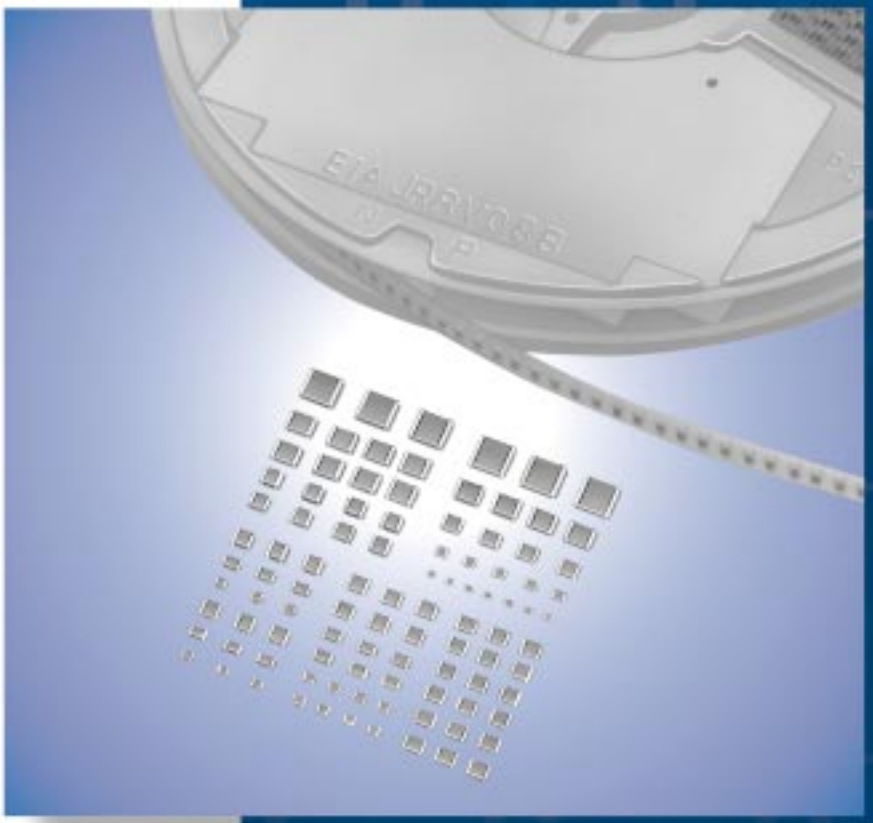
Chip Monolithic Ceramic Capacitors



muRata Innovator in Electronics

Murata Manufacturing Co., Ltd.

Cat.No.C02E-16

Part Numbering

Chip Monolithic Ceramic Capacitors

(Part Number)

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

❶Product ID

❷Series

Product ID	Code	Series
GR	J	Soft Termination Type
	M	Tin Plated Layer
	4	Only for Information Devices / Tip & Ring
	7	Only for Camera Flash Circuit
GQ	M	High Frequency for Flow/Reflow Soldering
GM	A	Monolithic Microchip
	D	For Bonding
GN	M	Capacitor Array
LL	L	Low ESL Type
	R	Controlled ESR Low ESL Type
	A	8-termination Low ESL Type
	M	10-termination Low ESL Type
GJ	M	High Frequency Low Loss Type
GA	2	For AC250V (r.m.s.)
	3	Safety Standard Certified Type

❸Dimensions (L×W)

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

❹Dimension (T) (Except **GNM**)

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

❹Elements (**GNM** Only)

Code	Elements
2	2-elements
4	4-elements

Continued on the following page.

Please check the MURATA home page (http://www.murata.com/) if you cannot find the part number in the catalog.

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❺Temperature Characteristics

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

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

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●Capacitance Change from each temperature

JIS Code

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

EIA Code

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

❻Rated Voltage

Code	Rated Voltage
0E	DC2.5V
0G	DC4V
0J	DC6.3V
1A	DC10V
1C	DC16V
1E	DC25V
YA	DC35V
1H	DC50V
2A	DC100V
2D	DC200V
2E	DC250V
YD	DC300V
2H	DC500V
2J	DC630V
3A	DC1kV
3D	DC2kV
3F	DC3.15kV
BB	DC350V (for Camera Flash Circuit)
E2	AC250V
GC	X1/Y2; AC250V (Safety Standard Certified Type GC)
GF	Y2, X1/Y2; AC250V (Safety Standard Certified Type GF)
GD	Y3; AC250V (Safety Standard Certified Type GD)
GB	X2; AC250V (Safety Standard Certified Type GB)

❼Capacitance

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

Ex.)

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

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❽Capacitance Tolerance

Code	Capacitance Tolerance	TC	Series	Capacitance Step	
W	±0.05pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
B	±0.1pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
			GQM	≦1pF	0.1pF
				1.1 to 9.9pF	1pF Step and E24 Series
C	±0.25pF	CΔ	**GRM/GJM**	≦9.9pF	0.1pF
		except CΔ	**GRM**	≦5pF	* 1pF
		CΔ	**GQM**	≦1pF	0.1pF
				1.1 to 9.9pF	1pF Step and E24 Series
D	±0.5pF	CΔ	**GRM/GJM**	5.1 to 9.9pF	0.1pF
		except CΔ	**GRM**	5.1 to 9.9pF	* 1pF
		CΔ	**GQM**	5.1 to 9.9pF	1pF Step and E24 Series
G	±2%	CΔ	**GJM**	≧10pF	E12 Series
		CΔ	**GQM**	≧10pF	E24 Series
J	±5%	CΔ, SL, U2J	**GRM/GA3**	≧10pF	E12 Series
		CΔ	**GQM/GJM**	≧10pF	E24 Series
K	±10%	B, R, X7R, X5R, ZLM	**GRJ/GRM/GR7/GA3**	E6 Series	
		C0G	**GNM**	E6 Series	
		B, R, X7R, X5R, ZLM	**GR4, GMD**	E12 Series	
M	±20%	B, R, X7R, X7S	**GRM/GMA**	E6 Series	
		X5R, X7R, X7S	**GNM**	E3 Series	
		X7R	**GA2**	E3 Series	
		X5R, X7R, X7S, X6S	**LLL/LLR/LLA/LLM**	E3 Series	
Z	+80%, -20%	F, Y5V	**GRM**	E3 Series	
R	Depends on individual standards.				

***** E24 series is also available.

❾Individual Specification Code (Except **LLR**)

Expressed by three figures.

❾ESR (**LLR** Only)

Code	ESR
E01	100mΩ
E03	220mΩ
E05	470mΩ
E07	1000mΩ

❿Packaging

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

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Chip Monolithic Ceramic Capacitors

Capacitor Array GNM Series

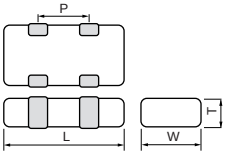
■ Features

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

■ Applications

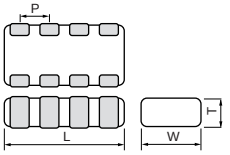
General electronic equipment

GNM0M2/1M2/212



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

GNM214/314



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

Capacitance Table

Temperature Compensating Type C0G(5C) Characteristics

0.6 ex.0.6: T Dimension [mm]

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

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

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

0.6 ex.0.6: T Dimension [mm]

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

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

High Dielectric Constant Type X7R(R7) Characteristics-Low Profile

0.5 ex.0.5: T Dimension [mm]

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

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

Capacitance Table

High Dielectric Constant Type X5R(R6) Characteristics

0.6 ex.0.6: T Dimension [mm]

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

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

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

0.5 ex.0.5: T Dimension [mm]

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

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

Temperature Compensating Type C0G(5C) Characteristics

LxW [mm]		1.37x1.0(**1M**)<0504>	2.0x1.25(**21**)<0805>	3.2x1.6(**31**)<1206>	
Number of Elements		2(**2**)	4(**4**)		
Rated Volt. [Vdc]		50(**1H**)	50(**1H**)	100(**2A**)	50(**1H**)
Capacitance	Tolerance	Part Number			
10pF(**100**)	±10%(**K**)	**GNM1M25C1H100KD01D**	**GNM2145C1H100KD01D**	**GNM3145C2A100KD01D**	**GNM3145C1H100KD01D**
15pF(**150**)	±10%(**K**)	**GNM1M25C1H150KD01D**	**GNM2145C1H150KD01D**	**GNM3145C2A150KD01D**	**GNM3145C1H150KD01D**
22pF(**220**)	±10%(**K**)	**GNM1M25C1H220KD01D**	**GNM2145C1H220KD01D**	**GNM3145C2A220KD01D**	**GNM3145C1H220KD01D**
33pF(**330**)	±10%(**K**)	**GNM1M25C1H330KD01D**	**GNM2145C1H330KD01D**	**GNM3145C2A330KD01D**	**GNM3145C1H330KD01D**
47pF(**470**)	±10%(**K**)	**GNM1M25C1H470KD01D**	**GNM2145C1H470KD01D**	**GNM3145C2A470KD01D**	**GNM3145C1H470KD01D**
68pF(**680**)	±10%(**K**)	**GNM1M25C1H680KD01D**	**GNM2145C1H680KD01D**	**GNM3145C2A680KD01D**	**GNM3145C1H680KD01D**
100pF(**101**)	±10%(**K**)	**GNM1M25C1H101KD01D**	**GNM2145C1H101KD01D**	**GNM3145C2A101KD01D**	**GNM3145C1H101KD01D**
150pF(**151**)	±10%(**K**)	**GNM1M25C1H151KD01D**	**GNM2145C1H151KD01D**	**GNM3145C2A151KD01D**	**GNM3145C1H151KD01D**
220pF(**221**)	±10%(**K**)	**GNM1M25C1H221KD01D**	**GNM2145C1H221KD01D**		**GNM3145C1H221KD01D**
330pF(**331**)	±10%(**K**)				**GNM3145C1H331KD01D**

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

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

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

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

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

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

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

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

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

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

High Dielectric Constant Type X7R(R7) Characteristics-Low Profile

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

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

High Dielectric Constant Type X5R(R6) Characteristics

LxW [mm]		0.9x0.6(**0M**)<0302>			
Number of Elements		2(**2**)			
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	6.3(**0J**)	4(**0G**)
Capacitance	Tolerance	Part Number			
10000pF(**103**)	±20%(**M**)	**GNM0M2R61C103ME18D***	**GNM0M2R61A103ME17D***	**GNM0M2R60J103ME17D***	
22000pF(**223**)	±20%(**M**)	**GNM0M2R61C223ME18D***	**GNM0M2R61A223ME17D***	**GNM0M2R60J223ME17D***	
47000pF(**473**)	±20%(**M**)	**GNM0M2R61C473ME18D***	**GNM0M2R61A473ME17D***	**GNM0M2R60J473ME17D***	
0.10μF(**104**)	±20%(**M**)	**GNM0M2R61C104ME18D***	**GNM0M2R61A104ME17D***	**GNM0M2R60J104ME17D***	
1.0μF(**105**)	±20%(**M**)				**GNM0M2R60G105ME17D***

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

LxW [mm]		1.37x1.0(**1M**)<0504>	
Number of Elements		2(**2**)	
Rated Volt. [Vdc]		10(**1A**)	6.3(**0J**)
Capacitance	Tolerance	Part Number	
22000pF(**223**)	±20%(**M**)	**GNM1M2R61A223MA01D**	
47000pF(**473**)	±20%(**M**)	**GNM1M2R61A473MA01D**	
0.10μF(**104**)	±20%(**M**)	**GNM1M2R61A104MA01D**	
1.0μF(**105**)	±20%(**M**)	**GNM1M2R61A105ME17D***	**GNM1M2R60J105ME12D***
2.2μF(**225**)	±20%(**M**)	**GNM1M2R61A225ME18D***	**GNM1M2R60J225ME18D***

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

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

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

(Part Number) **GN** ❶ | **M** ❷ | **1M** ❸ | **2** ❹ | **R7** ❺ | **1C** ❻ | **104** ❼ | **M** ❽ | **AA1** ❾ | **D** ❿

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

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

High Dielectric Constant Type X5R(R6) Characteristics

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

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

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

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

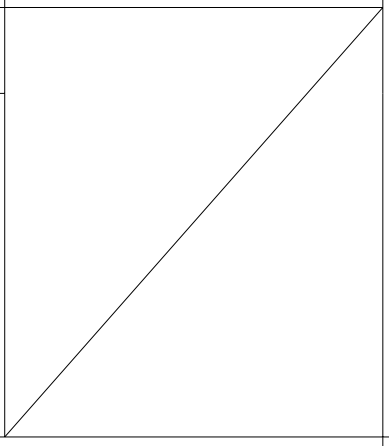
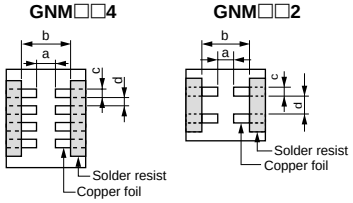
LxW [mm]		1.37x1.0(**1M**)<0504>		2.0x1.25(**21**)<0805>
Number of Elements		2(**2**)		4(**4**)
Rated Volt. [Vdc]		16(**1C**)	10(**1A**)	10(**1A**)
Capacitance	Tolerance	Part Number		
1.0μF(**105**)	±20%(**M**)	**GNM1M2R61C105MEA2D***	**GNM1M2R61A105MEA4D***	**GNM214R61A105MEA2D***

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

GNM Series Specifications and Test Methods (1)

When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Type</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>5C: –55 to +125°C</td><td>R7, C7: –55 to +125°C
R6: –55 to +85°C</td><td></td></tr>
<tr><td>2</td><td colspan="2">Rated Voltage</td><td colspan="2">See the previous pages.</td><td>The rated voltage is defined as the maximum voltage that may be applied continuously to the capacitor.
When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.</td></tr>
<tr><td>3</td><td colspan="2">Appearance</td><td colspan="2">No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>4</td><td colspan="2">Dimensions</td><td colspan="2">Within the specified dimensions</td><td>Using calipers</td></tr>
<tr><td>5</td><td colspan="2">Dielectric Strength</td><td colspan="2">No defects or abnormalities</td><td>No failure should be observed when 300% of the rated voltage (5C) or 250% of the rated voltage (R7) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>6</td><td colspan="2">Insulation Resistance</td><td colspan="2">More than 10,000MΩ or 500Ω · F (whichever is smaller)</td><td>The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging.</td></tr>
<tr><td>7</td><td colspan="2">Capacitance</td><td colspan="2">Within the specified tolerance</td><td rowspan="2">The capacitance/Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
<table>
<tr><th>Item \ Char.</th><th>5C</th><th>R7</th></tr>
<tr><td>Frequency</td><td>1±0.1MHz</td><td>1±0.1kHz</td></tr>
<tr><td>Voltage</td><td>0.5 to 5Vrms</td><td>1.0±0.2Vrms</td></tr>
</table></td></tr>
<tr><td>8</td><td colspan="2">Q/ Dissipation Factor (D.F.)</td><td colspan="2">30pF min.: Q≧1000
30pF max.: Q≧400+20C
C: Nominal Capacitance (pF)
<table>
<tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr>
<tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr>
</table></td></tr>
<tr><td rowspan="4">9</td><td rowspan="4">Capacitance Temperature Characteristics</td><td>Capacitance Change</td><td>Within the specified tolerance (Table A)</td><td colspan="2">
<table>
<tr><th>Char.</th><th>Temp. Range</th><th>Reference Temp.</th><th>Cap. Change</th></tr>
<tr><td>R7</td><td>–55°C to +125°C</td><td rowspan="3">25°C</td><td rowspan="2">Within ±15%</td></tr>
<tr><td>R6</td><td>–55°C to +85°C</td></tr>
<tr><td>C7</td><td>–55°C to +125°C</td><td>Within ±22%</td></tr>
</table></td><td rowspan="4">The capacitance change should be measured after 5 min. at each specified temperature stage.
(1) Temperature Compensating Type
The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from steps 1 through 5, the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as in Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the steps 1, 3 and 5 by the cap. value in step 3.
<table>
<tr><th>Step</th><th>Temperature (°C)</th></tr>
<tr><td>1</td><td>25±2</td></tr>
<tr><td>2</td><td>–55±3 (for 5C/R7/C7), –30±3 (for F5)</td></tr>
<tr><td>3</td><td>25±2</td></tr>
<tr><td>4</td><td>125±3 (for 5C/R7/C7), 85±3 (for F5)</td></tr>
<tr><td>5</td><td>25±2</td></tr>
</table>
(2) High Dielectric Constant Type
The ranges of capacitance change compared with the above 25°C value over the temperature ranges shown in the table should be within the specified ranges.

• Initial measurement for high dielectric constant type.
Perform a heat treatment at 150+0/-10°C for one hour and then set for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Temperature Coefficient</td><td>Within the specified tolerance (Table A)</td><td colspan="2" rowspan="2">  </td></tr>
<tr><td>Capacitance Drift</td><td>Within ±0.2% or ±0.05pF (whichever is larger.)</td></tr>
<tr><td>10</td><td colspan="2">Adhesive Strength of Termination</td><td colspan="2">No removal of the terminations or other defect should occur.
 
</td><td>Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 5N force in parallel with the test jig for 10±1 sec.
The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
<table>
<tr><th>Type</th><th>a</th><th>b</th><th>c</th><th>d</th></tr>
<tr><td>GNM1M2</td><td>0.5</td><td>1.6</td><td>0.32</td><td>0.32</td></tr>
<tr><td>GNM212</td><td>0.6</td><td>1.8</td><td>0.5</td><td>0.5</td></tr>
<tr><td>GNM214</td><td>0.6</td><td>2.0</td><td>0.25</td><td>0.25</td></tr>
<tr><td>GNM314</td><td>0.8</td><td>2.5</td><td>0.4</td><td>0.4</td></tr>
</table>
(in mm)
Fig. 1</td></tr>
</table>

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GNM Series Specifications and Test Methods (1)

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When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Type</th></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).</td></tr>
<tr><td>Capacitance</td><td colspan="2">Within the specified tolerance</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1000
30pF max.: Q≧400+20C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td rowspan="3">12</td><td rowspan="3">Deflection</td><td>Appearance</td><td colspan="2">No marking defects</td><td rowspan="3">Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder.
Then apply a force in the direction shown in Fig. 3 for 5±1 sec. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.

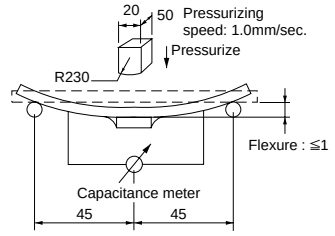
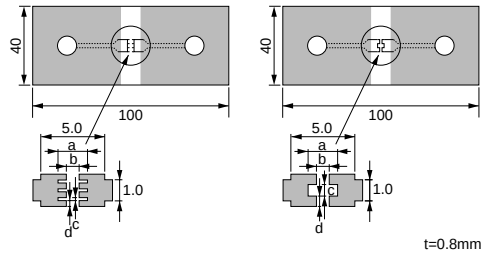
 

Fig. 3</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (whichever is larger)</td><td>Within ±10%</td></tr>
<tr><td colspan="3">•GNM□□4 •GNM□□2
 

<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th><th>d</th></tr><tr><td>GNM1M2</td><td>2.0±0.05</td><td>0.5±0.05</td><td>0.32±0.05</td><td>0.32±0.05</td></tr><tr><td>GNM212</td><td>2.0±0.05</td><td>0.6±0.05</td><td>0.5±0.05</td><td>0.5±0.05</td></tr><tr><td>GNM214</td><td>2.0±0.05</td><td>0.7±0.05</td><td>0.3±0.05</td><td>0.2±0.05</td></tr><tr><td>GNM314</td><td>2.5±0.05</td><td>0.8±0.05</td><td>0.4±0.05</td><td>0.4±0.05</td></tr></table>(in mm)
Fig. 2</td></tr>
<tr><td>13</td><td colspan="2">Solderability of Termination</td><td colspan="2">75% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.</td></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Resistance to Soldering Heat</td><td colspan="3">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours, then measure.

• Initial measurement for high dielectric constant type
Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (whichever is larger)</td><td>R7, R6, C7: Within ±7.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1000
30pF max.: Q≧400+20C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 10,000MΩ or 500Ω · F (whichever is smaller)</td></tr>
<tr><td>Dielectric Strength</td><td colspan="2">No failure</td></tr>
</table>

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GNM Series Specifications and Test Methods (1)

Continued from the preceding page.

When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Type</th></tr>
<tr><td rowspan="5">15</td><td rowspan="5">Temperature Cycle</td><td colspan="3">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
<table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>Temp. (°C)</td><td>Min. Operating Temp.+0/–3</td><td>Room Temp.</td><td>Max. Operating Temp. +3/–0</td><td>Room Temp.</td></tr><tr><td>Time (min.)</td><td>30±3</td><td>2 to 3</td><td>30±3</td><td>2 to 3</td></tr></table>• Initial measurement for high dielectric constant type
Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (whichever is larger)</td><td>R7, R6, C7: Within ±7.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1000
30pF max.: Q≧400+20C
C:Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V</th><th>6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.025 max.</td><td>0.035 max.</td><td>0.035 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 10,000MΩ or 500Ω · F (whichever is smaller)</td></tr>
<tr><td rowspan="5">16</td><td rowspan="5">Humidity Steady State</td><td colspan="3">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Set the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours.
Remove and let sit for 24±2 hours at room temperature, then measure.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (whichever is larger)</td><td>R7, R6, C7: Within ±12.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF and over: Q≧350
10pF and over, 30pF and below: Q≧275+5C/2
10pF and below: Q≧200+10C
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V/6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.05 max.</td><td>0.05 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 1,000MΩ or 50Ω · F (whichever is smaller)</td></tr>
<tr><td rowspan="5">17</td><td rowspan="5">Humidity Load</td><td colspan="3">The measured and observed characteristics should satisfy the specifications in the following table.</td><td rowspan="5">Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours.
Remove and let sit for 24±2 hours at room temperature, then measure.
The charge/discharge current is less than 50mA.</td></tr>
<tr><td>Appearance</td><td colspan="2">No marking defects</td></tr>
<tr><td>Capacitance Change</td><td>Within ±7.5% or ±0.75pF (whichever is larger)</td><td>R7, R6, C7: Within ±12.5%</td></tr>
<tr><td>Q/D.F.</td><td>30pF and over: Q≧200
30pF and below: Q≧100+10C/3
C: Nominal Capacitance (pF)</td><td><table><tr><th>Char.</th><th>25V min.</th><th>16V</th><th>10V/6.3V</th></tr><tr><td>R7, R6, C7</td><td>0.05 max.</td><td>0.05 max.</td><td>0.05 max.</td></tr></table></td></tr>
<tr><td>I.R.</td><td colspan="2">More than 500MΩ or 25Ω · F (whichever is smaller)</td></tr>
</table>

Continued on the following page.

GNM Series Specifications and Test Methods (1)

Continued from the preceding page.

When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. • Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 24±2 hours at room temperature. Perform initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±3% or ±0.3pF (whichever is larger)	R7, R6, C7: Within ±12.5%	
		Q/D.F.	30pF and over: Q≧350 10pF and over, 30pF and below: Q≧275+5C/2 10pF and below: Q≧200+10C C: Nominal Capacitance (pF)	Char. / 25V min. / 16V / 10V/6.3V R7, R6, C7 / 0.04 max. / 0.05 max. / 0.05 max.	
		I.R.	More than 1,000MΩ or 50Ω · F (whichever is smaller)		

Table A

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

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

GNM Series Specifications and Test Methods (2)

When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

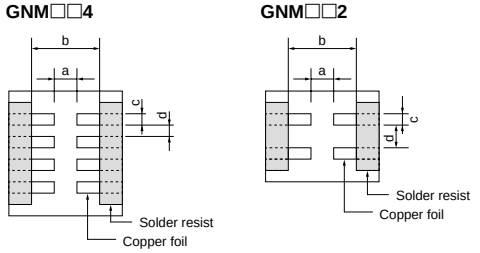
<table>
<tr><th>No.</th><th>Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>R6: –55°C to +85°C</td><td></td></tr>
<tr><td>2</td><td>Rated Voltage</td><td>See the previous pages.</td><td>The rated voltage is defined as the maximum voltage that may be applied continuously to the capacitor.
When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.</td></tr>
<tr><td>3</td><td>Appearance</td><td>No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>4</td><td>Dimensions</td><td>Within the specified dimension</td><td>Using calipers</td></tr>
<tr><td>5</td><td>Dielectric Strength</td><td>No defects or abnormalities</td><td>No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>6</td><td>Insulation Resistance</td><td>50Ω · F min.</td><td>The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 1 minute of charging.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance</td><td rowspan="2">The capacitance/D.F. should be measured at 25°C at the frequency and voltage shown in the table.
Nominal Capacitance | Measuring Frequency | Measuring Voltage
C≦10μF *1 (10V min.) | 1±0.1kHz | 1.0±0.2Vrms
C≦10μF *2 (6.3V max.) | 1±0.1kHz | 0.5±0.1Vrms
*1For items in Table1 | 1±0.1kHz | 0.5±0.1Vrms
*2For items in Table2 | 1±0.1kHz | 1.0±0.1Vrms
Table 1
GNM0M2 R6 1A 104
GNM0M2 R6 1C 104
GNM1M2 R6 1A 105/225
GNM1M2 R6 1C 224/105
Table 2
GNM0M2 R6 0J 103/223/473
GNM212 R6 0J 225
GNM214 R6 0J 105</td></tr>
<tr><td>8</td><td>Dissipation Factor (D.F.)</td><td>0.1 max.*3
Table 3
GNM0M2 R6 103/223/473/104
GNM1M2 R6 0J 105/225
GNM1M2 R6 1A 105MEA4
GNM1M2 R6 1A 225
GNM212 R6 0J 225
GNM212 R6 1A 225
GNM214 R6 0J 225
*3 However 0.125 max. for Table 3 items.</td></tr>
<tr><td>9</td><td>Capacitance Temperature Characteristics</td><td>Char. | Temp. Range | Reference Temp. | Cap. Change
R6 | –55 to +85°C | 25°C | Within ±15%</td><td>The capacitance change should be measured after 5 min.at each specified temperature stage.
Step | Temperature (°C)
1 | 25±2
2 | –55±3
3 | 25±2
4 | 85±3
5 | 25±2
The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges.
• Initial measurement for high dielectric constant type.
Perform a heat treatment at 150+0/-10°C for one hour and then set for 24±2 hours at room temperature.
Perform the initial measurement.</td></tr>
<tr><td>10</td><td>Adhesive Strength of Termination</td><td>No removal of the terminations or other defects should occur.
 

Fig. 1</td><td>Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder.
Then apply 5N (GNM0M2: 2N) force in parallel with the test jig for 10±1 sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
Type | a | b | c | d
GNM0M2 | 0.2 | 0.96 | 0.25 | 0.2
GNM1M2 | 0.5 | 1.6 | 0.32 | 0.32
GNM212 | 0.6 | 1.8 | 0.5 | 0.5
GNM214 | 0.6 | 2.0 | 0.25 | 0.25
GNM314 | 0.8 | 2.5 | 0.4 | 0.4
(in mm)</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration</td><td>Appearance</td><td>No defects or abnormalities</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10).
The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz.
The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.</td><td>0.1 max.*3
*3 However 0.125 max. for Table 3 items.</td></tr>
</table>

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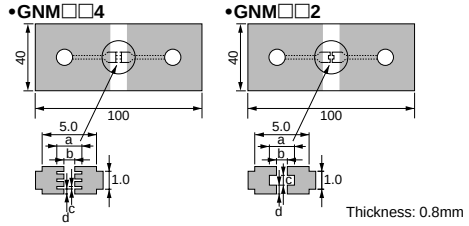
GNM Series Specifications and Test Methods (2)

Continued from the preceding page.

When no "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (1).
When "*" is added in PNs table, please refer to GNM Series Specifications and Test Methods (2).

No.	Item		Specifications	Test Method
12	Deflection	Appearance	No marking defects	Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
		Capacitance Change	Within ±10%	
			•GNM□□4 •GNM□□2  Thickness: 0.8mm	

Type	a	b	c	d
GNM0M2	2.0±0.05	0.2±0.05	0.2±0.05	0.25±0.05
GNM1M2	2.0±0.05	0.5±0.05	0.32±0.05	0.32±0.05
GNM212	2.0±0.05	0.6±0.05	0.5±0.05	0.5±0.05
GNM214	2.0±0.05	0.7±0.05	0.3±0.05	0.2±0.05
GNM314	2.5±0.05	0.8±0.05	0.4±0.05	0.4±0.05

(in mm)

Fig. 2

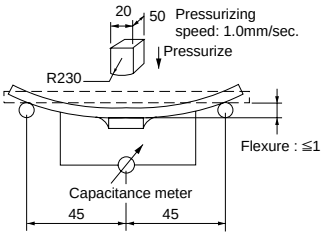


Fig. 3

No.	Item		Specifications	Test Method
13	Solderability of Termination		75% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.
14	Resistance to Soldering Heat	Appearance	No marking defects	Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours, then measure. • Initial measurement Perform a heat treatment at 150 +0/-10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Capacitance Change	R6*4: Within ±7.5% *4 GNM0M2R60G105: Within +15/-7.5%	
		D.F.	0.1 max. *3 *3 However 0.125 max. for Table 3 items.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	
15	Temperature Cycle	Appearance	No marking defects	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. • Initial measurement Perform a heat treatment at 150 +0/-10 °C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement.
		Capacitance Change	R6*5: Within ±12.5% *5 GNM0M2R60G105, GNM0M2R60J103/223/473/104, GNM0M2R61A103/223/473/104, GNM0M2R61C103/223/473/104, GNM1M2R61A105: Within ±15%	
		D.F.	0.1 max. *3 *3 However 0.125 max. for Table 3 items.	
		I.R.	50Ω · F min.	
		Dielectric Strength	No failure	

Step	1	2	3	4
Temp. (°C)	Min. Operating Temp.	Room Temp.	Min. Operating Temp.	Room Temp.
Time (min.)	30±3	2 to 3	30±3	2 to 3

No.	Item		Specifications	Test Method
16	High Temperature High Humidity (Steady)	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. The charge/discharge current is less than 50mA. • Initial measurement Perform a heat treatment at 150 +0/-10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. • Measurement after test Perform a heat treatment at 150 +0/-10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6: Within ±12.5%	
		D.F.	0.2 max.	
		I.R.	12.5Ω · F min.	
17	Durability	Appearance	No marking defects	Apply 150% (GNM1M2R61A225/1C105: 125% of the rated voltage) of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. • Initial measurement Perform a heat treatment at 150 +0/-10°C for one hour and then let sit for 24±2 hours at room temperature. Perform the initial measurement. • Measurement after test Perform a heat treatment at 150 +0/-10°C for one hour and then let sit for 24±2 hours at room temperature, then measure.
		Capacitance Change	R6: Within ±12.5%	
		D.F.	0.2 max.	
		I.R.	25Ω · F min.	

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GNM1M2R60J105ME12D GNM1M2R61A104MA01D GNM1M2R61A105ME14D GNM1M2R71C223MA01D GNM1M2R71C473MA01D GNM212R61C105MA16D GNM214R71C104MA01D GNM214R71E103MA01D GNM214R71H102MA01D GNM3145C1H100JD01D GNM3145C1H101JD01D GNM3145C1H101KD01D GNM3145C1H120JD01D GNM3145C1H120KD01D GNM3145C1H121JD01D GNM3145C1H121KD01D GNM3145C1H150JD01D GNM3145C1H150KD01D GNM3145C1H151JD01D GNM3145C1H151KD01D GNM3145C1H180JD01D GNM3145C1H180KD01D GNM314F51C104ZD01D GNM314F51C154ZD01D GNM314F51C683ZD01D GNM314F51H223ZD01D GNM314F51H333ZD01D GNM314F51H473ZD01D GNM314F52A222ZD01D GNM314F52A332ZD01D GNM314F52A472ZD01D GNM314R71C104KA01L GNM314R71C104MA01K GNM314R71C104MA01L GNM314R71C223KD01D GNM314R71C223MD01D GNM314R71C333KD01D GNM314R71C333MD01D GNM314R71C393KD01D GNM314R71C473MA01K GNM314R71C473MA01L GNM314R71E183KD01D GNM314R71H102KD01D GNM314R71H102MD01D GNM314R71H103KD01D GNM314R71H103MD01D GNM314R71H152KD01D GNM3145C2A180JD01D GNM3145C2A180KD01D GNM3145C2A220JD01D GNM3145C2A220KD01D GNM3145C2A270JD01D GNM3145C2A270KD01D GNM3145C2A330JD01D GNM3145C2A330KD01D GNM3145C2A390JD01D GNM3145C2A390KD01D GNM3145C2A470JD01D GNM3145C2A470KD01D GNM3145C2A560JD01D GNM3145C2A560KD01D GNM3145C2A680JD01D GNM3145C2A680KD01D GNM3145C2A820JD01D GNM3145C2A820KD01D GNM3145C1H181JD01D GNM3145C1H181KD01D GNM3145C1H220JD01D GNM3145C1H220KD01D GNM3145C1H221JD01D GNM3145C1H221KD01D GNM3145C1H270JD01D GNM3145C1H270KD01D GNM3145C1H271JD01D GNM3145C1H271KD01D GNM3145C1H330JD01D GNM3145C1H331JD01D GNM3145C1H331KD01D GNM3145C1H390JD01D GNM3145C1H470JD01D GNM3145C1H470KD01J GNM3145C1H560JD01D GNM3145C1H560KD01D GNM3145C1H680JD01D GNM3145C1H680KD01D GNM3145C1H820JD01D GNM3145C1H820KD01D GNM3145C2A100JD01D GNM3145C2A101JD01D GNM3145C2A101KD01D GNM3145C2A120JD01D GNM3145C2A120KD01D GNM3145C2A121JD01D GNM3145C2A121KD01D GNM3145C2A150JD01D GNM3145C2A150KD01D GNM3145C2A151JD01D GNM3145C2A151KD01D GNM314R72A152KD01D GNM314R72A152MD01D