R7 : Within ±12.5%	Set the capacitor for 500±12 hours at 40±2°C, in 90 to 95%
13	Humidity (Steady State)	D.F.	R7 : W.V. 25Vmin. : 0.05 max. W.V. 16/10V : 0.05 max.	humidity.  Take it out and set it for 24±2 hours at room temperature, then measure.
		I.R.	More than 1,000M $\Omega$ or $50\Omega \cdot F$ (Whichever is smaller)	10/N.COM.TW
		Appearance	No defects or abnormalities.	X 1/01.
		Capacitance Change	R7 : Within ±12.5%	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to
14	Humidity Load	D.F.	R7: W.V. 25Vmin.: 0.05 max. W.V. 16/10V: 0.05 max.	95% humidity and set it for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
	CM	I.R.	More than $500 M\Omega$ or $25\Omega \cdot F$ (Whichever is smaller)	W 100Y.COM.TW
1	-XXI	Appearance	No defects or abnormalities.	A voltage treatment should be given to the capacitor, in which a
	"" W.M.	Capacitance Change	R7 : Within ±12.5%	DC voltage of 200% the rated voltage is applied for one hour at the maximum operating temperature ±3°C then it should be set
15	High Temperature Load	D.F.	R7: W.V. 25Vmin.: 0.05 max. W.V. 16/10V: 0.05 max.	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
	OM.T	I.R.	More than 1,000M $\Omega$ or $50\Omega \cdot F$ (Whichever is smaller)	bath, and set it for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.

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.





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• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

## **GMD Series Specifications and Test Methods (2)**

Below GMD Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table. In case "\*" is not added in capacitance table, please refer to GMD Series Specifications and Test Methods (1) (P.75).

No.	Ite	em	Specifications	Test Method
1	Operating Tempera Range	•	R6 : –55°C to 85°C	Reference Temperature : 25°C
2	Rated Vo	ltage	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 <sup>p-p</sup> or V <sup>c-p</sup> whichever is larger, should be maintained within the rated voltage range.
3	Appearar	nce	No defects or abnormalities.	Visual inspection.
1	Dimensio	**	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 Resistant		More than $50\Omega \cdot F$	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	Capacita	nce	Within the specified tolerance.	The capacitance/D.F. should be measured at reference temperature at the frequency and voltage shown in the table.
8	Dissipation Factor (D.		R6: 0.1 max.	CapacitanceFrequencyVoltageC≤10μF (10Vmin.)*11±0.1kHz1.0±0.2VrmsC≤10μF (6.3Vmax.)1±0.1kHz0.5±0.1Vrms
	TIM	N	M., 21 1001.	*1 GMD155 R6 1A 124 to 224 are applied to 0.5±0.1 Vrms.
	OM.T	W	WWW.100Y.COM.TW	The capacitance change should be measured after 5min. at each specified temp. stage.
	COM	TW	WWW.100Y.COM.TW	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.*
	Capacitance	TW.	WWW. JOOY.CO. TW	Step Temperature (°C)
)	Temperature	No bias	R6 : Within ±15% (–55°C to +85°C)	1 Reference temperature ±2
	Characteristics	M.T.	M. 1001. ONITY	2 -55±3 3 Reference temperature ±2
	N.C.	, T	WWW. TOUX.CO. T.	4 85±3
	00X.C	$co_{M_i}$	TW WWW.100Y.COM.	*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.
N	Mechanical	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
0	Strength	7.	W.100 - CO	capacitor terminal using an ultrasonic ball bond. Then, pull wire
	NW.19	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.
	-TXXI 1	Appearance	No defects or abnormalities.	ON THE COMP.
	Vibration	Capacitance	Within the specified tolerance.	Ramp frequency from 10 to 55Hz then return to 10Hz all with 1 minute. Amplitude : 1.5 mm (0.06 inch) max. total excursion
1	Resistance	D.F.	R6 : 0.1 max.	Apply this motion for a period of 2 hours in each of 3 mutually perpendicular directions (total 6 hours).
	44 4	Appearance	No defects or abnormalities.	The capacitor should be set for 24±2 hours at room
	WW	Capacitance Change	R6 : Within ±7.5%	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
	W	D.F.	R6: 0.1 max.	conditions as (11) and conduct the five cycles according to the
2	Temperature	I.R.	More than $50\Omega \cdot F$	temperatures and time shown in the following table. Set it for
2	Sudden Change	TOWN	TOWN.	24±2 hours at room temperature, then measure.  Step 1 2 3 4
	J	Dielectric Strength	No defects	Temp. (°C) Min. Room Max. Room Operating Tomp
			W.In COM.	Temp.+0/-3 Temp.+3/-0 Temp.+3/-0 Time (min.) 30±3 2 to 3 30±3 2 to 3
		201.4	100x. 11/1 M.	Time (time.) 00±0 2 to 3 00±0 2 to 3

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. WWW.100Y.COM





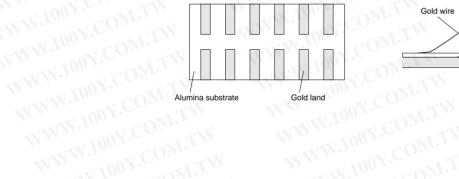
## **GMD Series Specifications and Test Methods (2)**

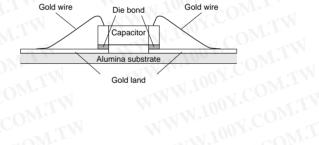
Below GMD Series Specifications and Test Methods (2) are applied to "\*" PNs in capacitance table.

Continued from the preceding page. In case "\*" is not added in capacitance table, please refer to GMD Series Specifications and Test Methods (1) (P.75).

No. It	em	Specifications	Test Method
NN .	Appearance	No defects or abnormalities.	Apply the rated voltage for 500±12 hours at 40±2°C, in 90 to
	Capacitance Change	R6 : Within ±12.5%	95% humidity and set it for 24±2 hours at room temprature, then muasure. The charge/discharge current is less than 50mA.
High	D.F.	R6 : 0.2 max.	COM.
Temperature High Humidity (Steady)	I.R.	More than $12.5\Omega \cdot F$	<ul> <li>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.     </li> <li>Measurement after test         Perform a heat treatment at 150+0/-10°C for one hour and then     </li> </ul>
N	MM	TIOOY.CO MITTY WY	let sit for 24±2 hours at room temperature, then measure.
rVV	Appearance	No defects or abnormalities.	Apply 150%*2 of the rated voltage for 1000±12 hours at the
TW	Capacitance Change	R6 : Within ±12.5%	maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure.  The charge/ discharge current is less than 50mA.
. · ·	D.F.	R6 : 0.2 max.	The draiger distributes that confine
14 Durability		WWW.100Y.COM.TW	*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
$O_{M',I',I'}$	I.R.	More than $25\Omega \cdot F$	measurement.
$co_{M,1}$	N	WWW.100X.COM.TW	<ul> <li>Measurement after test</li> <li>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.</li> </ul>

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.





08.9.1

# **Chip Monolithic Ceramic Capacitors**



## for Ultrasonic Sensors GRM Series

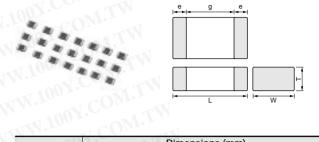
#### ■ Features

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

### Applications

Ultrasonic sensor

WWW.100Y.COM.TW (Back sonar, Corner sonar and etc.)



Part Number	7.	Dir	nensions (r	mm)	
Part Number	47 LC.U	W	T	е	g min.
GRM219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7

Part Number	TC Code	Rated Voltage	Capacitance	Length L	Width W	Thickness
GRM2199E2A102KD42	ZLM (Murata)	(Vdc)	(pF) 1000 ±10%	(mm) 2.0	(mm) 1.25	(mm) 0.85
GRM2199E2A152KD42	ZLM (Murata)	100	1500 ±10%	2.0	1.25	0.85

## for Ultrasonic Sensors GRM Series Specifications and Test Methods

lo.	Item	Specifications	Test Method		
	erating nperature	−25 to +85°C	Reference Temperat	ture: 20°C	
2 Rat	ed 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 <sup>p,p</sup> or whichever is larger, should be maintained within the rated age range.		
3 App	pearance	No defects or abnormalities	Visual inspection		
	nensions	Within the specified dimensions	Using calipers	V	
1	lectric Strength	No defects or abnormalities	No failure should be is applied between the	observed when 300% of the rated voltagente terminations for 1 to 5 seconds, provicing current is less than 50mA.	
Insu (I.R	ulation Resistance .)	More than 10,000MΩ	M •	ance should be measured with a DC volt- ne rated voltage at 20℃ and 75%RH max s of charging.	
Cap	pacitance	Within the specified tolerance	The 100 1 110 F	- I All have a second of Colon with	
Diss (D.F	sipation Factor F.)	0.01 max.	_ <   `   `   `   `   `   `   `   `   `	F. should be measured at 20°C with acy and 1±0.2Vrms in voltage.	
	Capacitance Within -4,700 ±1,000 ppm/°C (at -25 to +20°C)		capacitance measure When cycling the ter 5, the capacitance sl the temperature coef	The temperature coefficient is determined using the capacitance measured in step 1 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.  The capacitance change should be measured after 5 min. at apply capacitance.	
	nperature	Within −4,700 ±500 ppm/°C (at +20 to +85°C)	Step	Temperature (℃)	
Cna	racteristics	WWW. COLLEGE	1	20±2	
•	OM.'I'	100 COM. 1	2	-25±3	
V.C	TW	WWW	3	20±2	
	COMP.	COM.	4	85±3	
0x	TIME	1 100x. OW.IV	5	20±2	
	nesive Strength ermination	No removal of the terminations or other defect should occur.	Fig.1 using a eutection direction of the arrow The soldering should reflow method and s	be done either with an iron or using the hould be conducted with care so that the and free of defects such as heat shock.  C  Solder resist  Baked electrode or copper foil  a b c  1.2 4.0 1.65	
	WW.Ing	CONT.	COMP.	(in mm) Fig. 1	
	Annogrance	No defects or abnormalities	Solder the consciter	to the test jig (glass epoxy board) in the	
4	Appearance			nder the same conditions as (10).	
Vibra Resis	Capacitance  Capacitance  D.F.	Within the specified tolerance  0.01 max.	The capacitor should having a total amplitude uniformly between the frequency range, from the traversed in approximation.	d be subjected to a simple harmonic moti ude of 1.5mm, the frequency being varie- ne approximate limits of 10 and 55Hz. Th m 10 to 55Hz and return to 10Hz, should oximately 1 minute. This motion should b of 2 hours in each of 3 mutually perpendi	
	WW	W. CO. CO. TW. WAY	1007.	Continued on the following page.	
				Continued on the following page.	





## for Ultrasonic Sensors GRM Series Specifications and Test Methods

Continued from the preceding page Specifications No Item Test Method Solder the capacitor to the test jig (glass epoxy boards) shown No cracking or marking defects should occur. 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. 50 Pressurizing speed: 1.0mm/sec \_Pressurize Deflection 12 t: 1.6mm 100 Type а h C GRM21 1.2 4.0 1.65 (in mm) (in mm) Fig. 2 Fig.3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at Solderability of 75% of the terminations are to be soldered evenly and 80 to 120°C for 10 to 30 seconds. After preheating, immerse in Termination continuously. 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. No defects or abnormalities Capacitance Within ±7.5% Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the Change Resistance capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution to Soldering D.F 0.01 max. at 270±5°C for 10±0.5 seconds. Let sit at room temperature for Heat More than  $10,000M\Omega$ I.R. 24±2 hours, then measure. Dielectric No failure Strength No defects or abnormalities Fix the capacitor to the supporting jig in the same manner and Appearance under the same conditions as (11). Capacitance Within ±7.5% Perform the five cycles according to the four heat treatments Change listed in the following table. Let sit for 24±2 hours at room tem-Temperature D.F. 0.01 max perature, then measure. Cycle Step I.R. More than  $10,000M\Omega$ 3 4 85<sup>+3</sup><sub>o</sub> -25 ±°3 Room Temp. Temp. (℃) Room Temp Dielectric No failure Time (min.) 30±3 2 to 3 30±3 2 to 3 Strength Appearance No defects or abnormalities Sit the capacitor at 40±2℃ and 90 to 95% humidity for 500±12 Capacitance Humidity, Within ±12.5% Change Steady 16 Remove and let sit for 24±2 hours at room temperature, then State D.F. 0.02 max I.R More than  $1,000M\Omega$ **Appearance** No defects or abnormalities Apply the rated voltage at 40±2℃ and 90 to 95% humidity for Capacitance Within ±12.5% Humidity 500±12 hours. Remove and let sit for 24±2 hours at room tem-Change 17 Load perature, then measure. The charge/discharge current is less D.F. 0.02 max than 50mA. I.R. More than  $500M\Omega$ Appearance No defects or abnormalities Capacitance Apply 200% of the rated voltage for 1,000±12 hours at 85±3℃. High Within ±12.5% Change Temperature Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. Load D.F More than  $1.000M\Omega$ 

## **Package**

	1007.	1	LAL	, ,	AA .	100 7.	Quant	ity (pcs.)			
Part Number		Dim	ensions	(mm)	ø180n	nm Reel	ø330mm Reel		Dully Corre	D. II. D.	
M. I.	vi 100 jr.	L	W	Т	Paper Tape	Embossed Tape	Paper Tape	Embossed Tape	Bulk Case	Bulk Baç	
Packaging	g Code		VI.IV		D	N.160X.	T.IKO	к	С	Bulk : B Tray : T	
W.	GRM02	0.4	0.2	0.2	20,000 1)	40,000 1)		-	-	1,000	
	GRM03	0.6	0.3	0.3	15,000	-10°	50,000		-	1,000	
W	GRM15	1.0	0.5	0.25	10,000	- 400	50,000	1111 -	-	1,000	
Ì	OTT.	1.0	0.0	0.5	10,000	W. P.	50,000		50,000	1,000	
	GRM18	1.6	0.8	0.5	4,000	10	10,000	1,1,7	45.000.2)	1,000	
J .		-01	$CO_{h}$	0.8	4,000	NW W	10,000 10,000	W.T.	15,000 <sup>2)</sup> 10,000	1,000 1,000	
	GRM21	2.0	1.25	0.85	4,000	- W.	10,000		10,000	1,000	
N	GINIZI	2.0	1.23	1.0/1.25	-	3,000	10,000	10,000	5,000 <sup>3)</sup>	1,000	
	-31	1.10	- 00	0.6/0.85	4,000	- 0,000	10,000	-	-	1,000	
TV)	GRM31	3.2	1.6	1.15	-	3,000	10,000	10,000	-	1,000	
For General	-31	W.Lo.	-1	1.6		2,000	- 4/	6,000	-	1,000	
Purpose	MA		10 1.	0.85	4,000	1.	10,000	-01/1-1	-	1,000	
		Mer		1.15		3,000	O.	10,000	N -	1,000	
V.I.M	GRM32	3.2	2.5	1.35	(4.4.	2,000	W.100.	8,000	-	1,000	
			003	1.6		2,000	1 444.	6,000	-	1,000	
W.T.Y		1	100	1.8/2.0 2.5	M. 7-	1,000	-1W-100	4,000	-	1,000	
W				. 00	1.15	W	1,000	AA O	5,000	-	1,000
OM.	GRM43	4.5	3.2	1.35/1.6 1.8/2.0	111-	1,000	1.1	4,000	-	1,000	
TV	G. (111.10	1.0		2.5		500	111-	2,000		1,000	
OM	-1		(V.)	2.8	ON	500	WW.	1,500	-000	500	
		1/1/1/	-7.4	1.15		1,000	W 1 -	5,000	V. J.	1,000	
COMP	GRM55	5.7	5.0	1.35/1.6 1.8/2.0	COS	1,000		4,000	-	1,000	
	O.K.II.OO			2.5		500	- 1	2,000	- N-	500	
$\frac{4 \text{ CO}_{Nr}}{2}$	GJM03	0.6	0.3	3.2 0.3	15,000	300	50,000	1,500		500 1,000	
gh Power Type	GJM15	1.0	0.5	0.5	10,000	-	50,000	W.110	50,000	1,000	
CONT	GQM18	1.6	0.8	0.7/0.8	4,000		10,000	1.007	-	1,000	
	GQM21	2.0	1.25	0.85	4,000		10,000	W. T.	COM	1,000	
gh Frequency	ERB18	1.6	0.8	0.9 max.	4,000	T.T.Y	10,000	1100	-7/1	1,000	
	ERB21	2.0	1.25	1.35 max.	-, CO	3,000		10,000	1 CON	1,000	
100X.C	ERB32	3.2	2.5	1.7 max.	1001	2,000	- 1	8,000	Mo:	1,000	
or Ultrasonic	GRM21	2.0	1.25	0.85	4,000	OFF - WI	10,000		A.Co.	1,000	
1100 X.	GMA0D	0.38	0.38	0.3	100 2.	OM-II	-		100-	400 4)	
1.10	GMA05	0.5	0.5	0.35	-07	10 - W	-	W-1		400 4)	
Microchip	GMA08	0.8	0.8	0.5	140		-	-100	- 40	400 4)	
11.2	GMD03	0.6	0.3	0.3	15,000	CO. T.	50,000	M/M	.007.00	1,000	
100 h	GMD15	1.0	0.5	0.5	10,000	COM.	50,000	-WW	100 - C	1,000	
N TOO	GNM0M	0.9	0.6	0.45	10,000		50,000	11-11	100	1,000	
-XIW.100	GNM1M	1.37	1.0	0.5/0.6/0.8	4,000	S COM.	10,000	- in W		1,000	
Array	GNM21	2.0	1.25	0.6/0.85	4,000	-	10,000	1	W 100 J.	1,000	
TINIW.10	GNM31	3.2	1.6	0.8/0.85	4,000	- 2,000	10,000	10,000	V1	1,000	
N 11	11145		1.0	1.0/1.15	10,000 5)	3,000	FO 000 5)	10,000	12N 100 1	1,000	
TINN .	LLL15 LLL18	0.5	1.0	0.3	10,000 %	4,000	50,000 5)	10,000	- 100	1,000 1,000	
AN TO	100		-	0.5/0.6		4,000	M. T	10,000	<u> </u>	1,000	
THE WAY	LLL21	1.25	2.0	0.5/0.6	11/2/	3,000		10,000	10	1,000	
	1100	TOM	-	0.5/0.7		4,000	0//	10,000	TN IN . W	1,000	
	LLL31	1.6	3.2	1.15	4	3,000	117	10,000	- <11	1,000	
	LLA18	1.6	0.8	0.5	- 111	4,000	COMP	10,000		1,000	
Low ESL	400	y		0.5	7////	4,000	The	10,000		1,000	
	LLA21	2.0	1.25	0.85		3,000	CON	10,000	- 1	1,000	
	7 10	11.	- M "	0.5	- 11	4,000	Mo.	10,000	-	1,000	
-7	LLA31	3.2	1.6	0.85	- 💉	3,000	1 CO	10,000	-	1,000	
		001.	100	1.15	- 1	3,000	:01	10,000	-	1,000	
	LLM21	2.0	1.25	0.5		4,000	W.CO.	10,000	-	1,000	
	LLM31	3.2	1.6	0.5	-	4,000	_	10,000	-	1,000	

<sup>1) 8</sup>mm width 2mm pitch Paper Taping. 4mm width 1mm pitch Embossed Taping.





<sup>2)</sup> There are parts number without bulk case.

<sup>3)</sup> Dimension tolerance  $\pm 0.15$ mm rated are not available by bulk case.

<sup>4)</sup> Tray

<sup>5)</sup> LLL15: ø180mm Reel Paper Taping Packaging Code: E, ø330mm Reel Paper Taping Packaging Code: F

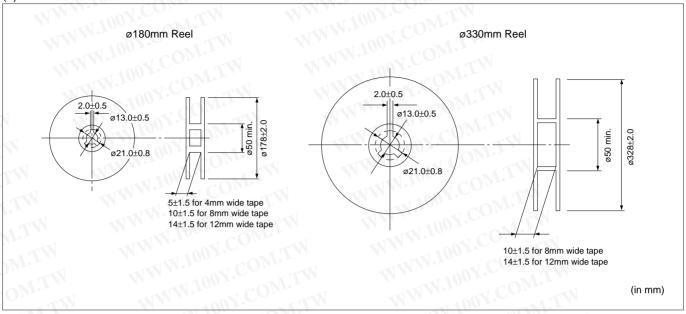
## **Package**



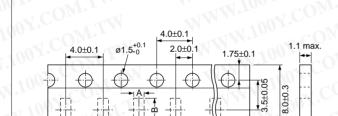
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### ■ Tape Carrier Packaging

### (1) Dimensions of Reel



### (2) Dimensions of Paper Tape



8mm width 4mm pitch Tape

Direction of Feed

Part Number	Α	В
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
<b>GRM32</b> (T≦0.85mm)	2.8±0.2	3.6±0.2

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8mm width 2mm pitch	(GRM02) 0.5 max. (GJM03/GRM03/GMD03)
2.0±0.05 Ø1.5 0 2.0±0.1 1.7	0.8 max. (GJM15/GRM15/GMD15 LLL15/GNM0M)
	8.040.3
Direction of Feed	Y.COM.TW

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
W. S		

\*Nominal Value

(in mm)

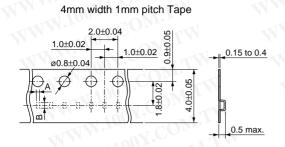




## **Package**

Continued from the preceding page

### (3) Dimensions of Embossed Tape

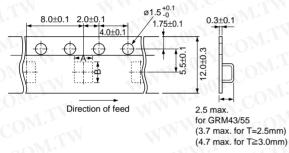


Part Number	A* C	B*
GRM02	0.23	0.43

\*Nominal Value

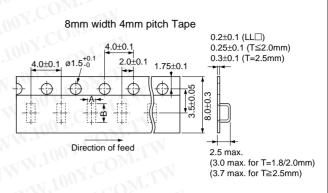
\*GRM03 is also available by 4mm width 1mm pitch Tape.

### 12mm width 8mm pitch Tape



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

\*Nominal Value



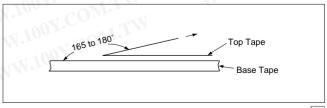
_ 7		
Part Number	Α	В
LLL18, LLA18	1.05±0.1	1.85±0.1
GRM21 (T≧1.0mm) LLL21 LLA21, LLM21	1.45±0.2	2.25±0.2
ERB21	1.55±0.2	2.3±0.2
GRM31 (T≥1.15mm) LLL31 LLA31, LLM31 GNM31 (T≥1.0mm)	1.9±0.2	3.5±0.2
<b>GRM32</b> , <b>ERB32</b> (T≧1.0mm)	2.8±0.2	3.5±0.2

(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

: 0.05 to 0.5N NWW.100Y.COD WWW.100Y.COM.T Vacant Section Chip-mounting Unit 210 min. -(Top Tape alone) Direction of Feed (in mm)



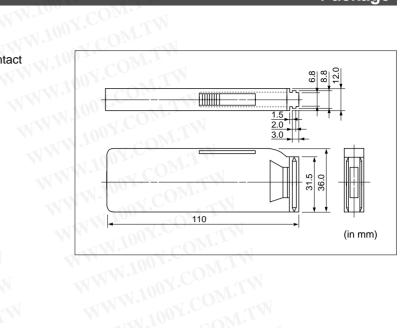




**Package** 

Continued from the preceding page

■ Dimensions of Bulk Case Packaging The bulk case uses antistatic materials. Please contact Murata for details. WWW.100Y.COM.





## **△**Caution

### 

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

Storage environment must be at an ambient temperature of 5-40 degree C and an ambient humidity of 20-70%RH. Use chip within 6 months. If 6 months or more have elapsed, check solderability before use.

Insulation Resistance should be deteriorated on specific condition of high humidity or incorrosion gas such as hydrogen sulfide, sulfurous acid gas, chlorine.

Those condition are not suitable for use.

### ■ Handling

1. Inspection

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

- 2. Board Separation (or depanalization)
- (1) Board flexing at the time of separation causes cracked chips or broken solder.
- (2) Severity of stresses imposed on the chip at the time of board break is in the order of: Pushback<Slitter<V Slot<Perforator.</p>
- (3) Board separation must be performed using special jigs, not with hands.

Use of Sn-Zn based solder will deteriorate reliability of MLCC.

Please contact murata factory for the use of Sn-Zn based solder in advance.

Do not use under the condition that causes condensation. Use damp proof countermeasure if using under the condition that causes condensation.

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.

3. Reel and bulk case

In the handling of reel and case, please be careful and do not drop it.

Do not use chips from a case which has been dropped.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND FUMING WHEN THE PRODUCTS IS USED.



## **⚠**Caution

Locate chip

horizontal to the direction in

## ■ **∆**Caution (Soldering and Mounting)

### 1. Mounting Position

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

which stress acts

[Chip Mounting Close to Board Separation Point]

Perforation
Worst A-C-(B\_D) Best

(Reference Data 2. Board bending strength for solder fillet height)

(Reference Data 3. Temperature cycling for solder fillet height)

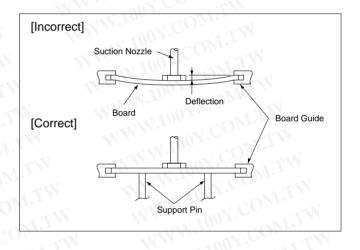
[Component Direction]

(Reference Data 4. Board bending strength for board material)

### 2. Chip Placing

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

(Reference Data 5. Break strength)





## **⚠**Caution

Continued from the preceding page

### 3. Reflow Soldering

- When sudden heat is applied to the components, the mechanical strength of the components should go down because remarkable temperature change causes deformity inside 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 1. It is required to keep temperature differential between the soldering and the components surface ( $\Delta T$ ) 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 ( $\Delta T$ ) between the component and solvent within the range shown in the table 1.

Table 1

Part Number	Temperature Differential
GRM02/03/15/18/21/31	M. M. Toolar
GJM03/15	MAN-TON CON
LLL15/18/21/31	ΔΤ≦190℃
ERB18/21	MAN M. CO
GQM18/21	10V 100
GRM32/43/55	11001
LLA18/21/31	MAN W. OOK.C
LLM21/31	ΔT≦130°C
GNM	1/1/1/1007
ERB32	WWW.

### **Recommended Conditions**

NW.I	Pb-Sn S	Lood Fron Colder	
	Infrared Reflow	Vapor Reflow	Lead Free Solder
Peak Temperature	230-250°C	230-240°C	240-260°C
Atmosphere	Air	Air	Air or N2

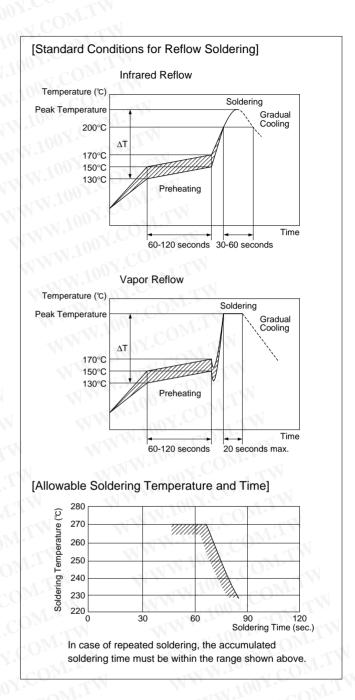
Pb-Sn Solder: Sn-37Pb Lead Free Solder: Sn-3.0Ag-0.5Cu

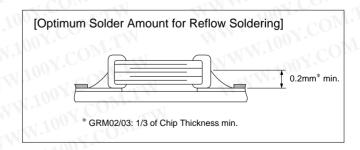
### Optimum Solder Amount for Reflow Soldering

- 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.

### Inverting the PCB

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







Continued from the preceding page.

### 4. Leaded Component Insertion

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

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

### 5. Flow Soldering

- When sudden heat is applied to the components, the mechanical strength of the components should go down because remarkable temperature change causes deformity inside components. And an excessively long soldering time or high soldering temperature results in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
- In order to prevent mechanical damage in the components, preheating shoud be required for the both 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 ( $\Delta T$ ) 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

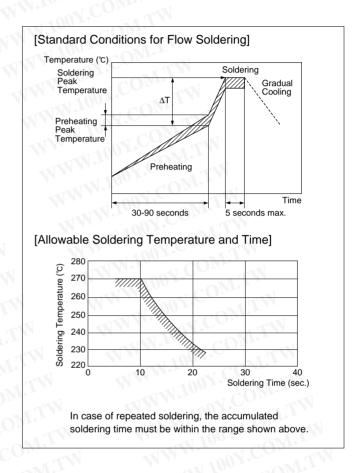
Part Number	Temperature Differential	
GRM18/21/31	MAIN. OOK	
LLL21/31	ΔT≦150°C	
ERB18/21	Δ1≥150 C	
GQM18/21	I WWW.	

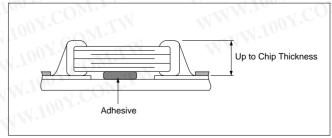
### **Recommended Conditions**

TAMM'TO COM	Pb-Sn Solder	Lead Free Solder
Preheating Peak Temperature	90-110°C	100-120°C
Soldering Peak Temperature	240-250°C	250-260°C
Atmosphere	Air	N2

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

 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.









## **1** Caution

Continued from the preceding page

### 6. Correction with a Soldering Iron

(1) For Chip Type Capacitors

 When sudden heat is applied to the components by soldering iron, the mechanical strength of the components should go down because remarkable temperature change causes deformity inside 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 3. It is required to keep temperature differential between the soldering and the components surface ( $\Delta T$ ) as small as possible. After soldering, it is not allowed to cool it down rapidly.

 Optimum Solder Amount when Corrections Are Made Using a Soldering Iron

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. Soldering iron ø3mm or smaller should be required. And it is necessary to keep a distance between the soldering iron and the components without direct touch. Thread solder 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.

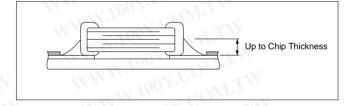
FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND FUMING WHEN THE PRODUCT IS USED.

Part Number	Temperature Differential	Peak Temperature	Atmosphere
GRM03/15/18/21/31 GJM03/15 LLL15/18/21/31 GQM18/21 ERB18/21	ΔT≦190°C	300°C max. 3 seconds max. / termination	Air
GRM32/43/55 GNM LLA18/21/31 LLM21/31 ERB32	ΔΤ≦130℃	270°C max. 3 seconds max. / termination	Air

\*Applicable for both Pb-Sn and Lead Free Solder.

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu



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**Notice** 

### ■ Notice (Soldering and Mounting)

### 1. PCB Design

### (1) Notice for Pattern Forms

WWW.100Y.COM.TW Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted

Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take eliminate the possibility of excess solder fillet height. It has a possibility to happen the chip crack by the expansion and shrinkage of metal board. Please contact us if you want to use the ceramic capacitor on metal board such as Aluminum.

### Pattern Forms

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



### **Notice**

Continued from the preceding page.

(2) Land Dimensions

• Chip capacitor could be cracked due to the stress of PCB bending / etc if the land area is larger having excess amount of solder.

Please refer to land dimension of table 1 for flow soldering, table 2 for reflow soldering, table 3 for GNM & LLA, and table 4 for LLM.

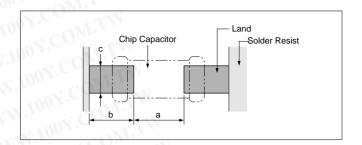


Table 1 Flow Soldering Method

Chip (L×W)	a	COP	С
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
1.25×2.0	0.4-0.7	0.5-0.7	1.4-1.8
1.6X3.2	0.6-1.0	0.8-0.9	2.6-2.8
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
	1.6×0.8 2.0×1.25 3.2×1.6 1.25×2.0 1.6×3.2 1.6×0.8	1.6×0.8 0.6-1.0  2.0×1.25 1.0-1.2  3.2×1.6 2.2-2.6  1.25×2.0 0.4-0.7  1.6×3.2 0.6-1.0  1.6×0.8 0.6-1.0	1.6×0.8     0.6-1.0     0.8-0.9       2.0×1.25     1.0-1.2     0.9-1.0       3.2×1.6     2.2-2.6     1.0-1.1       1.25×2.0     0.4-0.7     0.5-0.7       1.6×3.2     0.6-1.0     0.8-0.9       1.6×0.8     0.6-1.0     0.8-0.9

Part Number	Chip (L×W)	COM a	b	COMP
GRM02	0.4×0.2	0.16-0.2	0.12-0.18	0.2-0.23
GRM03 GJM03	0.6×0.3	0.2-0.3	0.2-0.35	0.2-0.4
GRM15 GJM15	1.0×0.5	0.3-0.5	0.35-0.45	0.4-0.6
GRM18 GQM18	1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8
GRM21 GQM21	2.0×1.25	1.0-1.2	0.6-0.7	0.8-1.1
GRM31	3.2×1.6	2.2-2.4	0.8-0.9	1.0-1.4
GRM32	3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3
GRM43	4.5×3.2	3.0-3.5	1.2-1.4	2.3-3.0
GRM55	5.7×5.0	4.0-4.6	1.4-1.6	3.5-4.8
LLL15	0.5×1.0	0.15-0.2	0.2-0.3	0.7-1.0
LLL18	0.8×1.6	0.2-0.3	0.3-0.4	1.4-1.6
LLL21	1.25×2.0	0.4-0.6	0.4-0.5	1.4-1.8
LLL31	1.6×3.2	0.6-0.8	0.6-0.7	2.6-2.8
ERB18	1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8
ERB21	2.0×1.25	1.0-1.2	0.6-0.7	0.8-1.1
ERB32	3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3
				(in mm) Continued on the following page

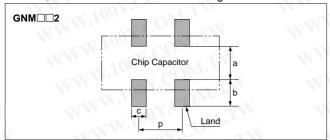




**Notice** 

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### GNM, LLA Series for Reflow Soldering Method



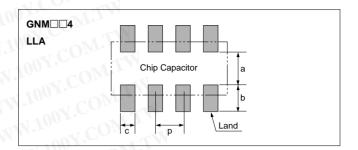


Table 3 GNM, LLA Series for Reflow Soldering Land Dimensions

Part Number	COn T	W.	Dimensi	ons (mm)	W.	
Part Number	TOM:	W	a	b	С	р
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 Series for Reflow Soldering Method

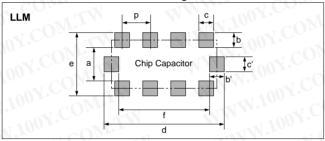


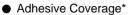
Table 4 LLM Series for Reflow Soldering Land Dimensions

Part Number	Dimensions (mm)						
	a	b, b'	c, c'	d	е	100f	р
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

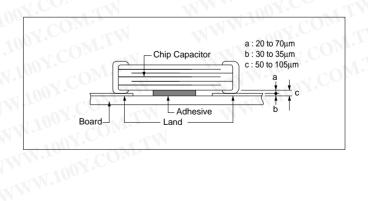
b=(c-e)/2, b'=(d-f)/2

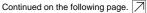
## 2. Adhesive Application

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



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







## **Notice**

Continued from the preceding page

### 3. Adhesive Curing

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

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

### Inverting the PCB

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

### 4. 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 resin 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] Outer Electrod [As Mounted on Substrate]

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

Die Bonding/Wire Bonding (GMA or GMD Series)

- 1. Die Bonding of Capacitors
- •Use the following materials Brazing alloy: Au-Sn (80/20) 300 to 320 degree C in N2 atmosphere
- Mounting
- (1) Control the temperature of the substrate so that it matches the temperature of the brazing
- (2) Place brazing alloy on substrate and place the capacitor on the alloy. Hold the capacitor and gently apply the load. Be sure to complete the operation in 1 minute.

### 2. Wire Bonding

Gold wire: 25 micro m (0.001 inch) diameter

- Bonding
- (1) Thermocompression, 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.



WWW.

sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

**Notice** 

Continued from the preceding page

### Others

### 1. Resin Coating

When selecting resin materials, select those with low contraction.

### 2. Circuit Design

GRM, GCM, GMA/D, LLL/A/M, ERB, GQM, GJM, GNM Series capacitors in this catalog are not safety recognized products. WWW.100Y.COM.TW WWW.100Y.C

# WWW.100Y.C

3. Remarks 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. WWW.100X.CO WWW



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

### (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.

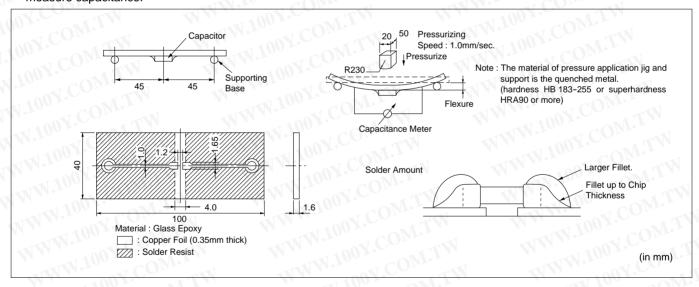
Table 1

Sample	Initial State	Prepared at Room Temperature		Prepared at High Temperature for	Prepared at High Humidity for 100 Hours at 90 to
Sample	ilitiai State	6 months	12 months	100 Hours at 85℃	95% RH and 40°C
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.

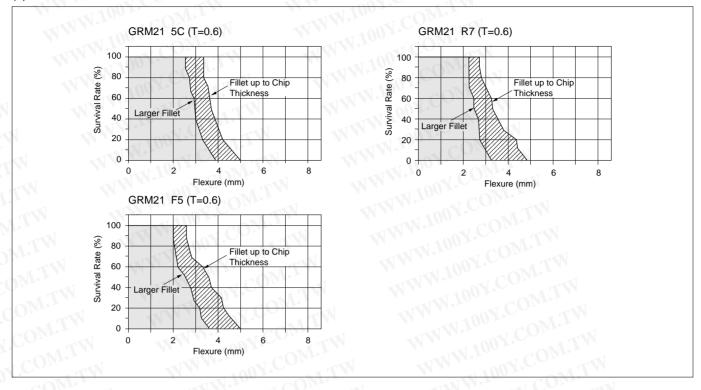
Table 2

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



Continued 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.

## 1 Solder Amount

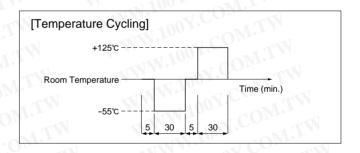
Alumina substrates are typically designed for reflow soldering.

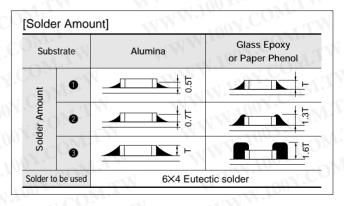
Glass epoxy or paper phenol substrates are typically used for flow soldering.

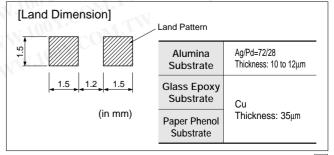
### ② Material

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

### 3 Land Dimension







Continued from the preceding page

(2) Test Samples

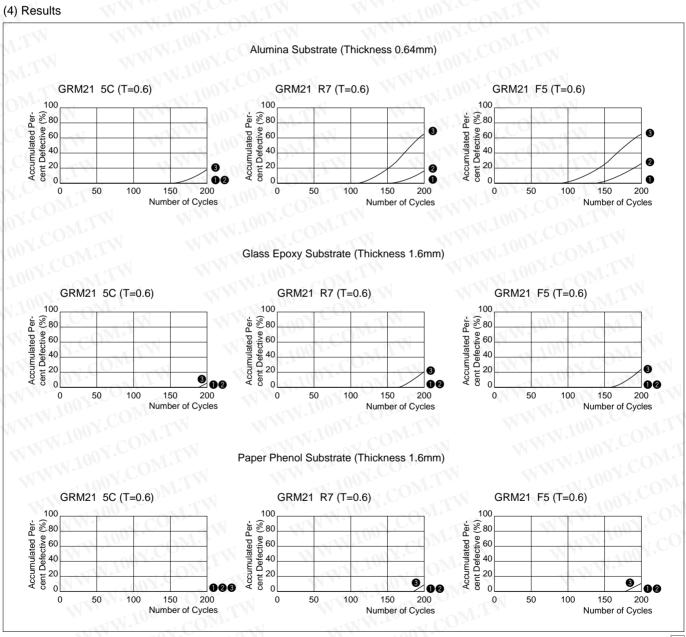
GRM21 5C/R7/F5 Characteristics T=0.6mm

### (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%



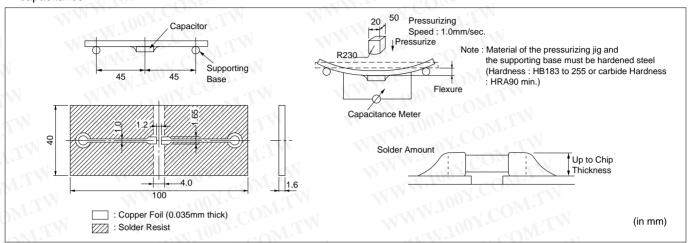


Continued from the preceding page.

### 4. Board Bending Strength for Board Material

### (1) Test Method

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



## (2) Test Samples GRM21 5C/R7/F5 Characteristics T=0.6mm typical

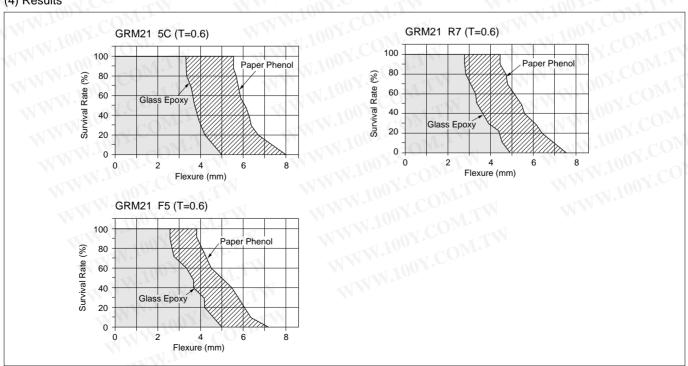
### (3) Acceptance Criteria

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



Continued from the preceding page

### 5. Break Strength

### (1) Test Method

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

### (2) Test Samples

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.

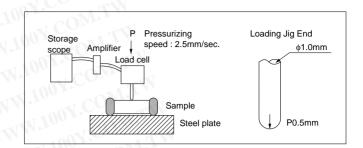
### (4) Explanation

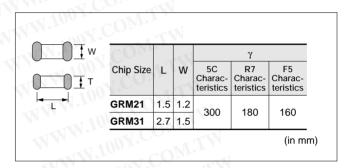
Break strength, P, is proportionate to the square of the thickness of the ceramic element and is expressed as a curve of secondary degree.

The formula is:

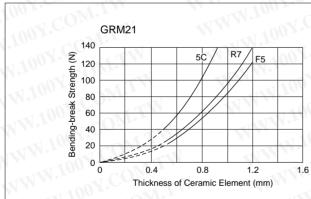
$$P = \frac{2\gamma WT^2}{3L} \quad (N)$$

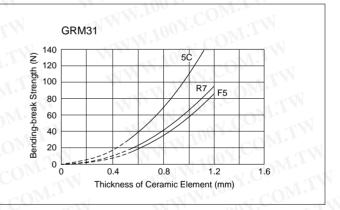
W: Width of ceramic element T: Thickness of element (mm) L: Distance between fulcrums (mm) γ: Bending stress (N/mm<sup>2</sup>)





### (5) Results





### 6. Thermal Shock

### (1) Test method

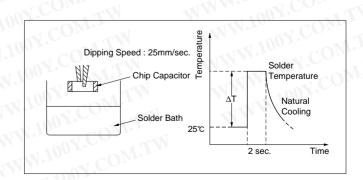
After applying flux (an ethanol solution of 25% rosin), dip the chip in a solder bath (6X4 eutectic solder) in accordance with the following conditions:

## (2) Test samples

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

### (3) Acceptance criteria

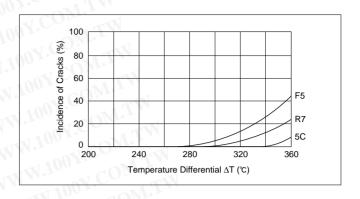
Visually inspect the test sample with a 60-power optical microscope. Chips exhibiting breaks or cracks should be determined to be defective.





Continued from the preceding page

(4) Results



### 7. Solder Heat Resistance

### (1) Test Method

1) Reflow soldering:

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

2 Flow soldering:

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

(2) Test samples

GRM21: For flow/reflow soldering T=0.6mm

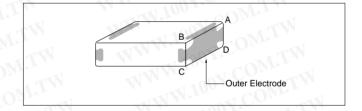
(3) Acceptance criteria

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:

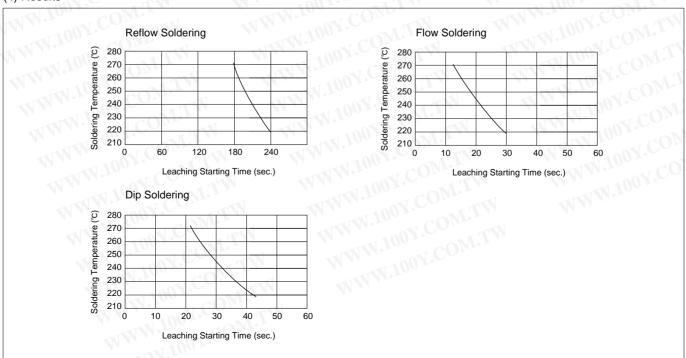
### 3 Dip soldering:

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

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



### (4) Results



Continued from the preceding page.

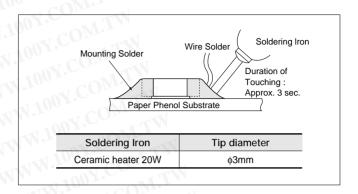
### 8. Thermal Shock when Making Corrections with a Soldering Iron

### (1) Test Method

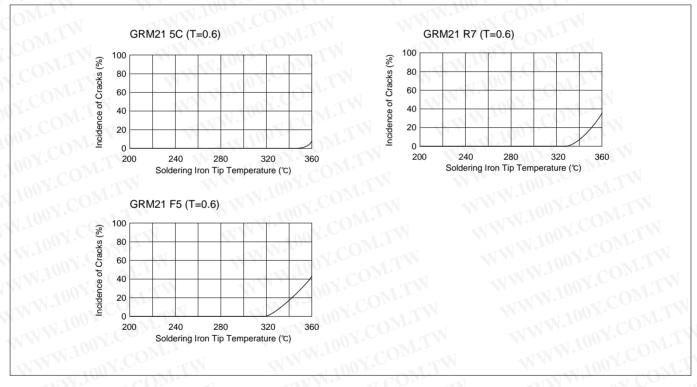
Apply a soldering iron meeting the conditions below to the soldered joint of a chip that has been soldered to a paper phenol board, while supplying wire solder. (Note: the soldering iron tip should not directly touch the ceramic element of the chip.)

(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





# **Chip Monolithic Ceramic Capacitors**



## **Medium Voltage Low Dissipation Factor**

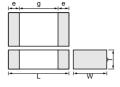
### ■ Features

- 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, surfacemountable 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.





Part Number	~11	Dim	ensions (mm	)	
Part Number	COFAR	W	T	e min.	g min.
GRM21A	2.0 ±0.2	1.25 ±0.2	1.0 +00.3		0.7
GRM31A	22102	1.6 +0.2	1.0 +0,-0.3		
GRM31B	3.2 ±0.2	1.6 ±0.2	1.25 +0,-0.3		1.5*
GRM32A	3.2 ±0.2	2.5 +0.2	1.0 +0,-0.3	0.3	1.5
GRM32B	3.2 10.2	2.5 ±0.2	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.

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.
GRM21A7U2E151JW31D	DC250	U2J (EIA)	150 ±5%	2.0	1.25	1.0	0.7	0.3 min.
GRM21A7U2E221JW31D	DC250	U2J (EIA) U2J (EIA) U2J (EIA)	220 ±5% 330 ±5% 470 ±5%	2.0 2.0 2.0	1.25 1.25 1.25	1.0 1.0 1.0	0.7 0.7 0.7	0.3 min. 0.3 min. 0.3 min.
GRM21A7U2E331JW31D	DC250							
GRM21A7U2E471JW31D	DC250							
GRM21A7U2E681JW31D	DC250	U2J (EIA)	680 ±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.
GRM21A7U2E152JW31D	DC250	U2J (EIA)	1500 ±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.
GRM31A7U2E332JW31D	DC250	U2J (EIA)	3300 ±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.
GRM31B7U2E682JW31L	DC250	U2J (EIA)	6800 ±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.
GRM31A7U2J150JW31D	DC630	U2J (EIA)	15 ±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.
GRM31A7U2J330JW31D	DC630	U2J (EIA)	33 ±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.
GRM31A7U2J680JW31D	DC630	U2J (EIA)	68 ±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.
GRM31A7U2J151JW31D	DC630	U2J (EIA)	150 ±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.
GRM31A7U2J331JW31D	DC630	U2J (EIA)	330 ±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.
GRM31A7U2J681JW31D	DC630	U2J (EIA)	680 ±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.
GRM32A7U2J152JW31D	DC630	U2J (EIA)	1500 ±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.
GRM31A7U3A150JW31D	DC1000	U2J (EIA)	15 ±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.
GRM31A7U3A330JW31D	DC1000	U2J (EIA)	33 ±5%	3.2	1.6	1.0	1.5	0.3 min.

Continued from the preceding page.

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

Note

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## **Specifications and Test Methods**

lo.	Item	Specifications	Test Method					
	perating mperature Range	-55 to +125℃	COMITY	_				
2 Ap	pearance	No defects or abnormalities	Visual inspection					
Dir	mensions	Within the specified dimension	Using calipers					
Die	electric 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					
	W.	AM: TODY: COM: TAM	DC3.15kV					
Ins (I.R	sulation Resistance R.)	More than 10,000M $\Omega$	(DC250±25V in case of r sec. of charging.	should be measured with DC500±50\ ated voltage: DC250V) and within 60±				
Ca	pacitance	Within the specified tolerance	The capacitance/Q should voltage shown as follows:	d be measured at the frequency and				
Q		1,000 min.	Capacitance C<1,000pF C≥1,000pF	Frequency   Voltage   1±0.2MHz   AC0.5 to 5V(r.m.s.)   1±0.2kHz   AC1±0.2V(r.m.s.)				
ON	I.TW	WWW.100Y.COM.TW	The capacitance measurement should be made at each step specified in Table.					
Ter	pacitance mperature aracteristics	Temp. Coefficient -750±120 ppm/°C (Temp. Range : +25 to +125°C) -750+120, -347 ppm/°C (Temp. Range : -55 to +25°C)	Step 1 2	Temperature (°C) 25±2  Min. Operating Temp.±3				
COM.TW		WWW.100Y.COM.TW	3 4 5	25±2  Max. Operating Temp.±2  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) sho 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.    10N, 10±1s   Glass Epoxy Board   Fig. 1					
	Appearance	No defects or abnormalities	Solder the capacitor to the	e test jig (glass epoxy board).				
U 1	Capacitance ration sistance Q	Within the specified tolerance  1,000 min.	The capacitor should be shaving a total amplitude cuniformly between the apfrequency range, from 10 traversed in approximatel	subjected to a simple harmonic motion of 1.5mm, the frequency being varied proximate limits of 10 and 55Hz. The to 55Hz and return to 10Hz, should by 1 min. This motion should be applied ach of 3 mutually perpendicular				
	MAM'TO	OX.COM.TW WWW.100Y						
	MAN.	100Y.COM.TW WWW.100 100Y.COM.TW WWW.10 N.100Y.COM.TW WWW.10	Glass E					





## **Specifications and Test Methods**

Continued from the preceding page.

7	Continued fr	om the pred	eding page.	N	M.	// /	007.	TI				
No.	Ite	em	Specifications					Test Method				
11	Deflection	MAN. MAN. MAN. M. Too	L×W (mm) 2.0×1.25	a 1.2	. b .	φ4.5 Q+ t:1.6	d	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.				
77			3.2×1.6 3.2×2.5	2.2	5.0 5.0	2.0	1.0		Capacitance meter	(in mm)		
$\Gamma V$			4.5×2.0	3.5	7.0	2.9	1111			(1111111)		
	N.	<b>**</b>	MAN	V.CO	Fig. 2			· Von V	Fig. 3			
12	Solderability of 75% of the terminations are to be soldered evenly						Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in 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					
01	Vir	Appearance	No marking defe	ects	COM			Preheat the o	capacitor at 120 to 150°C* for 1	min.		
$C_{C}$	Resistance	Capacitance Change	Within ±2.5%	V.100	Y.CO	V.LA		Immerse the capacitor in solder solution at 260±5°C for 10±1 sec Let sit at room condition* for 24±2 hrs., then measure.  •Immersing speed: 25±2.5mm/s				
/ W. /	to Soldering	I.R.	More than 10,00	ΟΜΩ	W.C.		N	*Preheating for more than 3.2×2.5mm				
-7	Heat	- 1	more unan rejec	N	~<1 C	OWIT	TAN .	Step	Temperature	Time		
)		Dielectric Strength	In accordance w	vith item No	0.4			1 2	100 to 120°C 170 to 200°C	1 min.		
,0	-1 CO	Appearance	No marking defe	ects	·In	$CO_{D_2}$		10.10.1	citor to the supporting jig (glass	epoxy board) shown		
00	oy.co	Capacitance Change	Within ±2.5%					in Fig. 4.  Perform the 5 cycles according to the 4 heat treatments listed in the following table.				
77		Q	500 min.		M.In.	-1 CO	N	Let sit for 24±2 hrs. at room condition*, then measure.				
<b>K</b> I 1		I.R.	More than 10,00	ΩΜΩ	10	01.		Step 1	Temperature (°C) Min. Operating Temp.±3	Time (min.) 30±3		
14	Temperature Cycle		TW					$ \begin{array}{r}   \hline     2 \\     \hline     3 \\     4 \end{array} $	Room Temp.  Max. Operating Temp.±2  Room Temp.	2 to 3 30±3 2 to 3		
M.	Dielectric Strength In accordance with item No.4					Solder resist  Glass Epoxy Board  Fig. 4						
10	Humidity (Steady State)	Appearance	No marking defe	ects		-TXV.1	00 7.	$M_{II}$	L.W.W.	in COM.		
1		Capacitance Change	Within $\pm 5.0\%$ 350 min. More than $1{,}000M\Omega$					Let the capacitor sit at 40±2°C and relative humidity of 90 to 95%				
15		Q						for 500 ± 2 d/2 hrs.  Remove and let sit for 24±2 hrs. at room condition*, then measure.				
		I.R.										
	W	Dielectric Strength	In accordance w		0.4	WW	100	Y.COMIN WWW.100Y.C				
	V	Appearance	No marking defe	ects	N	WY	111.	Y.Co				
		Capacitance Change	Within ±3.0%	M. I	W	W	MMI	operating ten	of the rated voltage for 1,000 $\stackrel{+}{_{\sim}}$			
16	Life	Q	350 min.	OM.			WW.		let sit for 24±2 hrs. at room co	ondition*, then		
		I.R.	More than 1,000	ΩΜΩ	711		TANK.	measure.  The charge/discharge current is less than 50mA.				
		Dielectric Strength	In accordance with item No.4									

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

## **Chip Monolithic Ceramic Capacitors**



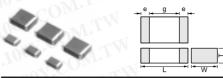
### **Medium Voltage High Capacitance for General Use**

#### ■ Features

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

### 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		Din	nensions (mm	1)	
Fait Number		W	T	е	g min.
GRM188	1.6 ±0.1	$0.8 \pm 0.1$	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		0.7
GRM21B	2.0 ±0.2	1.25 ±0.2	1.25 ±0.2		0.7
GRM31B	3.2 ±0.2	1.6 +0.2	1.25 +0,-0.3		
GRM31C	3.2 <u>1</u> 0.2	1.0 ±0.2	1.6 ±0.2		1.2
GRM32Q	3.2 ±0.3	2.5 ±0.2	1.5 +0,-0.3	0.3 min.	1.2
GRM32D	3.2 ±0.3	2.5 ±0.2	2.0 +0,-0.3		
GRM43Q	4.5 ±0.4	3.2 ±0.3	1.5 + 0, -0.3		22
GRM43D	4.5 ±0.4	3.2 ±0.3	2.0 + 0, -0.3		2.2
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.
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.
GRM31BR72J152KW01L	DC630	X7R (EIA)	1500pF ±10%	3.2	1.6	1.25	1.2	0.3 min.

Continued from the preceding page.

Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode (mm)
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.

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No.	Ite	em	Specifications	ON	Test Method		
1	Operating Temperatu	ıre Range	-55 to +125℃	COMITIN	_		
2	Appearan	nce	No defects or abnormalities	Visual inspection			
3	Dimensio	ns	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 F	Resistance	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ		ance should be measured with DC500±50V of rated voltage: DC250V) and within 60±6		
6	Capacitar	nce	Within the specified tolerance	1 100			
7	Dissipation Factor (D		0.025 max.	<ul> <li>The capacitance/D.F. should be measured at a frequency 1±0.2kHz and a voltage of AC1±0.2V(r.m.s.)</li> </ul>			
1.	LM	_	MAN TOOK CONTIN	The capacitance measure specified in Table.	asurement should be made at each step		
	TW		W. 1001. CONT. I.	Step	Temperature (℃)		
	Carrier Marie		Cap. Change	1 2	25±2		
8	Capacitar Temperati		Within ±15%	3	Min. Operating Temp.±3 25±2		
,	Character		(Temp. Range: −55 to +125°C)	4	Max. Operating Temp.±2		
	Onardotor	131103	(rompringing)	5	25±2		
	$O^{M,T}$		WWW.1001.COM.TW	•Pretreatment Perform a heat treat let sit for 24±2 hrs. a	ment at $150^{\pm}_{10}^{\circ}$ °C for $60\pm5$ min. and then at room condition*.		
9	Adhesive of Termin		No removal of the terminations or other defect should occur.	in Fig. 1. Then apply 10N force The soldering should	to the testing jig (glass epoxy board) shown to the testing jig (glass epoxy board) shown to the testing jig (glass epoxy board) shown to the direction of the arrow.  The direction of the ar		
	.10	Appearance	No defects or abnormalities		to the test jig (glass epoxy board).		
	N.100	Capacitance	Within the specified tolerance		be subjected to a simple harmonic motion ide of 1.5mm, the frequency being varied		
10	Vibration Resistance		0.025 max.	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 applie for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.).			
	MAM	D.F.	COM: TW WWW.100Y.C.		1110		

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa JUNIA TONI TIN WWW.100Y.C





No.	Ite	em	$^{1}$ CO $_{M^{1}}$ ,	S	pecification	ns		$0^{MT}$	Test Method			
11 W TY TY	Deflection		No cracking or marking defects should occur.						Solder the capacitor to the testing jig (glass epoxy board) she 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.  20 50 Pressurizing speed: 1.0mm/s Pressurize  Pressurize  Capacitance meter  (in mm)  Fig. 3			
1	L/A		1	001.	1 lg. 2		NY '	- XV 100 x				
12	Solderab Terminat		75% of the terminations are to be soldered evenly and continuously.					rosin (JIS-K-5 Immerse in so Immersing sp	capacitor in a solution of ethano 1902) (25% rosin in weight propoled solution for 2±0.5 sec. 1905 eed: 25±2.5mm/s 1907 ler: 245±5°C Lead Free Solder 1908 235±5°C H60A or H63A Eu	oortion).		
٦(	Mr.	Appearance	No marking de	fects	-1 CO	NI.		Preheat the c	apacitor at 120 to 150℃* for 1 i			
	OM.T	Capacitance Change	Within ±10%	W.100	WY.CC	M.T.	N	sec. Let sit at	room condition* for 24±2 hrs., peed: 25±2.5mm/s			
	cOM	D.F.	0.025 max.					<ul> <li>Pretreatment</li> </ul>	it 1			
13	Resistance to Soldering Heat	I.R.	$C \ge 0.01 \mu F$ : More than $100 M \Omega$ • $\mu F$ $C < 0.01 \mu F$ : More than $10,000 M \Omega$						eat treatment at 150±₁0°C for £2 hrs. at room condition*.	60±5 min. and then		
		$V_{I,I}$	In accordance with item No.4					*Preheating f	or more than 3.2×2.5mm			
	N.C	Dielectric Strength						Step 1 2	Temperature 100 to 120°C 170 to 200°C	Time 1 min. 1 min.		
36	W 7.	Annogrange	No morting do	footo	W.P	- 00	Maria	Fix the conce	itor to the supporting iig (gloss	anavy haard) shown		
	00X.c	Appearance Capacitance Change	No marking de Within ±7.5%	iecis	WW.10	ON C	OM.TW	Fix the capacitor to the supporting jig (glass epoxy board) show in Fig. 4.  Perform the 5 cycles according to the 4 heat treatments listed in the following table.				
	700 -	D.F.	0.025 max.		TANIN .	47 (	OM.	Let sit for 24±2 hrs. at room condition*, then measure.				
	-1100		C≧0.01μF: Mo	re than 100	MΩ • μF	1007.	TMA	Step	Temperature (°C)	Time (min.)		
	N.T.	I.R.	C<0.01μF: Mo					1	Min. Operating Temp.±3	30±3		
	XX 101		M. I.		-11	N.100	COM.	2 3	Room Temp.  Max. Operating Temp.±2	2 to 3 30±3		
	A (	N.V.	WT					4	Room Temp.	2 to 3		
14	Temperature Cycle	Dielectric Strength	In accordance	with item N	0.4				eat treatment at 150± <sub>1</sub> 8°C for 152 hrs. at room condition*.	60±5 min. and then		
	WV	N.F	OX.CON					COM.T	Glass Epoxy Board  Fig. 4			
	W	Appearance	No marking de	fects		11 4	-XI 100	.Mo	I. M.	7N.100		
	V	Capacitance Change	Within ±15%	om.T	N	W	VIV. 100	for 500 +24 h		•		
15	Humidity (Steady	D.F.	0.05 max.					Remove and measure.	let sit for 24±2 hrs. at room co	naition", then		
13	State)	I.R.	C≧0.01μF: Mo C<0.01μF: Mo		4.0	_	NNN.	Pretreatment     Perform a he	eat treatment at 150±₁8°C for	60±5 min. and then		
		Dielectric Strength	In accordance	with item N	0.4			let sit for 24∃	£2 hrs. at room condition*.			

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.CO



No.	Item		Specifications	Test Method				
	-431	Appearance	No marking defects	Apply 120% of the rated voltage (150% of the rated voltage in				
		Capacitance Change	Within ±15% (rated voltage: DC250V, DC630V) Within ±20% (rated voltage: DC1kV)	case of rated voltage: DC250V, 110% of the rated voltage in case of rated voltage: DC1kV) for 1,000 ± 48 hrs. at maximum				
16	Life	D.F.	0.05 max.	operating temperature ±3°C. Remove and let sit for 24 ±2 hrs. room condition*, then measure.				
10	TV.	I.R.	C≧0.01μF: More than 10MΩ • μF C<0.01μF: More than 1,000MΩ	The charge/discharge current is less than 50mA.  • Pretreatment				
I		Dielectric Strength	In accordance with item No.4	Apply test voltage for 60±5 min. at test temperature. Remove and let sit for 24±2 hrs. at room condition*.				
		Appearance	No marking defects	W.I COM.				
N	Humidity Loading	Capacitance Change	Within ±15%	Apply the rated voltage at 40±2°C and relative humidity of 90 to 95% for 500±26 hrs.				
17	(Application:	D.F.	0.05 max.	Remove and let sit for 24±2 hrs. at room condition*, then measure.				
Ţ	DC250V, DC630V	I.R. $C≥0.01μF$ : More than $10MΩ • μF$ C<0.01μF: More than $1,000MΩ$		Pretreatment     Apply test voltage for 60±5 min. at test temperature.				
1:	item) -	Dielectric Strength	In accordance with item No.4	Remove and let sit for 24±2 hrs. at room condition*.				

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.COM.TW WWW.100Y.C

This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering

## **Chip Monolithic Ceramic Capacitors**



### **Only for LCD Backlight Inverter Circuit**

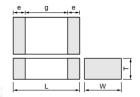
#### ■ Features

- 1. Low-loss and suitable for high frequency circuits
- 2. Murata's original internal electrode structure realizes high flash-over voltage.
- A new monolithic structure for small, surfacemountable devices capable of operating at high voltage levels.
- Sn-plated external electrodes realize good solderability.
- 5. Only for reflow soldering
- 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.



Ideal for use as the ballast in LCD backlight inverter.





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

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	COG (EIA)	5.0 ±0.5pF	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F100JW01L	DC3150	COG (EIA)	10 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F120JW01L	DC3150	COG (EIA)	12 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F150JW01L	DC3150	COG (EIA)	15 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F180JW01L	DC3150	COG (EIA)	18 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F220JW01L	DC3150	COG (EIA)	22 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F270JW01L	DC3150	COG (EIA)	27 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F330JW01L	DC3150	COG (EIA)	33 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F390JW01L	DC3150	COG (EIA)	39 ±5%	4.5	2.0	1.0	2.9	0.3 min.
GRM42A5C3F470JW01L	DC3150	COG (EIA)	47 ±5%	4.5	2.0	1.0	2.9	0.3 min.

Vo.	Item	Specifications	Test Method
1	Operating Temperature Range	-55 to +125℃	CONT.
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 10,000M $\Omega$	The insulation resistance should be measured with DC500± and within 60±5 sec. of charging.
6	Capacitance	Within the specified tolerance	The capacitance/Q should be measured at a frequency of
7	Q	1,000 min.	1±0.2MHz and a voltage of AC0.5 to 5V(r.m.s.)
		WW.100Y.COM.TW WW	The capacitance measurement should be made at each ste specified in Table.
. 7	Capacitance	Temp. Coefficient	Step Temperature (°C)
	Temperature	0±30 ppm/°C (Temp. Range: +25 to +125°C)	1 25±2 2 Min. Operating Temp.±3
7.	Characteristics	0+30, -72 ppm/℃ (Temp. Range: -55 to +25℃)	3 25±2
M		M. TAN TON TOWN THE	4 Max. Operating Temp.±2
) IV		WWW. TOOK CO. T. T.W. A	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) sl 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.  Glass Epoxy Board
00	Appearance	No defects or abnormalities	Fig. 1  Solder the capacitor to the test jig (glass epoxy board).
110	Vibration Resistance	1,000 min.	The capacitor should be subjected to a simple harmonic monomode having a total amplitude of 1.5mm, the frequency being variuniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should 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.).  Solder resist  Cu  Glass Epoxy Board
V	MAN TOOX	No cracking or marking defects should occur.	Solder the capacitor to the testing jig (glass epoxy board) sh
111	Deflection	Dimension (mm)	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 unifo and free of defects such as heat shock.  20 50 Pressurizing Speed: 1.0mm/s Pressurize  R230 Fressurize  Capacitance meter  (in mm)
		W.100X.COW.TW WAY	Fig. 3
			Continued on the following pa





	Solderabi Terminati		75% of the terminations are to be soldered evenly and continuously.	rosin (JIS-K-5 solder solution Immersing sp	nerse the capacitor in a solution of ethanol (JIS-K-8101) In (JIS-K-5902) (25% rosin in weight proportion). Immers Ider solution for 2±0.5 sec. Idersing speed: 25±2.5mm/s Inp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5 235±5°C H60A or H63A Eutectic Solder		
		Appearance	No marking defects		Preheat the capacitor as table.		
I		Capacitance Change	Within ±2.5%	Let sit at roon	capacitor in solder solution at 2 n condition* for 24±2 hrs., then speed: 25±2.5mm/s		
	Resistance	Q	1,000 min.	•ininersing s	speed. 25±2.5mm/s		
	o Soldering leat	I.R.	More than 10,000M $\Omega$	*Preheating	eating		
~ <b>V</b> J		5: 15T	M. S. COM	Step	Temperature	Time	
7.		Dielectric Strength	In accordance with item No.4	3 1	100 to 120℃	1 min.	
TV	N	Strength	M. 1001.CO. ILM	2	170 to 200℃	1 min.	
	×XI	Appearance	No marking defects		itor to the supporting jig (glass	epoxy board) show	
$\Lambda T$		Capacitance Change	Within ±2.5%	in Fig. 4. Perform the 5 the following	cycles according to the 4 hear	t treatments listed in	
Mi		Q	1,000 min.		£2 hrs. at room condition*, then	n measure.	
- 1	WTI	I.R.	More than $10,000M\Omega$	Step	Temperature (°C)	Time (min.)	
ON	7.	1	WINN.	1	Min. Operating Temp.±3	30±3	
14	Temperature		M. 100 r. COM. 1	3	Room Temp.  Max. Operating Temp.±2	2 to 3 30±3	
14 C	Cycle		WINTERSTON	4	Room Temp.	2 to 3	
1.CX	COM:	Dielectric Strength	In accordance with item No.4	MMA	Solde Glass Epoxy Board  Fig. 4	er resist	
002	1.00	Appearance	No marking defects		111.100 1. CON	1.1	
100	y.C(	Capacitance Change	Within ±5.0%	Let the capac	itor sit at 40±2℃ and relative h	numidity of 90 to 95	
	Humidity (Steady	Q	350 min.	for 500 +24 h	rs.		
~ 7 1 1 3	State)	I.R.	More than 1,000M $\Omega$	measure.	let sit for 24±2 hrs. at room co	indition*, then	
W.1	$100 \chi$	Dielectric Strength	In accordance with item No.4	M N			
N	1.100	Appearance	No marking defects		WW. POW	COM	
N. C.	N.100	Capacitance Change	Within ±3.0%		of the rated voltage for 1,000 ±	<sup>48</sup> hrs. at maximum	
	Life	Q	350 min.		let sit for 24±2 hrs. at room co	ndition*, then	
16 L	LIIC	100	More than 1,000M $\Omega$	measure.			
16 L		I.R.		The charge/discharge current is less than 50mA.			

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.CO WWW.100Y.COM.TW

## **Chip Monolithic Ceramic Capacitors**



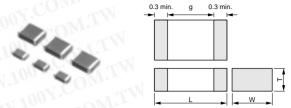
## Only for Information Devices/Tip & Ring

#### ■ Features

- These items are designed specifically for telecommunications devices (IEEE802.3) in Ethernet LAN and primary-secondary coupling for DC-DC converter.
- A new monolithic structure for small, high capacitance capable of operating at high voltage levels
- 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

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



Dont Number	Dimensions (mm)							
Part Number	CLVI.	W	T	g min.				
GR442Q	4.5 ±0.3	2.0 ±0.2	1.5 +0, -0.3					
GR443D	4.5.10.4	3.2 ±0.3	2.0 +0, -0.3	2.5				
GR443Q	4.5 ±0.4	3.2 ±0.3	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 (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.

lo.	Item	Specifications	WT	Test Method			
1	Operating Temperature Range	-55 to +125℃	ON				
2	Appearance	No defects or abnormalities	Visual inspection				
3	Dimensions	Within the specified dimensions	Using calipers				
	MMM	100X.COM.TW WWW.100	No failure should be observed when voltage in table is applied between the terminations, provided the charge/discharge currer is less than 50mA.				
4	Dielectric Strength	No defects or abnormalities	Rated Voltage	Test Voltage	Time		
		W.TOO T. COM: IT. WWW.T	DC2kV	120% of the rated voltage AC1500V(r.m.s.)	60±1 sec. 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 $6{,}000M\Omega$	The insulation resistance should be measured with DC500±50 and within 60±5 sec. of charging.				
7	Capacitance	Within the specified tolerance	The conscit-	E should be massived at a fe	oguora: -f		
8	Dissipation Factor (D.F.)	0.025 max.	The capacitance/D.F. should be measured at a frequency of 1±0.2kHz and a voltage of AC1±0.2V(r.m.s.)				
	MIN	WWW.100Y.COM.TW V	The capacitance measurement should be made at each specified in Table.		at each step		
	)N. T. W.	WWW. OOY.CO. TW	Step	Temperature (%	C)		
	Capacitance	Cap. Change	1 25±2 2 Min. Operating Temp.±3				
9	Temperature	within ±15%	3	25±2	•		
	Characteristics	(Temp. Range: −55 to +125°C)	4 Max. Operating Temp.±2 5 25±2				
) \ 	COM.TW	WWW.100Y.COM.TW	•Pretreatment Perform a heat treatment at 150 ± °C for 60±5 min. and ther let sit for 24±2 hrs. at room condition*.				
10	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	in Fig. 1. Then apply 10N ford The soldering shoul	r to the testing jig (glass epox- ce in the direction of the arrow d be done using the reflow m d with care so that the solderi such as heat shock.	v. ethod and		
	N.100Y.CO	M.TW WWW.100Y.COM.T		10N, 10±1s Glass Epoxy Boa	ard		
Ń	41.100 1.	M. I WWW. 100 COM.	TV	Fig. 1	ONL		
	Appearance	No defects or abnormalities		to the test jig (glass epoxy b			
	Capacitance	Within the specified tolerance		d be subjected to a simple ha tude of 1.5mm, the frequency			
1	Vibration Resistance	COW.TW WWW.100X.CO	uniformly between t frequency range, fro traversed in approxi	he approximate limits of 10 ar om 10 to 55Hz and return to 1 mately 1 min. This motion sho in each of 3 mutually perper	nd 55Hz. The 0Hz, should be ould be applied		
	D.F.	0.025 max.		Solder resis	100X.C.		

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35°c, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa .JokF WWW.100Y.COM



Continued from the preceding page Specifications No Item Test Method No cracking or marking defects should occur. Solder the capacitor to the testing jig (glass epoxy board) shown 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. Pressurizing speed: 1.0mm/s Deflection 12 Pressurize Dimension (mm) L×W (mm) а b C d 4 5X2 0 35 7 0 24 Flexure=1 4.5X3.2 3.5 7.0 3.7 1.0 Capacitance mete 5.7×5.0 8.0 5.6 (in mm) 45 Fig. 2 Fig. 3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Solderability of Immerse in solder solution for 2±0.5 sec. 75% of the terminations are to be soldered evenly and continuously. Immersing speed: 25±2.5mm/s Termination Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder No marking defects Preheat the capacitor as table. Appearance Immerse the capacitor in solder solution at 260±5℃ for 10±1 Capacitance Within +10% sec. Let sit at room condition\* for 24±2 hrs., then measure. Change •Immersing speed: 25±2.5mm/s 0.025 max. D.F Pretreatment Perform a heat treatment at 150 ± 100 °C for 60±5 min. and then Resistance I.R. More than  $1,000M\Omega$ let sit for 24±2 hrs. at room condition\*. to Soldering Heat \*Preheating Dielectric Step Temperature In accordance with item No.4 Time Strength 100 to 120℃ 1 min 170 to 200℃ 2 1 min No marking defects Fix the capacitor to the supporting jig (glass epoxy board) shown Appearance in Fig. 4. Capacitance Perform the 5 cycles according to the 4 heat treatments listed in Within ±15% Change the following table D.F. 0.05 max. Let sit for 24±2 hrs. at room condition\*, then measure. Time (min.) Temperature (°C) Step More than  $3,000M\Omega$ I.R. Min. Operating Temp.±3 30±3 2 Room Temp. 2 to 3 3 Max. Operating Temp.±2  $30 \pm 3$ 4 Room Temp. 2 to 3 Temperature 15 Pretreatment Cycle Perform a heat treatment at 150±10°C for 60±5 min. and then let sit for 24±2 hrs. at room condition\*. Dielectric In accordance with item No.4 Strength m m m Cu Glass Epoxy Board Fig. 4 Appearance No marking defects Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% Capacitance for 500 ±24 hrs. Within +15% Change Humidity Remove and let sit for 24±2 hrs. at room condition\*, then (Steady D.F 0.05 max measure. Pretreatment State) I.R. More than  $1,000M\Omega$ Perform a heat treatment at 150<sup>+</sup><sub>10</sub> °C for 60±5 min. and then Dielectric let sit for 24±2 hrs. at room condition\*.

In accordance with item No.4

Strength



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

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### **Specifications and Test Methods**

No.	It	em	Specifications	Test Method
	-788	Appearance	No marking defects	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		Capacitance Change	Within ±20%	Apply 110% of the rated voltage for 1,000 ±48 hrs. at maximu operating temperature ±3°C. Remove and let sit for 24 ±2 hrs room condition*, then measure.
17	Life	D.F.	0.05 max.	The charge/discharge current is less than 50mA.
	V	I.R.	More than 2,000M $\Omega$	Pretreatment     Apply test voltage for 60±5 min. at test temperature.
	4	Dielectric Strength	In accordance with item No.4	Remove and let sit for 24±2 hrs. at room condition*.

## **Chip Monolithic Ceramic Capacitors**



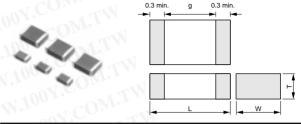
### **Only for Camera Flash Circuit**

#### ■ 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



Doub Number	Dimensions (mm)					
Part Number		W	Т	g min.		
GR731A	CON	L.O. 32	1.0 +0, -0.3			
GR731B	3.2 ±0.2	1.6 ±0.2	1.25 +0, -0.3	1.2		
GR731C		11.1	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	DC350	Mos.	10000 ±10%	3.2	1.6	1.0	1.2	0.3 min.
GR731AW0BB153KW01D	DC350	10.Y.L	15000 ±10%	3.2	1.6	1.0	1.2	0.3 min.
GR731BW0BB223KW01L	DC350	- < CO	22000 ±10%	3.2	1.6	1.25	1.2	0.3 min.
GR731BW0BB333KW01L	DC350	100 5.	33000 ±10%	3.2	1.6	1.25	1.2	0.3 min.
GR731CW0BB473KW03L	DC350	00-1.00	47000 ±10%	3.2	1.6	1.6	1.2	0.3 min.

Note

• This PDF catalog is downloaded from the website of Murata Manufacturing co., ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### **Specifications and Test Methods**

lo. Item			Test Method			
Operating Temperature	Range	−55 to +125°C	.CONT.TW -			
Appearance No defects or abnormalities		Visual inspection				
Dimensions	-311	Within the specified dimensions	Using calipers			
Dimensions  Dielectric Strength		No defects or abnormalities		bserved when DC500V is applied between to 5 sec., provided the charge/discharge mA.		
Insulation Res (I.R.)	sistance	C≧0.01μF: More than 100MΩ • μF C<0.01μF: More than 10,000MΩ	The insulation resistance should be measured with DC250± and within 60±5 sec. of charging.			
Capacitance	e	Within the specified tolerance	OUX.CO.			
Dissipation Factor (D.F.)		0.025 max.		F. should be measured at a frequency of age of AC1±0.2V(r.m.s.)		
N	MAN.100X'COM', MA		The capacitance measurement should be made at each step specified in Table.			
		INN ON COM THE WY	Step	Temperature (℃)		
		Can Change	1 1 0	25±2		
				Min. Operating Temp.±3		
	mperature Within +23 % (No DC hias)		4 3 3 6 6	25±2		
Adhesive Strength of Termination				Max. Operating Temp.±2 25±2		
		WWW.100Y.COM.TW	•Pretreatment Perform a heat treatment at 150±9₀℃ for 60±5 min. and then let sit for 24±2 hrs. at room condition*.			
		No removal of the terminations or other defect should occur.	Solder the capacitor to the testing jig (glass epoxy board) sho 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.  Glass Epoxy Board  Fig. 1			
Ar	ppearance	No defects or abnormalities	Solder the capacitor	to the test jig (glass epoxy board).		
- 47		Within the specified tolerance	The capacitor should	d be subjected to a simple harmonic motion		
Vibration Resistance D	pration		uniformly between the frequency range, from traversed in approximate tr			
	Temperature Appearance Dimensions Dielectric S Insulation Res (I.R.) Capacitance Dissipation Factor (D.F.  Capacitance Temperature Characterist  Adhesive St of Terminati  A C Vibration Resistance	Temperature Range Appearance Dimensions  Dielectric Strength Insulation Resistance (I.R.) Capacitance Dissipation Factor (D.F.)  Capacitance Temperature Characteristics  Adhesive Strength of Termination  Appearance Capacitance Capacitance	Temperature Range	Temperature Range         -55 to +125 C           Appearance         No defects or abnormalities         Visual inspection           Dimensions         Within the specified dimensions         Using calipers           Dielectric Strength         No defects or abnormalities         No failure should be the terminations for current is less than 5 current is less than 6 current is less than 5 current is less than 6 current is less than 5 current is less than 6 current is less		

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

WWW.100Y.COM.TW Continued on the following page.



Continued from the preceding page Specifications No Item Test Method Solder the capacitor to the testing jig (glass epoxy board) shown No cracking or marking defects should occur. 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. Pressurizing speed: 1.0mm/s ↓ Pressurize Deflection t: 1.6 Dimension (mm) LXW (mm) d Flexure=1 3 2X1 6 22 2.0 1.0 5.0 Capacitance meter Fig. 2 (in mm) Fig. 3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in solder solution for 2±0.5 sec. Solderability of 75% of the terminations are to be soldered evenly and continuously. Immersing speed: 25±2.5mm/s Termination Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder No marking defects Appearance Preheat the capacitor at 120 to 150°C\* for 1 min. Capacitance Within +10% Change Immerse the capacitor in solder solution at 260±5℃ for 10±1 Resistance sec. Let sit at room condition\* for 24±2 hrs., then measure. D.F. 0.025 max •Immersing speed: 25±2.5mm/s to Soldering C≥0.01μF: More than 100MΩ • μF Pretreatment Heat LR C<0.01 $\mu$ F: More than 10,000M $\Omega$ Perform a heat treatment at 150±10 °C for 60±5 min. and then let sit for 24±2 hrs. at room condition\*. Dielectric In accordance with item No.4 Strength No marking defects Fix the capacitor to the supporting jig (glass epoxy board) shown Appearance in Fig. 4. Capacitance Within ±7.5% Perform the 5 cycles according to the 4 heat treatments listed in Change the following table. D.F. 0.025 max. Let sit for 24±2 hrs. at room condition\*, then measure. Time (min.) Step Temperature (°C) C≥0.01μF: More than 100MΩ • μF I.R. Min. Operating Temp.±3 30±3 C<0.01 $\mu$ F: More than 10,000M $\Omega$ 1 2 Room Temp. 2 to 3 30±3 3 Max. Operating Temp.±2 4 Room Temp 2 to 3 Temperature 14 Cycle Pretreatment Perform a heat treatment at 150 <sup>+</sup><sub>-10</sub> °C for 60±5 min. and then let sit for 24±2 hrs. at room condition\*. Dielectric In accordance with item No.4 Strength 722 7// 777 777 Solder resis **M M M M -**Fig. 4 Appearance No marking defects Let the capacitor sit at 40±2℃ and relative humidity of 90 to 95% Capacitance Within ±15% Change Humidity Remove and let sit for 24±2 hrs. at room condition\*, then D.F. 0.05 max. (Steady measure. C≥0.01μF: More than 10MΩ • μF State) I.R. C<0.01 $\mu$ F: More than 1,000M $\Omega$ Perform a heat treatment at 150 ± 100 °C for 60±5 min. and then

In accordance with item No.4

Dielectric

Strenath

Continued on the following page.

let sit for 24±2 hrs. at room condition\*.



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

lo. It	em	Specifications	Test Method		
	Appearance	No marking defects	N COM.		
WW	Capacitance Change	Within ±15%	Apply DC350V for 1,000 <sup>±48</sup> hrs. at maximum operating temperature ±3°C. Remove and let sit for 24 ±2 hrs. at room		
16 Life	D.F.	0.05 max.	condition*, then measure.  The charge/discharge current is less than 50mA.		
Life	I.R.	C≥0.01μF: More than $10M\Omega \cdot \mu F$ C<0.01μF: More than $1,000M\Omega$	Pretreatment     Apply test voltage for 60±5 min. at test temperature.		
	Dielectric Strength	In accordance with item No.4	Remove and let sit for 24±2 hrs. at room condition*.		
	Appearance	No marking defects	N.110 COM.		
N	Capacitance Change	Within ±15%	Apply the rated voltage at $40\pm2^{\circ}$ C and relative humidity of 90 to 95% for $500\pm^{20}$ hrs.		
Humidity	D.F.	0.05 max.	Remove and let sit for 24±2 hrs. at room condition*, then measure.		
Loading	I.R.	C≥0.01μF: More than 10M $\Omega$ • μF C<0.01μF: More than 1,000M $\Omega$	Pretreatment     Apply test voltage for 60±5 min. at test temperature.		
LTW	Dielectric Strength	In accordance with item No.4	Remove and let sit for 24±2 hrs. at room condition*.		

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.COM.TW WWW.100Y.C

## **Chip Monolithic Ceramic Capacitors**



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

#### ■ Features

- 1. Chip monolithic ceramic capacitor for AC lines.
- A new monolithic structure for small, high capacitance capable of operating at high voltage levels
- 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.

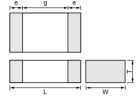
### ■ Applications

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	Dimensions (mm)							
Part Number	Lan	W	Т	e min.	g min.			
GA242Q	4.5 ±0.3	2.0 ±0.2	1.5 +0, -0.3					
GA243D	45104	3.2 +0.3	2.0 +0, -0.3	0.3	2.5			
GA243Q	4.5 ±0.4	3.2 ±0.3	1.5 +0, -0.3	0.3				
GA255D	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 (mm)
GA242QR7E2471MW01L	AC250 (r.m.s.)	X7R (EIA)	470pF ±20%	4.5	2.0	1.5	2.5	0.3 min.
GA242QR7E2102MW01L	AC250 (r.m.s.)	X7R (EIA)	1000pF ±20%	4.5	2.0	1.5	2.5	0.3 min.
GA243QR7E2222MW01L	AC250 (r.m.s.)	X7R (EIA)	2200pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243QR7E2332MW01L	AC250 (r.m.s.)	X7R (EIA)	3300pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243DR7E2472MW01L	AC250 (r.m.s.)	X7R (EIA)	4700pF ±20%	4.5	3.2	2.0	2.5	0.3 min.
GA243QR7E2103MW01L	AC250 (r.m.s.)	X7R (EIA)	10000pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243QR7E2223MW01L	AC250 (r.m.s.)	X7R (EIA)	22000pF ±20%	4.5	3.2	1.5	2.5	0.3 min.
GA243DR7E2473MW01L	AC250 (r.m.s.)	X7R (EIA)	47000pF ±20%	4.5	3.2	2.0	2.5	0.3 min.
GA255DR7E2104MW01L	AC250 (r.m.s.)	X7R (EIA)	0.10µF ±20%	5.7	5.0	2.0	3.2	0.3 min.

No.	Ite	em	Specifications	TW	Test Met	hod		
1	Operating Temperatu	ure Range	-55 to +125℃	ONLTW	_			
2	Appearar	nce	No defects or abnormalities	Visual inspection				
3	Dimensio	ns 1	Within the specified dimensions	Using calipers				
4	Dielectric	: Strenath	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.				
			W.100Y.COM.TW WWW.1	C≥10,000 C<10,000	pF	Test Voltage AC575V (r.m.s.) AC1500V (r.m.s.)		
5	Insulation F	Resistance	More than $2,000\text{M}\Omega$		The insulation resistance should be measured with DC5 and within 60±5 sec. of charging.			
6	Capacita	nce	Within the specified tolerance	The				
7	Dissipation Factor (D		0.025 max.	1±0.2kHz and a voltag		asured at a frequency of 2V (r.m.s.)		
		M.M.M.TOOX.COM.T.M.		The capacitance meas specified in Table.	surement show	uld be made at each step		
			COM.	Step	Те	mperature (°C)		
	Capacitar	nce	Cap. Change	1 2	Min O	25±2 perating Temp.±3		
8	Temperat		Within ±15%	3		25±2		
	Character	ristics	(Temp. Range: −55 to +125℃)	4	Max. C	perating Temp.±2		
	TI		WW. 1007.0 M.TW	5	-01	25±2		
	COM.TW		WWW.100Y.COM.TW	Pretreatment     Perform a heat treatment let sit for 24±2 hrs. at		n8°C for 60±5 min. and then on*.		
9	Discharge Test (Application: Nominal Capacitance C<10,000pF)	Appearance	No defects or abnormalities	the capacitor (Cd) cha	rged at DC vo	es at 5 sec. intervals from oltage of specified.  R1  Ct R2  st Cd: 0.001µF  R3: Surge resistance		
10	Adhesive Strength		nesive Strength   Termination   No removal of the terminations or other defects should occur.		in the directio the reflow me	g (glass epoxy board) shown n of the arrow. The soldering thod and should be lering is uniform and free of		
	- VV.		COM.1		-	10N, 10±1s		
			W. 1007.	W.I.A.	uum	Glass Epoxy Board		
	NNN	100	COM. TA WAYN. 100 X'CO	M.TW	Fig. 1	Class Epoxy Board		
	WW	Appearance	No defects or abnormalities	Solder the capacitor to				
	-150	Capacitance	Within the specified tolerance			o a simple harmonic motion		
11	Vibration Resistance	MM;	100X'COW'LA MAM'1002	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 traversed in approximately 1 min. This motion should be apple for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.).				
	Resistance D.F.		0.025 max.			Solder resist		

<sup>\* &</sup>quot;Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa --e nun



Specifications No Item Test Method Solder the capacitor to the testing jig (glass epoxy board) shown No cracking or marking defects should occur. 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.

> 100 Dimension (mm) LXW (mm) d а С 4.5×2.0 3.5 7.0 4.5X3.2 3.5 7.0 3.7 1.0 5.7×5.0 4.5 8.0 5.6

> > Fig. 2

20 50 Pressurizing speed: 1.0mm/s ↓ Pressurize Flexure=1 Capacitance mete (in mm) Fig. 3

13	Solderability of Termination	75% of the terminations are to be soldered evenly and continuously.	I I

No marking defects

Within ±15%

Continued from the preceding page

Appearance Capacitance

Change

Dielectric

Strength

**Appearance** 

Capacitance

Dielectric

Strength

Change

D.F.

I.R.

Temperature

Cycle

16

Humidity

Deflection

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	D.F.	0.05 max.
		I.R.	More than 1,000M $\Omega$
) Y .	COM	Dielectric Strength	In accordance with item No.4
00	~O <sup>1</sup>	Appearance	No marking defects
	7.00	Capacitance Change	Within ±10%
	Davistance	D.F.	0.025 max.
15	Resistance to Soldering	I.R.	More than 2,000M $\Omega$
	Heat	$CO_{Mr}$	TWWW.TOOX.COM. TW

In accordance with item No.4

No marking defects

More than  $2,000M\Omega$ 

In accordance with item No.4

Within ±15%

0.05 max.

The capacitor should be subjected to 40±2°C, relative humidity of 90 to 98% for 8 hrs., and then removed in room condition\* for 16 hrs. until 5 cycles.

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±10 °C for 60±5 min. and then let sit for 24±2 hrs. at room condition\*. \*Preheating

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

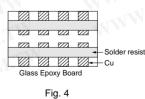
Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4. Perform the 5 cycles according to the 4 heat treatments listed in

the following table. Let sit for 24±2 hrs. at room condition\*, then measure.

Step	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

#### Pretreatment

Perform a heat treatment at 150 ± 10 °C for 60±5 min. and then let sit for 24±2 hrs. at room condition\*.



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



### **Specifications and Test Methods**

No.	Ite	em	Specifications	Test Method			
	-431	Appearance	No marking defects	COMP			
	Humidity	Capacitance Change	Within ±15%	Let the capacitor sit at 40±2°C and relative humidity of 90 to 95 for 500±26 hrs.  Remove and let sit for 24±2 hrs. at room condition*, then			
17	(Steady	D.F.	0.05 max.	measure.			
	State)	I.R.	More than 1,000MΩ	•Pretreatment  Perform a heat treatment at 150 <sup>+</sup> <sup>0</sup> <sup>∞</sup> c for 60±5 min. and the			
		Dielectric Strength	In accordance with item No.4	let sit for 24±2 hrs. at room condition*.			
	Appearance No marking defects		No marking defects	Apply voltage and time as Table at maximum operating tempera			
N		Capacitance Change Within ±20%		±3°C. Remove and let sit for 24±2 hrs. at room condition*, the measure. The charge / discharge current is less than 50mA.			
1		D.F.	0.05 max.	Nominal Capacitance Test Time Test Voltage C≥10,000pF 1,000±48 hrs. AC300V (r.m.s.)			
18	Life	I.R.	More than 1,000M $\Omega$	C<10,000pF 1,000 6 fils. AC500V (r.m.s.) 1,500 4 8 hrs. AC500V (r.m.s.) 1			
		Dielectric Strength	In accordance with item No.4	* 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*.			
12	WT	Appearance	No marking defects	W TIOOLO TLIN			
O		Capacitance Change	Within ±15%	Apply the rated voltage at 40±2°C and relative humidity of 90 t 95% for 500±20 hrs.  Remove and let sit for 24±2 hrs. at room condition*, then			
19	9 Humidity Loading D.F.		0.05 max.	measure.			
			More than 1,000MΩ	Pretreatment     Apply test voltage for 60±5 min. at test temperature.			
Dielectric Strength			In accordance with item No.4	Remove and let sit for 24±2 hrs. at room condition*.			

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126

## **Chip Monolithic Ceramic Capacitors**



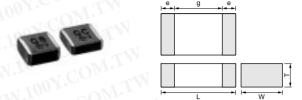
### Safety Standard Recognized Type GC (UL, IEC60384-14 Class X1/Y2)

#### ■ 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
- 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)						
Part Number	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	
VDE	IEC 60384-14 EN 60384-14	COM:	
BSI	EN 60065 (14.2) IEC 60384-14 EN 60384-14	X1, Y2	AC250V (r.m.s.)
SEMKO	IEC 60384-14 EN 60384-14	OON. COM.	L.M.
ESTI	EN 60065 IEC 60384-14	TOO T. COM	

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	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC151KY02L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC221KY02L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GC331KY02L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	5.7	5.0	2.0	4.0	0.3 min.

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## **Chip Monolithic Ceramic Capacitors**



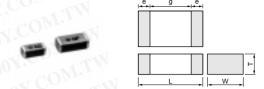
### Safety Standard Recognized Type GD (IEC60384-14 Class Y3)

#### ■ Features

- Available for equipment based on IEC/EN60950 and UL1950
- 2. The type GD can be used as a Y3-class capacitor.
- 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

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



- X								
Part Number	Dimensions (mm)							
Part Number	L	W	T	e min.	g min.			
GA342A	1 CO 5		1.0 +0, -0.3					
GA342D	4.5 ±0.3	2.0 ±0.2	2.0 ±0.3					
GA342Q	-1 CO		1.5 +0, -0.3	0.3	2.5			
GA343D	4.5 ±0.4	3.2 +0.3	2.0 +0, -0.3					
GA343Q	4.5 ±0.4	3.2 ±0.5	1.5 +0, -0.3					

### ■ Standard Recognition

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

**Applications** 

Size	Switching power supplies	Communication network devices such as a modem	
4.5×3.2mm and under	x 100 7.	0	

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	AC250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD120JY02L	AC250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD150JY02L	AC250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD180JY02L	AC250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGD220JY02L	AC250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGD270JW31L	AC250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD330JW31L	AC250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD390JW31L	AC250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD470JW31L	AC250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD560JW31L	AC250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD680JW31L	AC250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGD820JW31L	AC250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GD101KW01L	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD151KW01L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD221KW01L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD331KW01L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD102KW01L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GD152KW01L	AC250 (r.m.s.)	X7R (EIA)	1500 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA343QR7GD182KW01L	AC250 (r.m.s.)	X7R (EIA)	1800 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343QR7GD222KW01L	AC250 (r.m.s.)	X7R (EIA)	2200 ±10%	4.5	3.2	1.5	2.5	0.3 min.
GA343DR7GD472KW01L	AC250 (r.m.s.)	X7R (EIA)	4700 ±10%	4.5	3.2	2.0	2.5	0.3 min.

## **Chip Monolithic Ceramic Capacitors**



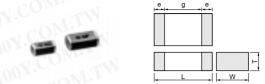
## Safety Standard Recognized Type GF (IEC60384-14 Class Y2, X1/Y2)

#### ■ Features

- 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.
- 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

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



Dout Number	Dimensions (mm)						
Part Number	L W T		e min.	g min.			
GA342A			1.0 +0, -0.3				
GA342D	4.5 ±0.3	2.0 ±0.2	2.0 ±0.2*		2.5		
GA342Q	J COP	TXV.	1.5 +0, -0.3	0.3			
GA352Q	F	2.8 ±0.3	1.5 +0, -0.3	0.3			
GA355D	5.7 ±0.4	5.0 +0.4	2.0 +0, -0.3		4.0		
GA355Q	17.0	5.0 ±0.4	1.5 +0, -0.3				

<sup>\*</sup> GA342D1X : 2.0±0.3

### ■ Standard Recognition

	Standard	<1 C	Status of R	Rated	
	No.	Class	Size : 4.5×2.0mm	Size: 5.7×2.8mm and over	Voltage
	UL1414	X1, Y2		0	
UL	UL 60950-1	VA.	0	- W	AC250V
SEMKO	IEC 60384-14 EN 60384-14	Y2	7.CO	0	(r.m.s.)

Applications						
Size	Switching power supplies	Communication network devices such as a modem				
4.5×2.0mm	M.10 CC	0				
5.7×2.8mm and over	A (Q)	- ( ) ( )				

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	AC250 (r.m.s.)	SL (JIS)	10 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF120JY02L	AC250 (r.m.s.)	SL (JIS)	12 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF150JY02L	AC250 (r.m.s.)	SL (JIS)	15 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF180JY02L	AC250 (r.m.s.)	SL (JIS)	18 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342D1XGF220JY02L	AC250 (r.m.s.)	SL (JIS)	22 ±5%	4.5	2.0	2.0	2.5	0.3 min.
GA342A1XGF270JW31L	AC250 (r.m.s.)	SL (JIS)	27 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF330JW31L	AC250 (r.m.s.)	SL (JIS)	33 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF390JW31L	AC250 (r.m.s.)	SL (JIS)	39 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF470JW31L	AC250 (r.m.s.)	SL (JIS)	47 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF560JW31L	AC250 (r.m.s.)	SL (JIS)	56 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF680JW31L	AC250 (r.m.s.)	SL (JIS)	68 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342A1XGF820JW31L	AC250 (r.m.s.)	SL (JIS)	82 ±5%	4.5	2.0	1.0	2.5	0.3 min.
GA342QR7GF101KW01L	AC250 (r.m.s.)	X7R (EIA)	100 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342QR7GF151KW01L	AC250 (r.m.s.)	X7R (EIA)	150 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA342DR7GF221KW02L	AC250 (r.m.s.)	X7R (EIA)	220 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342DR7GF331KW02L	AC250 (r.m.s.)	X7R (EIA)	330 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA342QR7GF471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF471KW01L	AC250 (r.m.s.)	X7R (EIA)	470 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342QR7GF681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	4.5	2.0	1.5	2.5	0.3 min.
GA352QR7GF681KW01L	AC250 (r.m.s.)	X7R (EIA)	680 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA342DR7GF102KW02L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	4.5	2.0	2.0	2.5	0.3 min.
GA352QR7GF102KW01L	AC250 (r.m.s.)	X7R (EIA)	1000 ±10%	5.7	2.8	1.5	4.0	0.3 min.
GA352QR7GF152KW01L	AC250 (r.m.s.)	X7R (EIA)	1500 ±10%	5.7	2.8	1.5	4.0	0.3 min.

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Continued from the preceding page.

GA355QR7GF222KW01L       AC250 (r.m.s.)       X7R (EIA)       2200 ±10%       5.7       5.0       1.5       4.0       0.3 mi         GA355QR7GF332KW01L       AC250 (r.m.s.)       X7R (EIA)       3300 ±10%       5.7       5.0       1.5       4.0       0.3 mi	Part Number	Rated Voltage (V)	TC Code (Standard)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)	Electrode g min. (mm)	Electrode (mm)
GA355QR7GF332KW01L AC250 (r.m.s.) X7R (EIA) 3300 ±10% 5.7 5.0 1.5 4.0 0.3 mi	GA355QR7GF182KW01L	AC250 (r.m.s.)	X7R (EIA)	1800 ±10%	5.7	5.0	1.5	4.0	0.3 min.
	GA355QR7GF222KW01L	AC250 (r.m.s.)	X7R (EIA)	2200 ±10%	5.7	5.0	1.5	4.0	0.3 min.
GA355DR7GF472KW01L         AC250 (r.m.s.)         X7R (EIA)         4700 ±10%         5.7         5.0         2.0         4.0         0.3 min	GA355QR7GF332KW01L	AC250 (r.m.s.)	X7R (EIA)	3300 ±10%	5.7	5.0	1.5	4.0	0.3 min.
WWW.100X.COM.TW WWW.100X.COM.TW	GA355DR7GF472KW01L	AC250 (r.m.s.)	X7R (EIA)	4700 ±10%	5.7	5.0	2.0	4.0	0.3 min.
		,				-41	-		

## **Chip Monolithic Ceramic Capacitors**



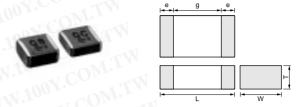
### Safety Standard Recognized Type GB (IEC60384-14 Class X2)

#### ■ 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
- 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	1 CUM	Dir	nensions (m	nm)		
Part Number	L	W	T	e min.	g min.	
GA355D	5.7 +0.4	5.0 +0.4	2.0 ±0.3	0.3	4.0	
GA355X	3.7 <u>1</u> 0.4	3.0 <u>1</u> 0.4	2.7 ±0.3	0.3	4.0	

### ■ Standard Recognition

	Standard No.	Class	Rated Voltage
VDE	WW.100	COM.	- 01
SEMKO	IEC 60384-14 EN 60384-14	X2	AC250V (r.m.s.)
ESTI	7/10/2/11		()

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
GA355DR7GB103KY02L	AC250 (r.m.s.)	X7R (EIA)	10000 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GB153KY02L	AC250 (r.m.s.)	X7R (EIA)	15000 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355DR7GB223KY02L	AC250 (r.m.s.)	X7R (EIA)	22000 ±10%	5.7	5.0	2.0	4.0	0.3 min.
GA355XR7GB333KY06L	AC250 (r.m.s.)	X7R (EIA)	33000 ±10%	5.7	5.0	2.7	4.0	0.3 min.

### **GA3 Series Specifications and Test Methods**

No.	Ite	em	$^{\Lambda}$ $CO_{M_1}$	Specifications	WIT		Test Method	
1	Operating Temperatu		-55 to +12	25°C	COM.TV		_	
2	Appearar	nce	No defects	or abnormalities	Visual inspection	on		
3	Dimensio	ns	Within the	specified dimensions	Using calipers	- 1		
4	Dielectric	: Strength	No defects	or abnormalities	between the ter	minations	rved when voltage in table is applied for 60±1 sec., provided the is less than 50mA.  Test Voltage	
<b>▼</b> 1			W.1007		Type GB Type GC/G	GD/GF	DC1075V AC1500V (r.m.s.)	
5	Pulse Vol (Applicati GD/GF)		No self hea	aling breakdowns or flash-overs have taken place in or.		ach polarit	ulse is 60 sec.	
6	Insulation I (I.R.)	Resistance	More than	6,000ΜΩ	The insulation rand within 60±		should be measured with DC500±50V harging.	
7	Capacita	nce	Within the	specified tolerance	M. T.		TW	
8	Dissipation Factor (D	X/R   D F ≥0.025		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.)				
7	T.MO			The capacitano specified in Tab		ement should be made at each step		
			T		Step 1	1007	Temperature (℃) 25±2 (20±2 for SL char.)	
J			Char.	Capacitance Change	2	400	Min. Operating Temp.±3	
7.0	Capacitar	200	X7R Temperatu	Within ±15% re characteristic guarantee is −55 to +125°C	3	N'You	25±2 (20±2 for SL char.)	
9	Temperat		Char.	Temperature Coefficient	5	10	Max. Operating Temp.±2 25±2 (20±2 for SL char.)	
100	Characteristics		SL   +350 to −1000ppm/°C  Temperature characteristic guarantee is +20 to +85°C			SL char.: The capacitance should be measured at even 85°C between st 3 and step 4.  •Pretreatment for X7R char. Perform a heat treatment at 150±18°C for 60±5 min. and the let sit for 24±2 hrs. at room condition*1.		
×1	1007	Appearance	No defects	or abnormalities	As in Fig., disch	narge is ma	ade 50 times at 5 sec. intervals from	
		I.R.	More than	1,000ΜΩ	the capacitor (C	cd) charge	d at DC voltage of specified.	
10	Discharge Test (Application: Type GC)	Dielectric Strength	In accordar	nce with item No.4	R3		Ct R2	
7		100X	$CO_{M}$				r under test Cd: 0.001μF 100MΩ R3: Surge resistance	
11	Adhesive Strength of Termination				Solder the capacitor to the testing jig (glass epoxy board) show in Fig. 1.  Then apply 10N force in the direction of the arrow. The solderin 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.			
				A.COM		Glass Epoxy Board Fig. 1		

ative humidi. برe (pF). \*1 "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa



<sup>\*2 &</sup>quot;C" expresses nominal capacitance value (pF).

### **GA3 Series Specifications and Test Methods**

Continued from the preceding page Specifications No Item Test Method 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 Within the specified tolerance Capacitance 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 Vibration Specification directions (total of 6 hrs.). 12 Char Resistance D.F. X7R D.F.≦0.025 Q≥400+20C\*2 (C<30pF) Q SL O≥1000 (C≥30pF) - Solder resist - Cu No cracking or marking defects should occur. Solder the capacitor to the testing jig (glass epoxy board) shown 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 20 50 Pressurizing speed: 1.0mm/s t: 1.6 100 Deflection ↓ Pressurize L×W Dimension (mm) (mm) а С 4.5×2.0 3.5 7.0 2.4 Flexure=1 4.5×3.2 3.7 3.5 7.0 1.0 Capacitance meter 5.7X2.8 3.2 4.5 8.0 (in mm) 5.7X5.0 4.5 5.6 45 8.0 Fig. 2 Fig. 3 Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Solderability of Immerse in solder solution for 2±0.5 sec. 75% of the terminations are to be soldered evenly and continuously. Immersing speed: 25±2.5mm/s Termination Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5°C H60A or H63A Eutectic Solder Preheat the capacitor as table. Immerse the capacitor in solder No marking defects Appearance solution at 260±5℃ for 10±1 sec. Let sit at room condition\*1 for 24±2 hrs., then measure. Char. Capacitance Change •Immersing speed: 25±2.5mm/s Capacitance X7R Within ±10% Within ±2.5% or ±0.25pF Pretreatment for X7R char. Change SI Resistance Perform a heat treatment at 150±10 °C for 60±5 min. and then (Whichever is larger) to Soldering 15 let sit for 24±2 hrs. at room condition\*1. Heat

> \*Preheating Step

> > 2

I.R.

Dielectric

Strength

More than  $1,000M\Omega$ 

In accordance with item No.4

Continued on the following page.

Time

1 min

1 min.

Temperature

100 to 120℃

170 to 200℃





<sup>\*1 &</sup>quot;Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

<sup>\*2 &</sup>quot;C" expresses nominal capacitance value (pF).

### **GA3 Series Specifications and Test Methods**

No.	Ite	em Specifications					Test Method			
	WW	Appearance Capacitance Change	No marking Char. X7R SL	g defects  Capacitance Change Within ±15%  Within ±2.5% or ±0.25pF (Whichever is larger)	in Fig. 4. Perform the follow	the 5 ving t	tor to the supporting jig (glass cycles according to the 4 hea able.  2 hrs. at room condition*1, the Temperature (°C)	t treatments listed in		
		-xIVI	Jun	COMP	101	IAT	Min. Operating Temp.±3	30±3		
		D.F.	Char. X7R	Specification D.F.≦0.05	$\frac{2}{3}$		Room Temp. Max. Operating Temp.±2	2 to 3 30±3		
6	Temperature Cycle	Q	SL	Q≥400+20C*² (C<30pF) Q≥1000 (C≥30pF)	•Pretreat	-10	Room Temp. t for X7R char.	2 to 3		
N		I.R.	More than	3,000ΜΩ			eat treatment at 150±₁8°C for -2 hrs. at room condition*¹.	60±5 min. and then		
	N TW .TW	Dielectric Strength	In accorda	nce with item No.4	MAM W.100 MMA W.100	7.00 001	Sold  Glass Epoxy Board  Fig. 4	er resist		
		Appearance	No marking	g defects						
		Capacitance Change	Char. X7R SL	Capacitance Change Within ±15% Within ±5.0% or ±0.5pF (Whichever is larger)		Adh	st, the test shown in the follow esive Strength of Termination ection			
	Humidity	[4]		W. J. 100 X. V. T. W.		Let the capacitor sit at 40±2°C and relative humidity of 90 to 95 for 500±26 hrs.				
7	(Steady State)	D.F.	Char. X7R	Specification  D.F.≦0.05  Q≧275+5/2C*² (C<30pF)		and	rs. let sit for 24±2 hrs. at room co	ondition*1, then		
5		WILL	SL	Q≥350 (C≥30pF)			t for X7R char. eat treatment at 150±₁8℃ for	60±5 min. and then		
		I.R.	More than	3,000ΜΩ	let sit fo	24±	2 hrs. at room condition*1.			
) V ()		Dielectric Strength	In accorda	nce with item No.4	WE					
	ony.C	Appearance	No marking	g defects			st, the test shown in the follow esive Strength of Termination			
(.)		Capacitance	Char. X7R	Capacitance Change Within ±20%	-Item 13		Front	time (T <sub>1</sub> )=1.2µs=1.67T		
		Change	SL	Within ±3.0% or ±0.3pF (Whichever is larger)		ividua	ge Time al capacitor should (%) to a 2.5kV (Type	to half-value (T₂)=50μs		
		D.F.	Char. X7R	Specification D.F.≤0.05	GC/GF: 8	5kV) alue	Impulse (the means zero to 030 0			
1		Q	SL	Q≥275+5/2C*2 (C<30pF) Q≥350 (C≥30pF)	capacitor	s are	e times. Then the applied to life test.  as Table for 1,000 hrs. at 125	T2		
8	Life	I.R.	More than	3,000ΜΩ	humidity	_		-8 C, relative		
		1007	COM	IM MAN'TOU	Type GB		Applied Voltag 312.5V (r.m.s.), except that on age is increased to AC1,000V	ce each hour the		
		Dielectric	In accorda	nce with item No.4	GC GD GF	AC	425V (r.m.s.), except that on age is increased to AC1,000V	ce each hour the		
		Strength	00X.C		Pretreat     Perform	men a he	.2 hrs. at room condition*¹, the t for X7R char.  that treatment at 150 ± ₁8 °C for the condition*¹.			

<sup>\*1 &</sup>quot;Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.COM.TW





<sup>\*2 &</sup>quot;C" expresses nominal capacitance value (pF). WWW.100Y.COM.T

### **GA3 Series Specifications and Test Methods**

Continued from the preceding page.

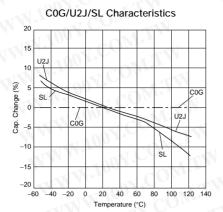
No.	Ite	em	A CON	Specifications	Test Method
	- 41	Appearance	No markin	g defects	OM
		Capacitance Change	Char. X7R	Capacitance Change Within ±15% Within ±5.0% or ±0.5pF	Before this test, the test shown in the following is performed.  Item 11 Adhesive Strength of Termination (apply force is 5N)
		41 °11.	SL	(Whichever is larger)	-Item 13 Deflection
19	Humidity	MAN	Char.	Specification	Apply the rated voltage at 40±2°C and relative humidity of 90 to 95% for 500±26 hrs. Remove and let sit for 24±2 hrs. at room
ſ	Loading	D.F.	X7R	D.F.≦0.05	condition*1, then measure.
<b>▼</b> 1		Q	SL	Q≥275+5/2C*2 (C<30pF) Q≥350 (C≥30pF)	•Pretreatment for X7R char.  Perform a heat treatment at 150 <sup>±</sup> 18 °C for 60±5 min. and then
N		I.R.	More than	3,000ΜΩ	let sit for 24±2 hrs. at room condition*1.
Y		Dielectric Strength	In accorda	nce with item No.4	NW 100X COM.TW
T. L. Y.			WWW.		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.
	Active		M. M.		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
20	Flammab	ility	The chees	ecloth should not be on fire.	$\begin{array}{cccccc} C_{1,2} &: 1\mu F \pm 10\% & C_3 &: 0.033\mu F \pm 5\% \ 10kV \\ L_{1\ to} \ 4 : 1.5mH \pm 20\% \ 16A \ Rod \ core \ choke \\ C_{t} &: 3\mu F \pm 5\% \ 10kV & R &: 100\Omega \pm 2\% \\ C_{x} &: Capacitor \ under \ test & UAC &: UR \pm 5\% \\ F &: Fuse, \ Rated \ 16A & UR &: \ Rated \ Voltage \\ & Ut &: Voltage \ applied \ to \ Ct \\ \end{array}$
10			LM LM		Ux Ui GB, GD 2.5kV GC, GF 5kV
V			TW		time
	N.IOO	N.CO	N. TV	WWW.100Y.C	The capacitor under test should be held in the flame in the position which best promotes burning. Each specimen should
4					only be exposed once to the flame. Time of exposure to flame: 30 sec.
N			$O_{MT}$		Length of flame : 12±1mm  Gas burner : Length 35mm min. Inside Dia. 0.5±0.1mm
21	Passive Flammab	ility N.100		g time should not exceed 30 sec. paper should not ignite.	Gas  Outside Dia. 0.9mm max. : Butane gas Purity 95% min.  Test Specimen
			OOY.C		Tissue About 10mm Thick Board

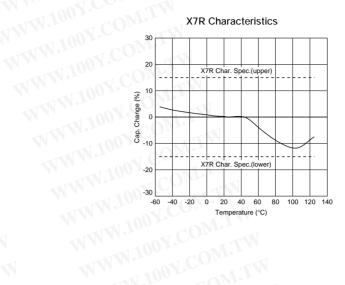
<sup>\*1 &</sup>quot;Room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa WWW.100Y.COM.TW

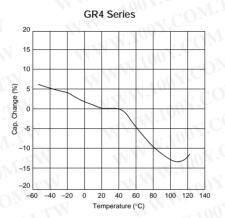
<sup>\*2 &</sup>quot;C" expresses nominal capacitance value (pF). WWW.100Y.COM.

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

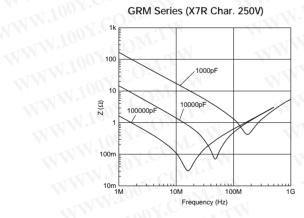
### ■ Capacitance - Temperature Characteristics

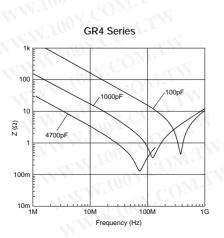




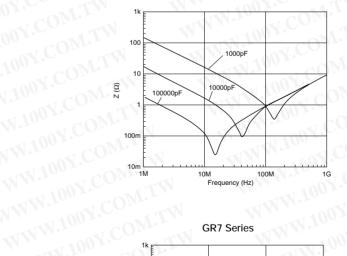


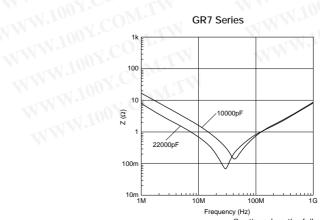
### ■ Impedance - Frequency Characteristics





### GRM Series (X7R Char. 630V)



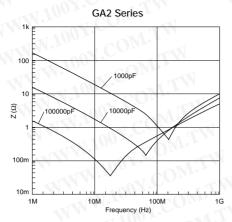


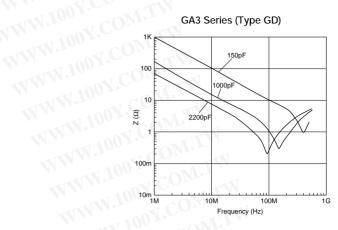
muRata

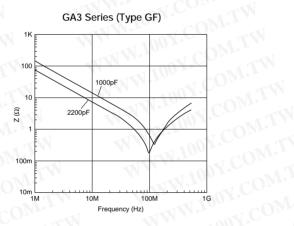
### GRM/GR4/GR7/GA2/GA3 Series Data (Typical Example)

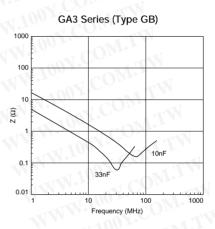
Continued from the preceding page

### ■ Impedance - Frequency Characteristics



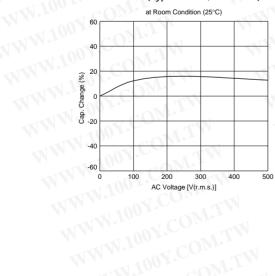


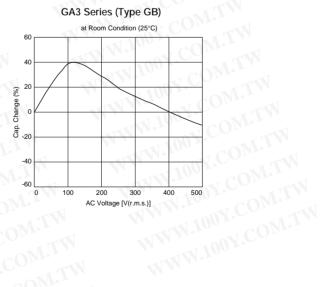




### ■ Capacitance - AC Voltage Characteristics

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





### **Package**

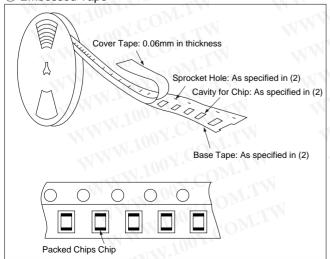
. IVIII III II GIII C	Quantity Guide						
	N.100	Mirr	Dimensions (ni	11 N . 10 . 1	Quantity	(pcs.)	
Part Nui	mber		Dimensions (m	m)	ø180mn	n Reel	
VV	M. P. CALC	Lavi	W	T	Paper Tape	Embossed Tape	
	GRM18	1.6	0.8	0.8	4,000	-	
W.	GRM21	2.0	1.25	1.0	4,000	-	
<b>*</b> 7	GRWIZI	C 2.0	1.25	1.25	ON CO.	3,000	
	-XIXI.100	COM		1.0	4,000	-	
	GRM31/GR731	3.2	1.6	1.25	1007. OM.TV	3,000	
×NI	WW.		WW	1.6	TIVE TO	2,000	
	1111.10	100	A. L.	1.0	4,000	-	
Лedium Voltage	GRM32	3.2	2.5	1.25	11007. M.TV	3,000	
	GRW32	3.2		1.5	M. COL	2,000	
			UM.T.	2.0	M.Ing - COM.	1,000	
	4/1/1/	100 Y.C	WITT	1.0	1003.	3,000	
M. I	GRM42/GR442	4.5	2.0	1.5	MM. CO.	2,000	
WI.M				2.0	M.In. COM.	2,000	
TW	GRM43/GR443	MM	1007	T	1.5	1107.0	1,000
OM.		4.5	3.2	2.0	MAN CO	1,000	
T.M			Mo	2.5	300	500	
COn	GRM55/GR455	5.7	5.0	2.0	11/10/1001	1,000	
COMP.	GA242	4.5	2.0	1.5	WWW.	2,000	
AC250V	04242	4.5	2.2	1.5	11/1/10/2	1,000	
AC250V	GA243	4.5	3.2	2.0	11/11/11/11	1,000	
COM	GA255	5.7	5.0	2.0		1,000	
101.0	TIN	M.	100 x.	1.0	A 100 s.	3,000	
COI	GA342	4.5	2.0	1.5	11311 100	2,000	
100	With	-TXX	W.100	2.0		2,000	
Safety Std.	GA343	4.5	3.2	1.5	77 100	1,000	
Recognition	GA343	4.5	3.2	2.0		1,000	
N.100 r.	GA352	5.7	2.8	1.5	- WW.	1,000	
1001	TI		100	1.5	- 11	1,000	
11.10	GA355	5.7	5.0	2.0	CM - MM	1,000	
-XX 100 1	. UM.I		1 .XXX.11	2.7	XXX	500	

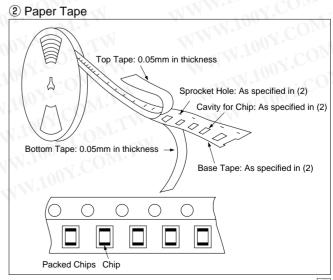
muRata

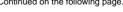
### ■ Tape Carrier Packaging

(1) Appearance of Taping

1 Embossed Tape

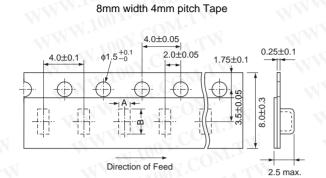






### **Package**

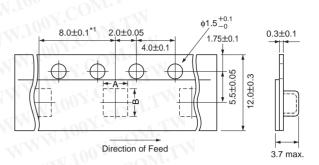
- Continued from the preceding page.
- (2) Dimensions of Tape
- ① Embossed Tape



Part Number	A*	B*	
<b>GRM21</b> (T≧1.25mm)	1.45	2.25	
GRM31/GR731 (T≧1.25mm)	2.0	3.6	
<b>GRM32</b> (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

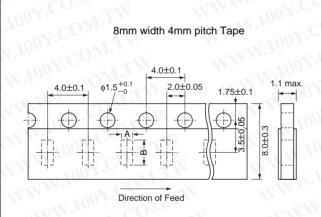
<sup>\*1 4.0±0.1</sup>mm in case of GRM42/GR442/GA242/GA342

(3) Dimensions of Reel

\*Nominal Value

(in mm)

#### 2 Paper Tape

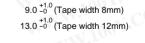


A*	B*	
1.05	1.85	
1.45	2.25	
2.0	3.6	
2.9	3.6	
	1.05	

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\*Nominal Value (in mm)

# 13.0±1.0 (Tape width 8mm) 17.0±1.0 (Tape width 12mm) 2.0±0.5 φ13±0.2 φ21±0.8



Continued on the following page.

(in mm)

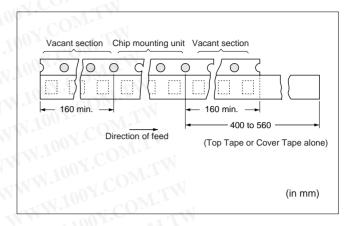
180+0 60 +1

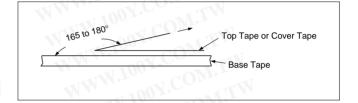
### **Package**

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
- Cumulative tolerance of sprocket holes, 10 pitches:
   ±0.3mm.
  - 7 Peeling off force: 0.1 to 0.6N in the direction shown at right.







#### ■ 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 WWW.100Y.COM.TW 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
Positional Measurement	Vo-p	Vo-p	Vp-p	Vp-p	Vp-p

- 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 highfrequency 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.)



### **⚠Caution**

Continued from the preceding page.

### (2) In case of COG, 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.

#### <C0G char.>

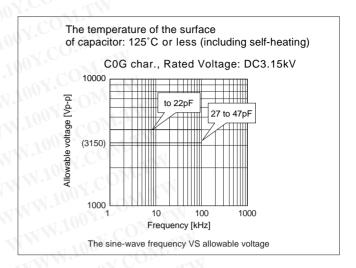
Therefore, in case of COG char., the frequency of the applied sine wave voltage should be less than 100kHz. The applied voltage should be less than the value shown in figure at right. The capacitors less than 22pF can be applied maximum 4.0kV peak to peak at 100kHz or less only for the ballast or the resonance usage in the LCD backlight inverter circuit.

#### <U2J char.>

In case of U2J char., 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.

#### <Capacitor selection tool>

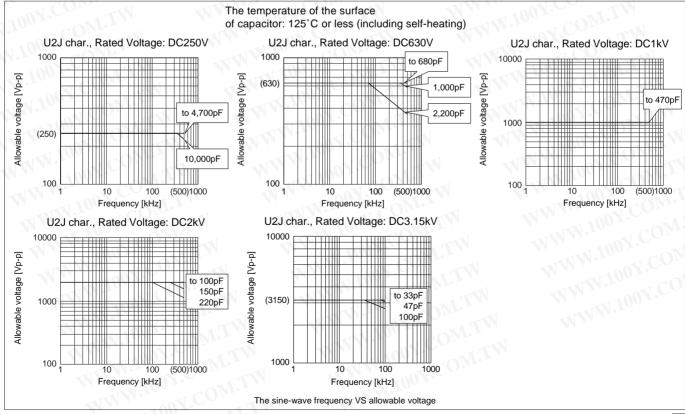
We are also offering free software the "capacitor selection tool: Murata Medium Voltage Capacitors Selection Tool by Voltage Form (\*)" which will assist you in selecting a suitable capacitor.



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).

- \* As of Jul. 2006, subject series are below.
  - · Temperature Characteristics C0G, U2J



### **⚠**Caution

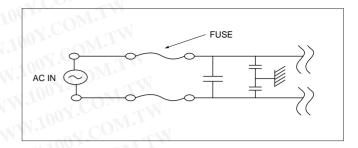


Continued from the preceding page

#### 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.

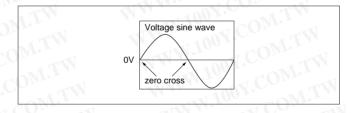
#### (2) Voltage Applied Method

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.





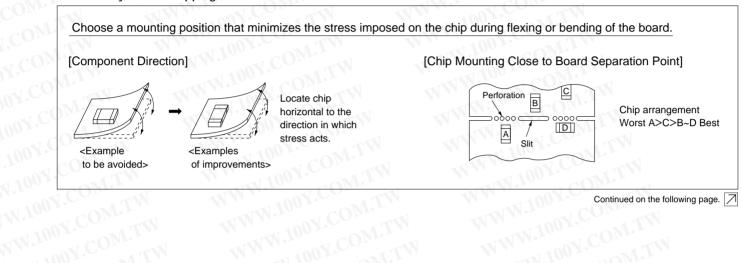
### ■ Caution (Soldering and Mounting)

1. Vibration and Impact Do not expose a capacitor to excessive shock or vibration during use. WWW.100Y.COM.T

#### 2. Circuit Board Material

In case that ceramic chip capacitor is soldered on the metal board, such as Aluminum board, the stress of heat expansion and contraction might cause the crack of ceramic capacitor, due to the difference of thermal expansion coefficient between metal board and ceramic

## OM.TW 3. Land Layout for Cropping PC Board



Continued on the following page.



145



### **⚠**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 ( $\Delta T$ ) as small as
- 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  $(\Delta T)$  between the component and solvent within the range shown in the Table 1.

Table 1

Part Number	Temperature Differential
G□□18/21/31	ΔΤ≦190℃
G□□32/42/43/52/55	ΔΤ≦130℃

#### Recommended Conditions

001.	Pb-Sn S	Solder	Lood Free Colder
	Infrared Reflow	Vapor Reflow	Lead Free Solder
Peak Temperature	230-250°C	230-240°C	240-260°C
Atmosphere	Air	Air	Air or N2

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

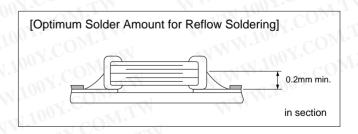
### [Standard Conditions for Reflow Soldering] Infrared Reflow Temperature (℃) Soldering Peak Temperature Gradual Cooling 200°C 170°C 150°C 130°C 60-120 seconds 30-60 seconds Vapor Reflow Temperature (°C) Soldering Peak Temperature Gradual Cooling 170°C 150°C 130°C Preheating 60-120 seconds 20 seconds max [Allowable Soldering Temperature and Time] 270 Femperature ( 260 250 230 0 90 Soldering Time (sec.) 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
- 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.

#### Inverting the PCB

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







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 ( $\Delta T$ ) 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

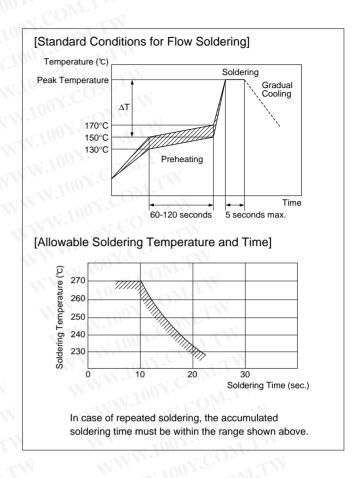
Part Number	Temperature Differential
G□□18/21/31	ΔT≦150°C

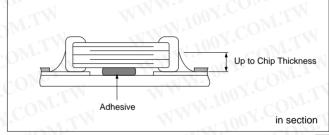
#### **Recommended Conditions**

COMP	Pb-Sn Solder	Lead Free Solder
Peak Temperature	240-250°C	250-260°C
Atmosphere	Air	N <sub>2</sub>

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

 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







### **⚠**Caution



Continued from the preceding page.

#### 6. Correction with a Soldering Iron

 When sudden heat is applied to the components by soldering iron, 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 3. It is required to keep temperature differential between the soldering and the components surface ( $\Delta T$ ) as small as possible. After soldering, it should not be allowed to cool down rapidly.

Table 3

Part Number	Temperature Differential	Peak Temperature	Atmosphere
G□□18/21/31	ΔT≦190°C	300°C max. 3 sec. max. / termination (both sides total 6 sec. max.)	Air
G□□32/42/43/ 52/55	ΔT≦130℃	270°C max. 3 sec. max. / termination (both sides total 6 sec. max.)	Air

<sup>\*</sup>Applicable for both Pb-Sn and Lead Free Solder.

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

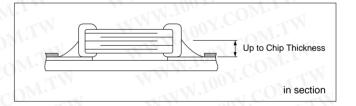
 Optimum Solder Amount when Corrections Are Made Using a Soldering Iron

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. Soldering iron ø3mm or smaller should be required. And it is necessary to keep a distance between the soldering iron and the components without direct touch. Thread solder with Ø0.5mm or smaller is required for soldering.



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.



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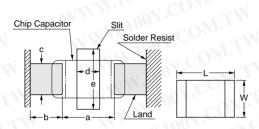
### **Notice**

### ■ Notice (Soldering and Mounting)

#### 1. Construction of Board Pattern

the circuit board, mechanical stress will cause destruction resistance characteristics to lower. To prevent this extremely careful. extremely careful in determining shape and dimension before designing the circuit board diagram.

#### Construction and Dimensions of Pattern (Example)



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

#### Flow Soldering

L×W	a	b CO	С
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

LXW	а	b	С	d	е
1.6×0.8	0.6-0.8	0.6-0.7	0.6-0.8	CVV	-
2.0×1.25	1.0-1.2	0.9-1.0	0.8-1.1	M.F.	-
3.2×1.6	2.2-2.4	0.8-0.9	1.0-1.4	1.0-2.0	3.2-3.7
3.2×2.5	2.0-2.4	1.0-1.2	1.8-2.3	1.0-2.0	4.1-4.6
4.5×2.0	2.8-3.4	1.2-1.4	1.4-1.8	1.0-2.8	3.6-4.1
4.5×3.2	2.8-3.4	1.2-1.4	2.3-3.0	1.0-2.8	4.8-5.3
5.7×2.8	4.0-4.6	1.4-1.6	2.1-2.6	1.0-4.0	4.4-4.9
5.7×5.0	4.0-4.6	1.4-1.6	3.5-4.8	1.0-4.0	6.6-7.1

(in mm)

# Land Layout to Prevent Excessive Solder

Examples of Prohibition	d1 - Chassis Solder (Ground solder)	Lead Wire Connected to a Part Provided with Lead Wires.	Soldering Iron Lead Wire of Component to be Connected Later.
MM.1001 CO.	Adhesive Base board Land Pattern in section	in section	in section
Examples of Improvements by the Land Division	d2 d1 <d2< td=""><td>Solder Resist</td><td>Solder Resist</td></d2<>	Solder Resist	Solder Resist
100	in section	in section	in section





### **Notice**



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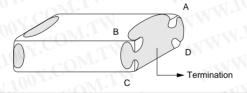
- 2. Mounting of Chips
- Thickness of adhesives applied Keep thickness of adhesives applied (50-105µm or more) to reinforce the adhesive contact considering the thickness of the termination or capacitor (20-70µm) and the land pattern (30-35µm).
- Mechanical shock of the chip placer When the positioning 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. Solderina

(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 resin type flux including wash-type flux and non-wash-type flux.)



**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

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

inductance of the circuit.

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



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sales representatives or product engineers before ordering.

• This PDF catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

### ISO 9001 Certifications

#### Qualified Standards

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