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GRM Series Specifications and Test Methods (1)

	Ite	Item Specifications Temperature Compensating Type		- Test Method				
1	Operating Temperature Range -55 to +125°C (2P/R/S/T, 3P/R/S/T/U, 4P/R/S/T/U: -25 to +85°C)			Reference temperature: 25° C (2Δ , 3Δ , 4Δ : 20° C)				
2	Rated Voltage		See the previous pages.	The rated voltage is defined as the maximum may be applied continuously to the capacitor When AC voltage is superimposed on DC vo whichever is larger, should be maintained wi voltage range.		citor. C voltage, V ^{P-P} or V ^{O-P} ,		
3	Appearar	nce	No defects or abnormalities	Visual inspection				
4	Dimensio	ons	Within the specified dimensions	Using calipers (GRN	102 size is based on	Microscope)		
5	Dielectric	: Strength	No defects or abnormalities	No failure should be observed when 300%* of the rated volta is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.				
6	Insulation Resistance		C≤0.047µF: More than 10,000MΩ C>0.047µF: More than 500Ω \cdot F C: Nominal Capacitance	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at Reference Temperature and 75%RH max. and within 2 minutes of charging, provided the charge/discharge current is less th 50mA.				
7	Capacita	nce	Within the specified tolerance	The capacitance/Q/D.F. should be measured at Reference Temperature at the frequency and voltage shown in the table				
8	0	30pF and over: Q≧1000 30pF and below: Q≧400+20C		Capacitance Item	1000pF and below	more than 1000pF		
0	Q		C: Nominal Capacitance (pF)	Frequency Voltage	1±0.1MHz 0.5 to 5Vrms	1±0.1kHz 1±0.2Vrms		
		No bias	Within the specified tolerance (Table A-1)	The capacitance cha each specified temp		sured after 5 min. at		
9		Capacitance Drift		The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 throug 5 (5C: +25 to +125°C/ Δ C: +20 to +125°C: other temp. coeffs.: +25 to +85°C/+20 to +85°C) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1, 3 and 5 by the cap. value in step 3.				
9	Temperature		Within ±0.2% or ±0.05pF (Whichever is larger.) *Do not apply to 1X/25V	between the maximu step 1, 3 and 5 by th	um and minimum me e cap. value in step	asured values in the 3.		
9	Temperature		(Whichever is larger.)	between the maximu step 1, 3 and 5 by th Step	um and minimum me e cap. value in step Tempera	asured values in the 3. ture (°C)		
9	Temperature		(Whichever is larger.)	between the maximustep 1, 3 and 5 by the Step	um and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for	asured values in the 3. ture (°C) mperature ±2 ΔC to 7U) other TC)		
9	Temperature		(Whichever is larger.)	between the maximustep 1, 3 and 5 by the Step	um and minimum me e cap. value in step Tempera Reference Te -55±3 (for	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2		
9	Temperature		(Whichever is larger.)	between the maximustep 1, 3 and 5 by the step	Im and minimum me e cap. value in step Tempera Reference Te 55±3 (for -25±3 (for Reference Te 125±3 (85±3 (for	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC)		
9	Temperature		(Whichever is larger.)	between the maximustep 1, 3 and 5 by the Step	Im and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for Reference Te 125±3 (asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC)		
9	Temperature		(Whichever is larger.)	between the maximustep 1, 3 and 5 by the Step 1 and 5 by the Step	Im and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for Reference Te 125±3 (85±3 (for Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. J be done either with hould be conducted and free of defects s	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 epoxy board) shown in an iron or using the with care so that the uch as heat shock.		
9	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V	between the maximustep 1, 3 and 5 by the Step 1 and 5 by the Step	Im and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for Reference Te 125±3 (85±3 (for Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. J be done either with hould be conducted and free of defects s	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 epoxy board) shown in ly 10N* force in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) D C		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the Step 1 and 5 between the capacitor Fig. 1a using a euteer parallel with the test The soldering should reflow method and s soldering is uniform a *1N (GRM02), 2N (GRM02 GRM03 between the solder and s between the solder and s solder and s between the solder and s between	Im and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for Reference Te 125±3 (85±3 (for Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. d be done either with hould be conducted and free of defects s SRM03), 5N (GRM15 a b 0.2 0.4 0.3 0.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 repoxy board) shown in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) 0 c 56 0.23 9 0.3		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the step	Im and minimum me e cap. value in step Tempera Reference Te 55±3 (for 25±3 (for 25±3 (for Reference Te 125±3 (85±3 (for 1 Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. d be done either with hould be conducted and free of defects s GRM03), 5N (GRM15 a 0.2 0.4 0.3 0. 0.4 1.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC other TC) mperature ± 2 for ΔC other TC) mperature ± 2 epoxy board) shown in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) 0 C 56 0.23 9 0.3 5 0.5		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the step	Im and minimum me e cap. value in step Tempera Reference Te 55±3 (for 25±3 (for Reference Te 125±3 (85±3 (for Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. I be done either with hould be conducted and free of defects s SRM03), 5N (GRM15 a t 0.2 0.4 0.3 0. 0.4 1. 1.0 3.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 repoxy board) shown in valy 10N* force in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) $\frac{C}{56}$ 0.23 9 0.3 5 0.5 0 1.2		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the step	Im and minimum me e cap. value in step Tempera Reference Te 55±3 (for 25±3 (for 25±3 (for Reference Te 125±3 (85±3 (for 1 Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. d be done either with hould be conducted and free of defects s GRM03), 5N (GRM15 a 0.2 0.4 0.3 0. 0.4 1.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 repoxy board) shown in ly 10N* force in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) 0 0 1.2 0 1.65		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the Step 1 and 5 by the Step	and minimum me e cap. value in step Tempera Reference Te 55±3 (for -25±3 (for Reference Te 125±3 (for Reference Te 125±3 (for Reference Te 125±3 (for Reference Te to the test jig (glass ctic solder. Then app jig for 10±1 sec. be done either with hould be conducted and free of defects s SRM03), 5N (GRM15 a b 0.2 0.3 0.3 0. 0.4 1. 1.0 3. 1.2 4.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 repoxy board) shown in ly 10N* force in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) 0 C 56 0.23 9 0.3 5 0.5 0 1.2 0 1.65 0 2.0		
	Temperature Characteristics	Strength	(Whichever is larger.) *Do not apply to 1X/25V No removal of the terminations or other defect should occur.	between the maximustep 1, 3 and 5 by the Step 1 and 5 by the Step	am and minimum me e cap. value in step Tempera Reference Te -55±3 (for -25±3 (for Reference Te 125±3 (for Reference Te 125±3 (for Reference Te to the test jig (glass tc solder. Then app jig for 10±1 sec. be done either with hould be conducted and free of defects s SRM03), 5N (GRM15 a b 1.0 3. 1.2 4. 2.2 5.	asured values in the 3. ture (°C) mperature ± 2 ΔC to 7U) other TC) mperature ± 2 for ΔC) other TC) mperature ± 2 epoxy board) shown in ly 10N* force in an iron or using the with care so that the uch as heat shock. 5, GRM18) (in mm) 0 C 56 0.23 9 0.3 5 0.5 0 1.2 0 1.65 0 2.0 0 2.9		

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GRM Series Specifications and Test Methods (1)

Continued from the preceding page.

			Specifications					
No.	Ite	m	Temperature Compensating Type	Test Method				
		Appearance	No defects or abnormalities	Solder the capacitor on the test jig (glass epoxy board) in the same manner and under the same conditions as (10).				
11	Vibration Resistance	Q	Within the specified tolerance 30pF and over: Q≥1000 30pF and below: Q≥400+20C C: Nominal Capacitance (pF)	The capacitor should be subjected to a simple harmonic having a total amplitude of 1.5mm, the frequency being v uniformly between the approximate limits of 10 and 55Hz frequency range, from 10 to 55Hz and return to 10Hz, sh be traversed in approximately 1 minute. This motion shou applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).			narmonic motion by being varied and 55Hz. The 10Hz, should otion should be	
		Appearance	No marking defects	Solder the capacito	or on the test ji	g (glass epoxy	v board) shown	
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2a using a eutectic solder. Then apply a force in the direction shown in Fig. 3a for 5±1 sec. The soldering should b done by the reflow method and should be conducted with car so that the soldering is uniform and free of defects such as he shock.				
12	Solderability of		R230 R230 R230 R230 R230 R230 R230 R230		t t t t t a a t t t t a a t t t t t t t	¢4.5	/03/15: t: 0.8mm)	
			Flexure : ≤1	Туре	а	b	С	
			Capacitance meter	GRM02	0.2	0.56	0.23	
				GRM03	0.3	0.9	0.3	
				GRM15	0.4	1.5	0.5	
			Fig. 3a	GRM18	1.0	3.0	1.2	
			rig. Sa	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)	
13			75% of the terminations are to be soldered evenly and continuously.	Immerse the capacitor in a solution of ethanol (JIS-K-8° rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in a eutectic solder solution f 2±0.5 seconds at 230±5°C or Sn-3.0Ag-0.5Cu solder so for 2±0.5 seconds at 245±5°C.			ion).	
			The measured and observed characteristics should satisfy the specifications in the following table.					
		Appearance	No defects or abnormalities	 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. Set at room temperature for 24±2 hours, then measure. 				
	Resistance to Soldering Heat	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)					
14		° I	30pF and over: Q≧1000 30pF and below: Q≧400+20C	Preheating for GR Step	M32/43/55 Temperatur	0	Time	
				1	100 to 120°		1 min.	
			C: Nominal Capacitance (pF)	2	170 to 200°		1 min.	
		I.R.	More than 10,000M Ω or 500 $\Omega \cdot F$ (Whichever is smaller)					
		Dielectric Strength	No defects					

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lo.	b. Item		Specifications	Test Method					
			Temperature Compensating Type The measured and observed characteristics should satisfy the specifications in the following table.						
		Appearance	No defects or abnormalities	Fix the capacite	rting jig i	n the same			
15		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	 manner and under the same conditions as (10). Perform the five cycles according to the four heat trees shown in the following table. Set for 24±2 hours at room temperature, then measured to the same condition of the same conditions are same conditions at room temperature. 					
	Temperature Cycle		30pF and over: Q≧1000	Step	1	2	3	4	
		Q	30pF and below: Q≥400+20C		Min.	Room	Max.	Room	
			C: Nominal Capacitance (pF)	Temp. (°C)	Operating Temp. +0/-3	Temp.	Operating Temp. +3/–0	Temp.	
		I.R.	More than 10,000M Ω or 500 $\Omega \cdot$ F (Whichever is smaller)	Time (min.)	30±3	2 to 3	30±3	2 to 3	
		Dielectric Strength	No defects	_					
			The measured and observed characteristics should satisfy the specifications in the following table.						
		Appearance	No defects or abnormalities						
		Capacitance	Within ±5% or ±0.5pF]					
	Humidity	Change	(Whichever is larger)	Set the capacit	or at 40±2°C a	nd in 90	to 95% humidi	ty for	
16	(Steady State)	Q	30pF and over: Q≧350 10pF and over 30pF and below: Q≧275+2.5C 10pF and below: Q≧200+10C	500±12 hours. Remove and set for 24±2 h measure.		irs at roo	m temperature	, then	
			C: Nominal Capacitance (pF)						
		I.R.	More than 1,000M Ω or 50 $\Omega \cdot$ F (Whichever is smaller)	_					
			The measured and observed characteristics should satisfy the specifications in the following table.						
		Appearance	No defects or abnormalities	Apply the rated voltage at 40±2°C and 90 to 95% humidity 500±12 hours. Remove and set for 24±2 hours at room					
7	Humidity	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)						
	Load	Q	30pF and over: Q≧200 30pF and below: Q≧100+10C/3	temperature, then measure. The charge/discharge current is less than 50mA.			han 50mA.		
			C: Nominal Capacitance (pF)						
		I.R.	More than 500M Ω or 25 $\Omega \cdot F$ (Whichever is smaller)						
			The measured and observed characteristics should satisfy the specifications in the following table.						
	High Temperature Load	Appearance	No defects or abnormalities	Apply 200% of the rated voltage at the maximum ope					
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)				erating		
18		Q	30pF and over: Q≧350 10pF and over 30pF and below: Q≧275+2.5C 10pF and below: Q≧200+10C	temperature ±3°C for 1000±12 hours. Set for 24±2 hours at room temperatu The charge/discharge current is less		mperatu		re.	
			C: Nominal Capacitance (pF)						
				7					

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Table A-1

(1)

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

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

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

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

