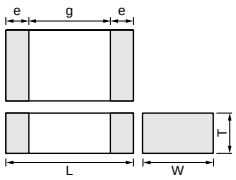
Chip Monolithic Ceramic Capacitors

for Flow/Reflow Soldering GRM15/18/21/31 Series

■ Features

1. Terminations are made of metal highly resistant to migration.
2. The GRM series is a complete line of chip ceramic capacitors in 6.3V, 10V, 16V, 25V, 50V, 100V, 200V and 500V ratings. These capacitors have temperature characteristics ranging from C0G to Y5V.
3. A wide selection of sizes is available, from the miniature LxWxT: 1.0x0.5x0.5mm to LxWxT: 3.2x1.6x1.15mm.
   GRM18, 21 and GRM31 types are suited to flow and reflow soldering.
   GRM15 type is applied to only reflow soldering.
4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placement on PCBs.
5. The GRM series is available in paper or plastic embossed tape and reel packaging for automatic placement. Bulk case packaging is also available for GRM15, GRM18 and GRM21.



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM155	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4
GRM188*	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.5
GRM216	2.0 ±0.1	1.25 ±0.1	0.6 ±0.1	0.2 to 0.7	0.7
GRM219			0.85 ±0.1		
GRM21A			1.0 +0/-0.2		
GRM21B			1.25 ±0.1		
GRM316	3.2 ±0.15	1.6 ±0.15	0.6 ±0.1	0.3 to 0.8	1.5
GRM319			0.85 ±0.1		
GRM31M			1.15 ±0.1		
GRM31C	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2		

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

■ Applications

General electronic equipment

Temperature Compensating Type GRM15 Series (1.0x0.5 mm) 50V/25V

Part Number	**GRM15**							
L x W [EIA]	1.00x0.50 [0402]							
TC	C0G (**5C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)		T2H (**6T**)	U2J (**7U**)
Rated Volt.	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)								
0.50pF(**R50**)	0.50(**5**)							
0.75pF(**R75**)	0.50(**5**)							
1.0pF(**1R0**)	0.50(**5**)							
2.0pF(**2R0**)	0.50(**5**)							
3.0pF(**3R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
4.0pF(**4R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
5.0pF(**5R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
6.0pF(**6R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
7.0pF(**7R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
8.0pF(**8R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
9.0pF(**9R0**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
10pF(**100**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
12pF(**120**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
15pF(**150**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
18pF(**180**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
22pF(**220**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
27pF(**270**)	0.50(**5**)	0.50(**5**)	0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)
33pF(**330**)	0.50(**5**)		0.50(**5**)	0.50(**5**)			0.50(**5**)	0.50(**5**)

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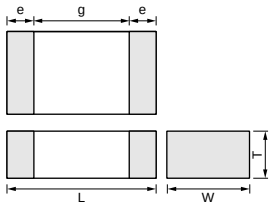
Chip Monolithic Ceramic Capacitors

Thin Type (Flow/Reflow)

■ Features

1. This series is suited to flow and reflow soldering. Capacitor terminations are made of metal highly resistant to migration.
2. Large capacitance values enable excellent bypass effects to be realized.
3. Its thin package makes this series ideally suited for the production of small electronic products and for mounting underneath ICs.



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM15X	1.0 ±0.05	0.5 ±0.05	0.25 ±0.05	0.1 to 0.3	0.4

■ Applications

Thin equipment such as IC cards

Temperature Compensating Type

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM15X5C1H1R0CDB4	C0G (EIA)	50	1.0 ±0.25pF	1.00	0.50	0.25
GRM15X5C1H2R0CDB4	C0G (EIA)	50	2.0 ±0.25pF	1.00	0.50	0.25
GRM15X5C1H3R0CDB4	C0G (EIA)	50	3.0 ±0.25pF	1.00	0.50	0.25
GRM15X5C1H4R0CDB4	C0G (EIA)	50	4.0 ±0.25pF	1.00	0.50	0.25
GRM15X5C1H5R0CDB4	C0G (EIA)	50	5.0 ±0.25pF	1.00	0.50	0.25
GRM15X5C1H6R0DDB4	C0G (EIA)	50	6.0 ±0.5pF	1.00	0.50	0.25
GRM15X5C1H7R0DDB4	C0G (EIA)	50	7.0 ±0.5pF	1.00	0.50	0.25
GRM15X5C1H8R0DDB4	C0G (EIA)	50	8.0 ±0.5pF	1.00	0.50	0.25
GRM15X5C1H9R0DDB4	C0G (EIA)	50	9.0 ±0.5pF	1.00	0.50	0.25
GRM15X5C1H100JDB4	C0G (EIA)	50	10 ±5%	1.00	0.50	0.25
GRM15X5C1H120JDB4	C0G (EIA)	50	12 ±5%	1.00	0.50	0.25
GRM15X5C1H150JDB4	C0G (EIA)	50	15 ±5%	1.00	0.50	0.25
GRM15X5C1H180JDB4	C0G (EIA)	50	18 ±5%	1.00	0.50	0.25
GRM15X5C1H220JDB4	C0G (EIA)	50	22 ±5%	1.00	0.50	0.25
GRM15X5C1H270JDB4	C0G (EIA)	50	27 ±5%	1.00	0.50	0.25
GRM15X5C1H330JDB4	C0G (EIA)	50	33 ±5%	1.00	0.50	0.25
GRM15X5C1H390JDB4	C0G (EIA)	50	39 ±5%	1.00	0.50	0.25
GRM15X5C1H470JDB4	C0G (EIA)	50	47 ±5%	1.00	0.50	0.25
GRM15X5C1H560JDB4	C0G (EIA)	50	56 ±5%	1.00	0.50	0.25
GRM15X5C1H680JDB4	C0G (EIA)	50	68 ±5%	1.00	0.50	0.25
GRM15X5C1H820JDB4	C0G (EIA)	50	82 ±5%	1.00	0.50	0.25
GRM15X5C1H101JDB4	C0G (EIA)	50	100 ±5%	1.00	0.50	0.25
GRM15X5C1E121JDB4	C0G (EIA)	25	120 ±5%	1.00	0.50	0.25
GRM15X5C1E151JDB4	C0G (EIA)	25	150 ±5%	1.00	0.50	0.25
GRM15X5C1E181JDB4	C0G (EIA)	25	180 ±5%	1.00	0.50	0.25
GRM15X5C1E221JDB4	C0G (EIA)	25	220 ±5%	1.00	0.50	0.25

High Dielectric Constant Type

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM15XR71H221KA86	X7R (EIA)	50	220 ±10%	1.00	0.50	0.25
GRM15XR71H331KA86	X7R (EIA)	50	330 ±10%	1.00	0.50	0.25
GRM15XR71H471KA86	X7R (EIA)	50	470 ±10%	1.00	0.50	0.25

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Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM15XR71H681KA86	X7R (EIA)	50	680 ±10%	1.00	0.50	0.25
GRM15XR71H102KA86	X7R (EIA)	50	1000 ±10%	1.00	0.50	0.25
GRM15XR71H152KA86	X7R (EIA)	50	1500 ±10%	1.00	0.50	0.25
GRM15XR71E182KA86	X7R (EIA)	25	1800 ±10%	1.00	0.50	0.25
GRM15XR71E222KA86	X7R (EIA)	25	2200 ±10%	1.00	0.50	0.25
GRM15XR71C332KA86	X7R (EIA)	16	3300 ±10%	1.00	0.50	0.25
GRM15XR71C472KA86	X7R (EIA)	16	4700 ±10%	1.00	0.50	0.25
GRM15XR71C682KA86	X7R (EIA)	16	6800 ±10%	1.00	0.50	0.25

GRM Series Specifications and Test Methods

No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
1	Operating Temperature		−55 to +125℃	R6 : −55 to +85℃ R7 : −55 to +125℃ E4 : +10 to +85℃ F5 : −30 to +85℃	
2	Rated Voltage		See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities		Visual inspection
4	Dimensions		Within the specified dimensions		Using calipers on micrometer
5	Dielectric Strength		No defects or abnormalities		No failure should be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V
6	Insulation Resistance		More than 10,000MΩ or 500Ω • F (Whichever is smaller)		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance		The capacitance/Q/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)		30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max.(C<0.10μF) : 0.09max.(C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A)	R6 : Within±15% (−55 to +85℃) R7 : Within±15% (−55 to +125℃) E4 : Within +22/−56% (+10 to +85℃) F5 : Within +22/−82% (−30 to +85℃)	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 step 1 through 5 (C0Δ : +25℃ to +125℃ : other temp. coeffs. : +25℃ to +85℃) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in steps 1, 3 and 5 by the capacitance value in step 3.
		Temperature Coefficient	Within the specified tolerance (Table A)	—	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Does not apply to 1X/25V	—	

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

Step	Temperature(℃)
1	25±2
2	−55±3 (for ΔC to 7U/1X/R6/R7) −30±3 (for F5) 10±3 (for E4)
3	25±2
4	125±3 (for ΔC/R7) 85±3 (for other TC)
5	25±2

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

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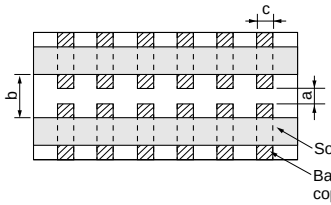
GRM Series Specifications and Test Methods

Continued from the preceding page.

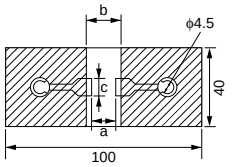
No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
10	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.		Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder. 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. ✻2N (GR□03) 5N (GR□15, GRM18)
11	Vibration Resistance	Appearance	No defects or abnormalities		Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance		
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
12	Deflection		No crack or marked defect should occur.		Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. 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
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 1



t : 1.6mm (GR□03/15 : 0.8mm)

Type	a	b	c
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 2

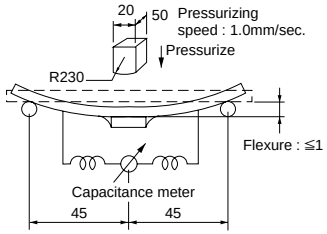


Fig. 3

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GRM Series Specifications and Test Methods

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No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	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℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. ✻Preheating for GRM32/43/55 Step 1: 100℃ to 120℃, 1 min. Step 2: 170℃ to 200℃, 1 min.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
15	Temperature Cycle		The measured and observed characteristics should satisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure. Step 1: Min. Operating Temp.+0/−3, 30±3 Step 2: Room Temp., 2 to 3 Step 3: Max. Operating Temp.+3/−0, 30±3 Step 4: Room Temp., 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

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GRM Series Specifications and Test Methods

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No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
16	Humidity Steady State		The measured and observed characteristics should satisfy the specifications in the following table.		Let the capacitor sit at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
		Appearance	No marking defects		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R6, R7 : Within ±12.5% E4, F5 : Within ±30%	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
17	Humidity Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F5/10V max. Apply the rated DC voltage for 1 hour at 40±2℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% [W.V. : 10Vmax.] F5 : Within +30/−40%	
		Q/D.F.	30pF and over : Q≧200 30pF and below : Q≧100+10C/3 C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 500MΩ or 25Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

Continued on the following page.

GRM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. ∗150% for 500V and C≧10μF
		Appearance	No marking defects		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% (Cap<1.0μF) F5 : Within +30/−40% (Cap≧1.0μF)	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω•F (Whichever is smaller)		
		Dielectric Strength	No failure		

Table A

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

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

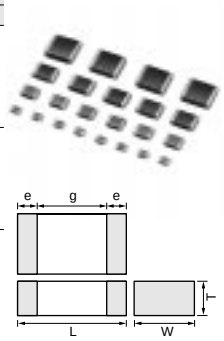
Chip Monolithic Ceramic Capacitors

for Reflow Soldering GRM32/43/55 Series

■ Features

1. Terminations are made of metal highly resistant to migration.
2. The GRM series is a complete line of chip ceramic capacitors in 10V, 16V, 25V, 50V, 100V and 200V ratings.
   These capacitors have temperature characteristics ranging from C0G to Y5V.
3. This series consists of type LxWxT: 3.2x2.5x0.85mm to LxWxT: 5.7x5.0x2.5mm. These are suited to only reflow soldering.
4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placement on PCBs.
5. The GRM series is available in paper or plastic embossed tape and reel packaging for automatic placement.

Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GRM329	3.2 ±0.3	2.5 ±0.2	0.85 ±0.1	0.3	1.0
GRM32M			1.15 ±0.1		
GRM32N			1.35 ±0.15		
GRM32R			1.8 ±0.2		
GRM32E			2.5 ±0.2		
GRM43M	4.5 ±0.4	3.2 ±0.3	1.15 ±0.1	0.3	2.0
GRM43N			1.35 ±0.15		
GRM43R			1.8 ±0.2		
GRM43D			2.0 ±0.2		
GRM43E			2.5 ±0.2		
GRM55M	5.7 ±0.4	5.0 ±0.4	1.15 ±0.1	0.3	2.0
GRM55N			1.35 ±0.15		
GRM55C			1.6 ±0.2		
GRM55R			1.8 ±0.2		
GRM55D			2.0 ±0.2		
GRM55E			2.5 ±0.2		



■ Applications

General electronic equipment

Temperature Compensating Type GRM32/43/55 Series

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM32N5C2D561JV01	C0G (EIA)	200	560 ±5%	3.20	2.50	1.35
GRM32N5C2D681JY21	C0G (EIA)	200	680 ±5%	3.20	2.50	1.35
GRM32N5C2D821JY21	C0G (EIA)	200	820 ±5%	3.20	2.50	1.35
GRM32N5C2D102JY21	C0G (EIA)	200	1000 ±5%	3.20	2.50	1.35
GRM43R5C2D122JV01	C0G (EIA)	200	1200 ±5%	4.50	3.20	1.80
GRM43R5C2D152JV01	C0G (EIA)	200	1500 ±5%	4.50	3.20	1.80
GRM43R5C2D182JY21	C0G (EIA)	200	1800 ±5%	4.50	3.20	1.80
GRM43R5C2D222JY21	C0G (EIA)	200	2200 ±5%	4.50	3.20	1.80
GRM43R5C2D272JY21	C0G (EIA)	200	2700 ±5%	4.50	3.20	1.80
GRM55N5C2D332JY21	C0G (EIA)	200	3300 ±5%	5.70	5.00	1.35
GRM55R5C2D392JY21	C0G (EIA)	200	3900 ±5%	5.70	5.00	1.80
GRM55R5C2D472JY21	C0G (EIA)	200	4700 ±5%	5.70	5.00	1.80
GRM55R5C2D562JY21	C0G (EIA)	200	5600 ±5%	5.70	5.00	1.80
GRM32N1X2D152JV01	SL (JIS)	200	1500 ±5%	3.20	2.50	1.35
GRM43N1X2D182JV01	SL (JIS)	200	1800 ±5%	4.50	3.20	1.35
GRM43N1X2D222JV01	SL (JIS)	200	2200 ±5%	4.50	3.20	1.35
GRM43R1X2D272JV01	SL (JIS)	200	2700 ±5%	4.50	3.20	1.80
GRM43R1X2D332JV01	SL (JIS)	200	3300 ±5%	4.50	3.20	1.80
GRM43R1X2D392JV01	SL (JIS)	200	3900 ±5%	4.50	3.20	1.80
GRM55N1X2D472JV01	SL (JIS)	200	4700 ±5%	5.70	5.00	1.35
GRM55R1X2D562JV01	SL (JIS)	200	5600 ±5%	5.70	5.00	1.80
GRM55R1X2D682JV01	SL (JIS)	200	6800 ±5%	5.70	5.00	1.80
GRM55R1X2D822JV01	SL (JIS)	200	8200 ±5%	5.70	5.00	1.80
GRM32N1X2A562JZ01	SL (JIS)	100	5600 ±5%	3.20	2.50	1.35
GRM32N1X2A682JZ01	SL (JIS)	100	6800 ±5%	3.20	2.50	1.35
GRM43N1X2A822JZ01	SL (JIS)	100	8200 ±5%	4.50	3.20	1.35
GRM43R1X2A103JZ01	SL (JIS)	100	10000 ±5%	4.50	3.20	1.80

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Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM43R1X2A123JZ01	SL (JIS)	100	12000 ±5%	4.50	3.20	1.80
GRM43R1X2A153JZ01	SL (JIS)	100	15000 ±5%	4.50	3.20	1.80
GRM55M1X2A183JZ01	SL (JIS)	100	18000 ±5%	5.70	5.00	1.15
GRM55N1X2A223JZ01	SL (JIS)	100	22000 ±5%	5.70	5.00	1.35
GRM55R1X2A273JZ01	SL (JIS)	100	27000 ±5%	5.70	5.00	1.80
GRM55R1X2A333JZ01	SL (JIS)	100	33000 ±5%	5.70	5.00	1.80
GRM55R1X2A393JZ01	SL (JIS)	100	39000 ±5%	5.70	5.00	1.80
GRM32N1X1H103JZ01	SL (JIS)	50	10000 ±5%	3.20	2.50	1.35
GRM32N1X1H123JZ01	SL (JIS)	50	12000 ±5%	3.20	2.50	1.35
GRM43R1X1H153JZ01	SL (JIS)	50	15000 ±5%	4.50	3.20	1.80
GRM55M1X1H183JZ01	SL (JIS)	50	18000 ±5%	5.70	5.00	1.15
GRM55N1X1H223JZ01	SL (JIS)	50	22000 ±5%	5.70	5.00	1.35
GRM55R1X1H273JZ01	SL (JIS)	50	27000 ±5%	5.70	5.00	1.80
GRM55R1X1H333JZ01	SL (JIS)	50	33000 ±5%	5.70	5.00	1.80
GRM55R1X1H393JZ01	SL (JIS)	50	39000 ±5%	5.70	5.00	1.80

High Dielectric Constant Type Type GRM32 Series (3.20x2.50mm)

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM32ER61A106KC01	X5R (EIA)	10	10µF ±10%	3.20	2.50	2.50
GRM32NR72A683KA01	X7R (EIA)	100	68000pF ±10%	3.20	2.50	1.35
GRM32NR72A104KA01	X7R (EIA)	100	0.10µF ±10%	3.20	2.50	1.35
GRM32ER72A105KA01	X7R (EIA)	100	1.0µF ±10%	3.20	2.50	2.50
GRM32NR71H684KA01	X7R (EIA)	50	0.68µF ±10%	3.20	2.50	1.35
GRM32RR71H105KA01	X7R (EIA)	50	1.0µF ±10%	3.20	2.50	1.80
GRM32RR71E225KC01	X7R (EIA)	25	2.2µF ±10%	3.20	2.50	1.80
GRM32MR71C225KC01	X7R (EIA)	16	2.2µF ±10%	3.20	2.50	1.15
GRM32NR71C335KC01	X7R (EIA)	16	3.3µF ±10%	3.20	2.50	1.35
GRM32RR71C475KC01	X7R (EIA)	16	4.7µF ±10%	3.20	2.50	1.80
GRM32ER71H475KA88	X7R (EIA)	16	4.7µF ±10%	3.20	2.50	2.50
GRM32NF52A104ZA01	Y5V (EIA)	100	0.10µF +80/-20%	3.20	2.50	1.35
GRM32RF51H105ZA01	Y5V (EIA)	50	1.0µF +80/-20%	3.20	2.50	1.8
GRM32DF51H106ZA01	Y5V (EIA)	50	10µF +80/-20%	3.20	2.50	2.00
GRM329F51E475ZA01	Y5V (EIA)	25	4.7µF +80/-20%	3.20	2.50	0.85
GRM32NF51E106ZA01	Y5V (EIA)	25	10µF +80/-20%	3.20	2.50	1.35
GRM32NF51C106ZA01	Y5V (EIA)	16	10µF +80/-20%	3.20	2.50	1.35

High Dielectric Constant Type Type GRM43 Series (4.50x3.20mm)

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (µF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM43RR72A154KA01	X7R (EIA)	100	0.15 ±10%	4.50	3.20	1.80
GRM43RR72A224KA01	X7R (EIA)	100	0.22 ±10%	4.50	3.20	1.80
GRM43DR72A474KA01	X7R (EIA)	100	0.47 ±10%	4.50	3.20	2.00
GRM43ER72A225KA01	X7R (EIA)	100	2.2 ±10%	4.50	3.20	2.50
GRM43ER71H225KA01	X7R (EIA)	50	2.2 ±10%	4.50	3.20	2.50

High Dielectric Constant Type Type GRM55 Series (5.70x5.00mm)

Part Number	TC Code (Standard)	Rated Voltage (Vdc)	Capacitance (μF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM55DR61H106KA01	X5R (EIA)	50	10.0 ±10%	5.70	5.00	2.00
GRM55DR72A105KA01	X7R (EIA)	100	1.0 ±10%	5.70	5.00	2.00
GRM55ER72A475KA01	X7R (EIA)	100	4.7 ±10%	5.70	5.00	2.50
GRM55RR71H105KA01	X7R (EIA)	50	1.0 ±10%	5.70	5.00	1.80
GRM55RR71H155KA01	X7R (EIA)	50	1.5 ±10%	5.70	5.00	1.80
GRM55ER71H475KA01	X7R (EIA)	50	4.7 ±10%	5.70	5.00	2.50
GRM55RF52A474ZA01	Y5V (EIA)	100	0.47 +80/-20%	5.70	5.00	1.80

GRM Series Specifications and Test Methods

No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
1	Operating Temperature		−55 to +125℃	R6 : −55 to +85℃ R7 : −55 to +125℃ E4 : +10 to +85℃ F5 : −30 to +85℃	
2	Rated Voltage		See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities		Visual inspection
4	Dimensions		Within the specified dimensions		Using calipers on micrometer
5	Dielectric Strength		No defects or abnormalities		No failure should be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V
6	Insulation Resistance		More than 10,000MΩ or 500Ω • F (Whichever is smaller)		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance		The capacitance/Q/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)		30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max.(C<0.10μF) : 0.09max.(C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A)	R6 : Within±15% (−55 to +85℃) R7 : Within±15% (−55 to +125℃) E4 : Within +22/−56% (+10 to +85℃) F5 : Within +22/−82% (−30 to +85℃)	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 step 1 through 5 (C0Δ : +25℃ to +125℃ : other temp. coeffs. : +25℃ to +85℃) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in steps 1, 3 and 5 by the capacitance value in step 3.
		Temperature Coefficient	Within the specified tolerance (Table A)	—	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Does not apply to 1X/25V	—	

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

Step	Temperature(℃)
1	25±2
2	−55±3 (for ΔC to 7U/1X/R6/R7) −30±3 (for F5) 10±3 (for E4)
3	25±2
4	125±3 (for ΔC/R7) 85±3 (for other TC)
5	25±2

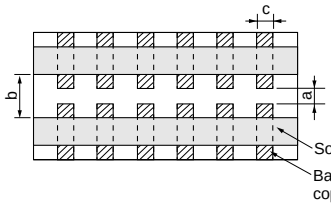
(2) High Dielectric Constant Type
The ranges of capacitance change compared with the above 25℃ value over the temperature ranges shown in the table should be within the specified ranges.

Continued on the following page.

GRM Series Specifications and Test Methods

Continued from the preceding page.

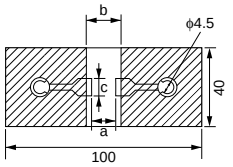
No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
10	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.		Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder. 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. ✻2N (GR□03) 5N (GR□15, GRM18)
11	Vibration Resistance	Appearance	No defects or abnormalities		Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance		
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
12	Deflection		No crack or marked defect should occur.		Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. 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
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 1



t : 1.6mm (GR□03/15 : 0.8mm)

Type	a	b	c
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 2

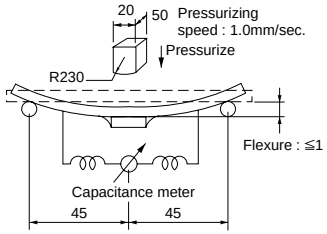


Fig. 3

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GRM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	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℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. ✻Preheating for GRM32/43/55 Step 1: 100℃ to 120℃, 1 min. Step 2: 170℃ to 200℃, 1 min.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
15	Temperature Cycle		The measured and observed characteristics should satisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure. Step 1: Min. Operating Temp.+0/−3, 30±3 Step 2: Room Temp., 2 to 3 Step 3: Max. Operating Temp.+3/−0, 30±3 Step 4: Room Temp., 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

Continued on the following page.

GRM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
16	Humidity Steady State		The measured and observed characteristics should satisfy the specifications in the following table.		Let the capacitor sit at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
		Appearance	No marking defects		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R6, R7 : Within ±12.5% E4, F5 : Within ±30%	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
17	Humidity Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F5/10V max. Apply the rated DC voltage for 1 hour at 40±2℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% [W.V. : 10Vmax.] F5 : Within +30/−40%	
		Q/D.F.	30pF and over : Q≧200 30pF and below : Q≧100+10C/3 C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 500MΩ or 25Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

Continued on the following page.

GRM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
18	High Temperature Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. ∗150% for 500V and C≧10μF
		Appearance	No marking defects		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% (Cap<1.0μF) F5 : Within +30/−40% (Cap≧1.0μF)	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω•F (Whichever is smaller)		
		Dielectric Strength	No failure		

Table A

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

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

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Part Number	GRM15							
L x W [EIA]	1.00x0.50 [0402]							
TC	C0G (**5C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)		T2H (**6T**)	U2J (**7U**)
Rated Volt.	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)								
39pF(**390**)	0.50(**5**)			0.50(**5**)			0.50(**5**)	0.50(**5**)
47pF(**470**)	0.50(**5**)				0.50(**5**)		0.50(**5**)	0.50(**5**)
56pF(**560**)	0.50(**5**)				0.50(**5**)		0.50(**5**)	0.50(**5**)
68pF(**680**)	0.50(**5**)				0.50(**5**)		0.50(**5**)	0.50(**5**)
82pF(**820**)	0.50(**5**)				0.50(**5**)		0.50(**5**)	0.50(**5**)
100pF(**101**)	0.50(**5**)				0.50(**5**)		0.50(**5**)	0.50(**5**)
120pF(**121**)	0.50(**5**)				0.50(**5**)			0.50(**5**)
150pF(**151**)	0.50(**5**)				0.50(**5**)			0.50(**5**)
180pF(**181**)	0.50(**5**)				0.50(**5**)			0.50(**5**)
220pF(**221**)	0.50(**5**)					0.50(**5**)		
270pF(**271**)	0.50(**5**)					0.50(**5**)		
330pF(**331**)	0.50(**5**)					0.50(**5**)		
390pF(**391**)	0.50(**5**)					0.50(**5**)		
470pF(**471**)	0.50(**5**)							
560pF(**561**)	0.50(**5**)							
680pF(**681**)	0.50(**5**)							
820pF(**821**)	0.50(**5**)							
1000pF(**102**)	0.50(**5**)							

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

Temperature Compensating Type GRM18 Series (1.60x0.80 mm) 200V/100V/50V/25V

Part Number	GRM18											
L x W [EIA]	1.60x0.80 [0603]											
TC	C0G (**5C**)			P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	200 (**2D**)	100 (**2A**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)												
0.50pF(**R50**)	0.80(**8**)	0.80(**8**)	0.80(**8**)									
0.75pF(**R75**)	0.80(**8**)	0.80(**8**)	0.80(**8**)									
1.0pF(**1R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)									
2.0pF(**2R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)									
3.0pF(**3R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
4.0pF(**4R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
5.0pF(**5R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
6.0pF(**6R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
7.0pF(**7R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
8.0pF(**8R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
9.0pF(**9R0**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
10pF(**100**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)
12pF(**120**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
15pF(**150**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
18pF(**180**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
22pF(**220**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
27pF(**270**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
33pF(**330**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
39pF(**390**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
47pF(**470**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)
56pF(**560**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)				0.80(**8**)	0.80(**8**)

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Part Number	GRM18											
L x W [EIA]	1.60x0.80 [0603]											
TC	C0G (**5C**)			P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	200 (**2D**)	100 (**2A**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)												
68pF(**680**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)		0.80(**8**)		0.80(**8**)	0.80(**8**)
82pF(**820**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)		0.80(**8**)		0.80(**8**)	0.80(**8**)
100pF(**101**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)		0.80(**8**)		0.80(**8**)	0.80(**8**)
120pF(**121**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
150pF(**151**)		0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
180pF(**181**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
220pF(**221**)		0.80(**8**)	0.80(**8**)			0.80(**8**)		0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
270pF(**271**)		0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
330pF(**331**)		0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
390pF(**391**)		0.80(**8**)	0.80(**8**)					0.80(**8**)	0.80(**8**)		0.80(**8**)	0.80(**8**)
470pF(**471**)		0.80(**8**)	0.80(**8**)						0.80(**8**)			0.80(**8**)
560pF(**561**)		0.80(**8**)	0.80(**8**)						0.80(**8**)			0.80(**8**)
680pF(**681**)			0.80(**8**)						0.80(**8**)			0.80(**8**)
820pF(**821**)			0.80(**8**)							0.80(**8**)		
1000pF(**102**)			0.80(**8**)							0.80(**8**)		
1200pF(**122**)			0.80(**8**)							0.80(**8**)		
1500pF(**152**)			0.80(**8**)							0.80(**8**)		
1800pF(**182**)			0.80(**8**)									
2200pF(**222**)			0.80(**8**)									
2700pF(**272**)			0.80(**8**)									

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

Temperature Compensating Type GRM21 Series (2.00x1.25 mm) 200V/100V/50V/25V

Part Number	GRM21												
L x W [EIA]	2.00x1.25 [0805]												
TC	C0G (**5C**)			C0H (**6C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)													
12pF(**120**)	0.85(**9**)												
15pF(**150**)	0.85(**9**)												
18pF(**180**)	0.85(**9**)												
22pF(**220**)	0.85(**9**)												
27pF(**270**)	0.85(**9**)												
33pF(**330**)	0.85(**9**)												
39pF(**390**)	0.85(**9**)												
47pF(**470**)	0.85(**9**)												
56pF(**560**)	0.85(**9**)												
68pF(**680**)	1.25(**B**)	0.85(**9**)											
82pF(**820**)	1.25(**B**)	0.85(**9**)											
100pF(**101**)	1.25(**B**)	0.60(**6**)											
120pF(**121**)	1.25(**B**)	0.60(**6**)						0.85(**9**)					
150pF(**151**)	1.25(**B**)	0.60(**6**)						1.25(**B**)					
180pF(**181**)	1.25(**B**)	0.60(**6**)			0.85(**9**)			1.25(**B**)					
220pF(**221**)	1.25(**B**)	0.60(**6**)			0.85(**9**)	0.85(**9**)		1.25(**B**)					
270pF(**271**)		0.60(**6**)			0.85(**9**)	0.85(**9**)	0.85(**9**)	1.25(**B**)					
330pF(**331**)		0.60(**6**)			0.85(**9**)	0.85(**9**)	0.85(**9**)	1.25(**B**)					
390pF(**391**)		0.60(**6**)			1.25(**B**)	0.85(**9**)	0.85(**9**)	1.25(**B**)					

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Part Number	GRM21												
L x W [EIA]	2.00x1.25 [0805]												
TC	C0G (**5C**)			C0H (**6C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)													
470pF(**471**)		0.60(**6**)			1.25(**B**)	0.85(**9**)	0.85(**9**)	1.25(**B**)	0.85(**9**)				
560pF(**561**)		0.60(**6**)			1.25(**B**)	1.25(**B**)	1.25(**B**)		0.85(**9**)			1.25(**B**)	
680pF(**681**)		0.85(**9**)				1.25(**B**)	1.25(**B**)		0.85(**9**)			1.25(**B**)	
820pF(**821**)		0.85(**9**)					1.25(**B**)		1.25(**B**)	0.60(**6**)		1.25(**B**)	0.60(**6**)
1000pF(**102**)		0.85(**9**)							1.25(**B**)	0.60(**6**)		1.25(**B**)	0.60(**6**)
1200pF(**122**)									1.25(**B**)	0.60(**6**)		1.25(**B**)	0.60(**6**)
1500pF(**152**)									1.25(**B**)	0.85(**9**)		1.25(**B**)	0.85(**9**)
1800pF(**182**)			0.60(**6**)						1.25(**B**)	0.85(**9**)		1.25(**B**)	0.85(**9**)
2200pF(**222**)			0.60(**6**)							0.85(**9**)			0.85(**9**)
2700pF(**272**)			0.60(**6**)	1.25(**B**)						1.25(**B**)			1.25(**B**)
3300pF(**332**)			0.60(**6**)	1.25(**B**)						1.25(**B**)			1.25(**B**)
3900pF(**392**)			0.60(**6**)	1.25(**B**)							0.85(**9**)		
4700pF(**472**)			0.60(**6**)								0.85(**9**)		
5600pF(**562**)			0.85(**9**)								1.25(**B**)		
6800pF(**682**)			0.85(**9**)								1.25(**B**)		
8200pF(**822**)			0.85(**9**)										
10000pF(**103**)			0.85(**9**)							0.60(**6**)			0.60(**6**)
12000pF(**123**)										0.60(**6**)			0.60(**6**)
15000pF(**153**)										0.60(**6**)			0.60(**6**)
18000pF(**183**)										0.60(**6**)			0.60(**6**)
22000pF(**223**)										0.85(**9**)			0.85(**9**)
27000pF(**273**)										0.85(**9**)			0.85(**9**)
33000pF(**333**)										1.00(**A**)			1.00(**A**)
39000pF(**393**)										1.25(**B**)			1.25(**B**)
47000pF(**473**)										1.25(**B**)			1.25(**B**)

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

Temperature Compensating Type GRM31 Series (3.20x1.60 mm) 500V/200V/100V/50V/25V

Part Number	GRM31													
L x W [EIA]	3.20x1.60 [1206]													
TC	C0G (**5C**)				C0H (**6C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	500 (**2H**)	200 (**2D**)	50 (**1H**)	25 (**1E**)	25 (**1E**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)														
1.0pF(**1R0**)	1.15(**M**)													
2.0pF(**2R0**)	1.15(**M**)													
3.0pF(**3R0**)	1.15(**M**)													
4.0pF(**4R0**)	1.15(**M**)													
5.0pF(**5R0**)	1.15(**M**)													
6.0pF(**6R0**)	1.15(**M**)													
7.0pF(**7R0**)	1.15(**M**)													
8.0pF(**8R0**)	1.15(**M**)													
9.0pF(**9R0**)	1.15(**M**)													
10pF(**100**)	1.15(**M**)													
12pF(**120**)	1.15(**M**)													
15pF(**150**)	1.15(**M**)													
18pF(**180**)	1.15(**M**)													
22pF(**220**)	1.15(**M**)													

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Part Number	GRM31													
L x W [EIA]	3.20x1.60 [1206]													
TC	C0G (**5C**)				C0H (**6C**)	P2H (**6P**)	R2H (**6R**)	S2H (**6S**)	SL (**1X**)				T2H (**6T**)	U2J (**7U**)
Rated Volt.	500 (**2H**)	200 (**2D**)	50 (**1H**)	25 (**1E**)	25 (**1E**)	50 (**1H**)	50 (**1H**)	50 (**1H**)	200 (**2D**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)														
27pF(**270**)	1.15(**M**)													
33pF(**330**)	1.15(**M**)													
39pF(**390**)	1.15(**M**)													
47pF(**470**)	1.15(**M**)													
56pF(**560**)	1.15(**M**)													
68pF(**680**)	1.15(**M**)													
82pF(**820**)	1.15(**M**)													
270pF(**271**)		1.15(**M**)												
330pF(**331**)		1.15(**M**)												
390pF(**391**)		1.15(**M**)												
470pF(**471**)		1.15(**M**)												
560pF(**561**)									1.15(**M**)					
680pF(**681**)						0.85(**9**)			1.15(**M**)					
820pF(**821**)						0.85(**9**)	0.85(**9**)		1.15(**M**)					
1000pF(**102**)						1.15(**M**)	1.15(**M**)	0.85(**9**)	1.15(**M**)					
1200pF(**122**)						1.15(**M**)	1.15(**M**)	1.15(**M**)	1.15(**M**)					
1500pF(**152**)						1.15(**M**)	1.15(**M**)	1.15(**M**)						
1800pF(**182**)								1.15(**M**)						
2200pF(**222**)										1.15(**M**)			1.15(**M**)	
2700pF(**272**)										1.15(**M**)			1.15(**M**)	
3300pF(**332**)										1.15(**M**)			1.15(**M**)	
3900pF(**392**)										1.15(**M**)	0.85(**9**)		1.15(**M**)	0.85(**9**)
4700pF(**472**)										1.15(**M**)	0.85(**9**)			0.85(**9**)
5600pF(**562**)			0.85(**9**)								0.85(**9**)			0.85(**9**)
6800pF(**682**)			0.85(**9**)		0.85(**9**)						1.15(**M**)			1.15(**M**)
8200pF(**822**)			0.85(**9**)		1.15(**M**)						1.15(**M**)			1.15(**M**)
10000pF(**103**)			0.85(**9**)									1.15(**M**)		
12000pF(**123**)												1.15(**M**)		
15000pF(**153**)												1.15(**M**)		
27000pF(**273**)			0.85(**9**)											
33000pF(**333**)			0.85(**9**)											
47000pF(**473**)			1.15(**M**)											
56000pF(**563**)											0.85(**9**)			0.85(**9**)
68000pF(**683**)											1.15(**M**)			1.15(**M**)
82000pF(**823**)											1.15(**M**)			1.15(**M**)
0.10µF(**104**)				1.60(**C**)							1.15(**M**)			1.15(**M**)

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

High Dielectric Constant Type X5R (R6) Characteristics

TC	X5R (**R6**)							
Part Number	GRM15		GRM18		GRM21		GRM31	
L x W [EIA]	1.00x0.50 [0402]		1.60x0.80 [0603]		2.00x1.25 [0805]		3.20x1.60 [1206]	
Rated Volt.	16 (**1C**)	10 (**1A**)	10 (**1A**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)								
68000pF(**683**)		0.50(**5**)						
0.10µF(**104**)	0.50(**5**)	0.50(**5**)						
0.33µF(**334**)			0.80(**8**)					

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TC	X5R (**R6**)							
Part Number	**GRM15**		**GRM18**		**GRM21**		**GRM31**	
L x W [EIA]	1.00x0.50 [0402]		1.60x0.80 [0603]		2.00x1.25 [0805]		3.20x1.60 [1206]	
Rated Volt.	16 (**1C**)	10 (**1A**)	10 (**1A**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)	10 (**1A**)	6.3 (**0J**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)								
0.47µF(**474**)			0.80(**8**)					
0.68µF(**684**)			0.80(**8**)					
1.0µF(**105**)			0.80(**8**)	0.80(**8**)	0.85(**9**)			
1.5µF(**155**)						0.85(**9**)		
2.2µF(**225**)					1.25(**B**)	1.25(**B**)	0.85(**9**)	
3.3µF(**335**)						1.25(**B**)	1.30(**X**)	
4.7µF(**475**)						1.25(**B**)	1.60(**C**)	1.15(**M**)
10µF(**106**)							1.60(**C**)	1.60(**C**)

The part numbering code is shown in each ( ).
3.3µF and 4.7µF, 6.3V rated are GRM21 series of L: 2±0.15, W: 1.25±0.15, T: 1.25±0.15.
T: 1.15±0.1mm is also available for GRM31 1.0µF for 16V.
L: 3.2±0.2, W: 1.6±0.2 for GRM31 16V 1.0µF type. Also L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15 for GRM31 16V 1.5µF and 2.2µF type.
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type X7R (R7) Characteristics

TC	X7R (**R7**)																	
Part Number	**GRM15**				**GRM18**					**GRM21**				**GRM31**				
L x W [EIA]	1.00x0.50 [0402]				1.60x0.80 [0603]					2.00x1.25 [0805]				3.20x1.60 [1206]				
Rated Volt.	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)																		
220pF (**221**)	0.50 (**5**)					0.80 (**8**)												
330pF (**331**)	0.50 (**5**)					0.80 (**8**)												
470pF (**471**)	0.50 (**5**)					0.80 (**8**)												
680pF (**681**)	0.50 (**5**)					0.80 (**8**)												
1000pF (**102**)	0.50 (**5**)					0.80 (**8**)												
1500pF (**152**)	0.50 (**5**)					0.80 (**8**)												
2200pF (**222**)	0.50 (**5**)				0.80 (**8**)	0.80 (**8**)												
3300pF (**332**)	0.50 (**5**)				0.80 (**8**)	0.80 (**8**)												
4700pF (**472**)	0.50 (**5**)					0.80 (**8**)				0.85 (**9**)								
6800pF (**682**)		0.50 (**5**)				0.80 (**8**)				0.85 (**9**)								
10000pF (**103**)		0.50 (**5**)				0.80 (**8**)				1.25 (**B**)								
15000pF (**153**)			0.50 (**5**)			0.80 (**8**)												
22000pF (**223**)			0.50 (**5**)			0.80 (**8**)												
33000pF (**333**)				0.50 (**5**)		0.80 (**8**)	0.80 (**8**)				0.85 (**9**)			1.15 (**M**)				

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TC	X7R (**R7**)																	
Part Number	**GRM15**				**GRM18**					**GRM21**				**GRM31**				
L x W [EIA]	1.00x0.50 [0402]				1.60x0.80 [0603]					2.00x1.25 [0805]				3.20x1.60 [1206]				
Rated Volt.	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)																		
47000pF (**473**)				0.50 (**5**)		0.80 (**8**)	0.80 (**8**)				1.25 (**B**)			1.15 (**M**)				
68000pF (**683**)						0.80 (**8**)	0.80 (**8**)				1.25 (**B**)							
0.10µF (**104**)			0.50 (**5**)	0.50 (**5**)		0.80 (**8**)	0.80 (**8**)	0.80 (**8**)			1.25 (**B**)	1.25 (**B**)						
0.15µF (**154**)							0.80 (**8**)		0.80 (**8**)		1.25 (**B**)	1.25 (**B**)						
0.22µF (**224**)								0.80 (**8**)	0.80 (**8**)		1.25 (**B**)	0.85 (**9**)						
0.33µF (**334**)											0.85 (**9**)	1.25 (**B**)			0.85 (**9**)			
0.47µF (**474**)											1.25 (**B**)	1.25 (**B**)	0.85 (**9**)		1.15 (**M**)			
0.68µF (**684**)													0.85 (**9**)			0.85 (**9**)		
1.0µF (**105**)													1.25 (**B**)		1.15 (**M**)	1.15 (**M**)	0.85 (**9**)	0.85 (**9**)
1.5µF (**155**)															1.60 (**C**)		1.15 (**M**)	
2.2µF (**225**)															1.60 (**C**)		1.15 (**M**)	0.85 (**9**)
3.3µF (**335**)																1.60 (**C**)		
4.7µF (**475**)																1.60 (**C**)		

The part numbering code is shown in each ( ).
The tolerance will be changed to L: 3.2±0.2, W: 1.6±0.2 for GRM31 16V 1.0µF type. Also L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15 for GRM31 16V 1.5µF and 2.2µF type.
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type Y5V (F5) Characteristics

TC	Y5V (**F5**)																
Part Number	**GRM15**			**GRM18**					**GRM21**				**GRM31**				
L x W [EIA]	1.00x0.50 [0402]			1.60x0.80 [0603]					2.00x1.25 [0805]				3.20x1.60 [1206]				
Rated Volt.	50 (**1H**)	25 (**1E**)	16 (**1C**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)																	
2200pF (**222**)	0.50 (**5**)																
4700pF (**472**)	0.50 (**5**)			0.80 (**8**)													
10000pF (**103**)	0.50 (**5**)				0.80 (**8**)												
22000pF (**223**)		0.50 (**5**)			0.80 (**8**)												
47000pF (**473**)			0.50 (**5**)		0.80 (**8**)												
0.10µF (**104**)		0.50 (**5**)	0.50 (**5**)		0.80 (**8**)	0.80 (**8**)			0.85 (**9**)								

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TC	Y5V (**F5**)																
Part Number	**GRM15**			**GRM18**					**GRM21**				**GRM31**				
L x W [EIA]	1.00x0.50 [0402]			1.60x0.80 [0603]					2.00x1.25 [0805]				3.20x1.60 [1206]				
Rated Volt.	50 (**1H**)	25 (**1E**)	16 (**1C**)	100 (**2A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	50 (**1H**)	25 (**1E**)	16 (**1C**)	10 (**1A**)	6.3 (**0J**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)																	
0.22µF (**224**)							0.80 (**8**)		1.25 (**B**)	0.85 (**9**)							
0.47µF (**474**)							0.80 (**8**)	0.80 (**8**)		1.25 (**B**)			1.15 (**M**)				
1.0µF (**105**)							0.80 (**8**)	0.80 (**8**)		0.85 (**9**)	0.85 (**9**)	0.85 (**9**)		1.15 (**M**)	0.85 (**9**)		
2.2µF (**225**)										1.25 (**B**)	1.25 (**B**)	1.25 (**B**)			1.15 (**M**)	0.85 (**9**)	
4.7µF (**475**)												1.25 (**B**)		1.15 (**M**)	1.15 (**M**)	1.15 (**M**)	
10µF (**106**)														1.60 (**C**)		1.15 (**M**)	1.15 (**M**)

The part numbering code is shown in each ( ).
T: 1.25±0.1mm is also available for GRM21 25V or 16V 1.0µF type.
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type Z5U (E4) Characteristics

TC	Z5U (**E4**)		
Part Number	**GRM18**	**GRM21**	**GRM31**
L x W [EIA]	1.60x0.80 [0603]	2.00x1.25 [0805]	3.20x1.60 [1206]
Rated Volt.	50 (**1H**)	50 (**1H**)	50 (**1H**)
Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code)			
10000pF(**103**)	0.80(**8**)		
22000pF(**223**)	0.80(**8**)		
47000pF(**473**)		0.60(**6**)	
0.10µF(**104**)		0.85(**9**)	
0.22µF(**224**)			0.85(**9**)

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

GRM Series Specifications and Test Methods

No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
1	Operating Temperature		−55 to +125℃	R6 : −55 to +85℃ R7 : −55 to +125℃ E4 : +10 to +85℃ F5 : −30 to +85℃	
2	Rated Voltage		See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities		Visual inspection
4	Dimensions		Within the specified dimensions		Using calipers on micrometer
5	Dielectric Strength		No defects or abnormalities		No failure should be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V
6	Insulation Resistance		More than 10,000MΩ or 500Ω • F (Whichever is smaller)		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance		The capacitance/Q/D.F. should be measured at 25℃ at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)		30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max.(C<0.10μF) : 0.09max.(C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A)	R6 : Within±15% (−55 to +85℃) R7 : Within±15% (−55 to +125℃) E4 : Within +22/−56% (+10 to +85℃) F5 : Within +22/−82% (−30 to +85℃)	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 step 1 through 5 (C0Δ : +25℃ to +125℃ : other temp. coeffs. : +25℃ to +85℃) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in steps 1, 3 and 5 by the capacitance value in step 3.
		Temperature Coefficient	Within the specified tolerance (Table A)	—	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Does not apply to 1X/25V	—	

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

Step	Temperature(℃)
1	25±2
2	−55±3 (for ΔC to 7U/1X/R6/R7) −30±3 (for F5) 10±3 (for E4)
3	25±2
4	125±3 (for ΔC/R7) 85±3 (for other TC)
5	25±2

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

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GRM Series Specifications and Test Methods

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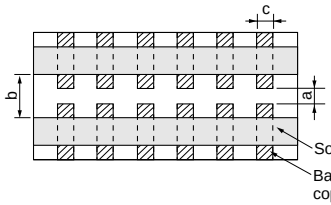
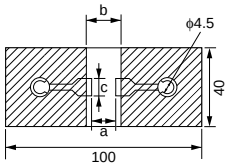
No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	Test Method
10	Adhesive Strength of Termination		No removal of the terminations or other defect should occur.		Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder. 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. ✻2N (GR□03) 5N (GR□15, GRM18)
11	Vibration Resistance	Appearance	No defects or abnormalities		Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).
		Capacitance	Within the specified tolerance		
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
12	Deflection		No crack or marked defect should occur.		Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. 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
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 1



t : 1.6mm (GR□03/15 : 0.8mm)

Type	a	b	c
GR□03	0.3	0.9	0.3
GR□15	0.4	1.5	0.5
GRM18	1.0	3.0	1.2
GRM21	1.2	4.0	1.65
GRM31	2.2	5.0	2.0
GRM32	2.2	5.0	2.9
GRM43	3.5	7.0	3.7
GRM55	4.5	8.0	5.6

(in mm)

Fig. 2

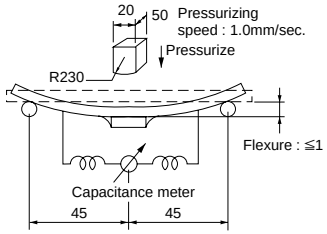


Fig. 3

Continued on the following page.

GRM Series Specifications and Test Methods

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No.	Item		Specifications: Temperature Compensating Type	Specifications: High Dielectric Type	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℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. ✻Preheating for GRM32/43/55 Step 1: 100℃ to 120℃, 1 min. Step 2: 170℃ to 200℃, 1 min.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
15	Temperature Cycle		The measured and observed characteristics should satisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure. Step 1: Min. Operating Temp.+0/−3, 30±3 Step 2: Room Temp., 2 to 3 Step 3: Max. Operating Temp.+3/−0, 30±3 Step 4: Room Temp., 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150 $^{+0}_{-10}$℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6, R7 : Within ±7.5% E4, F5 : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≧0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

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No.	Item		Specifications		Test Method
			Temperature Compensating Type	High Dielectric Type	
16	Humidity Steady State		The measured and observed characteristics should satisfy the specifications in the following table.		Let the capacitor sit at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
		Appearance	No marking defects		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R6, R7 : Within ±12.5% E4, F5 : Within ±30%	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
17	Humidity Load		The measured and observed characteristics should satisfy the specifications in the following table.		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F5/10V max. Apply the rated DC voltage for 1 hour at 40±2℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
		Appearance	No marking defects		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% [W.V. : 10Vmax.] F5 : Within +30/−40%	
		Q/D.F.	30pF and over : Q≧200 30pF and below : Q≧100+10C/3 C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 500MΩ or 25Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

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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℃. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. ∗150% for 500V and C≧10μF
		Appearance	No marking defects		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% (Cap<1.0μF) F5 : Within +30/−40% (Cap≧1.0μF)	
		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)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [E4] W.V. : 25Vmin. : 0.05max [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≧0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max.	
		I.R.	More than 1,000MΩ or 50Ω•F (Whichever is smaller)		
		Dielectric Strength	No failure		

Table A

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

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