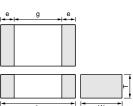
## Monolithic Ceramic Capacitors GR\_R6/R7/F5/E4 (X5R/X7R/Y5V/Z5U)

### High Dielectric Constant Type 6.3/16/25/50V





Part Number		Din	nensions (n	nm)	
Fait Number	L	W	Т	е	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			0.6 ±0.1		0.7
GRM219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	
GRM21B			1.25 ±0.1		
GRM319	2 2 40 15	1.6 ±0.15	0.85 ±0.1		
GRM31M	3.∠ ±0.15	1.0 ±0.15	1.15 ±0.1	0.3 to 0.8	1.5
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)

Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM155R61A683KA01	X5R (EIA)	10	68000pF±10%	1.0	0.5	0.50
GRM155R61A104KA01	X5R (EIA)	10	0.1µF±10%	1.0	0.5	0.50
GRM188R61A334KA61	X5R (EIA)	10	0.33 μF±10%	1.6	0.8	0.80
GRM188R61A474KA61	X5R (EIA)	10	0.47µF±10%	1.6	0.8	0.80
GRM188R61A684KA61	X5R (EIA)	10	0.68µF±10%	1.6	0.8	0.80
GRM188R61A105KA61	X5R (EIA)	10	1μF ±10%	1.6	0.8	0.80
GRM188R60J105KA01	X5R (EIA)	6.3	1μF ±10%	1.6	0.8	0.80
GRM219R61A105KC01	X5R (EIA)	10	1μF ±10%	2.0	1.25	0.90
GRM21BR61A225KA01	X5R (EIA)	10	2.2µF ±10%	2.0	1.25	1.25
GRM219R60J155KC01	X5R (EIA)	6.3	1.5μF ±10%	2.0	1.25	0.90
GRM21BR60J225KA01	X5R (EIA)	6.3	2.2µF ±10%	2.0	1.25	1.25
GRM21BR60J335KA11	X5R (EIA)	6.3	3.3μF ±10%	2.0	1.25	1.25
GRM21BR60J475KA11	X5R (EIA)	6.3	4.7μF ±10%	2.0	1.25	1.25
GRM319R61A225KC01	X5R (EIA)	10	2.2µF ±10%	3.2	1.6	0.90
GRM31XR61A335KC12	X5R (EIA)	10	3.3μF ±10%	3.2	1.6	1.30
GRM31CR61A475KA01	X5R (EIA)	10	4.7μF ±10%	3.2	1.6	1.60
GRM31MR60J475KC11	X5R (EIA)	6.3	4.7μF ±10%	3.2	1.6	1.15
GRM31CR61A106KA01	X5R (EIA)	10	10μF ±10%	3.2	1.6	1.60
GRM31CR60J106KA01	X5R (EIA)	6.3	10μF ±10%	3.2	1.6	1.60
GRM31CR60J226ME20	X5R (EIA)	6.3	22µF ±20%	3.2	1.6	1.60
GRM32ER61A106KC01	X5R (EIA)	10	10μF ±10%	3.2	2.5	2.50
GRM55DR61H106KA01	X5R (EIA)	50	10μF ±10%	5.7	5.0	2.00
GRM15XR71H221KA86	X7R (EIA)	50	220pF±10%	1.0	0.5	0.25
GRM155R71H221KA01	X7R (EIA)	50	220pF±10%	1.0	0.5	0.50
GRM15XR71H331KA86	X7R (EIA)	50	330pF±10%	1.0	0.5	0.25
GRM155R71H331KA01	X7R (EIA)	50	330pF±10%	1.0	0.5	0.50
GRM15XR71H471KA86	X7R (EIA)	50	470pF±10%	1.0	0.5	0.25
GRM155R71H471KA01	X7R (EIA)	50	470pF±10%	1.0	0.5	0.50
GRM15XR71H681KA86	X7R (EIA)	50	680pF±10%	1.0	0.5	0.25
GRM155R71H681KA01	X7R (EIA)	50	680pF±10%	1.0	0.5	0.50
GRM15XR71H102KA86	X7R (EIA)	50	1000pF±10%	1.0	0.5	0.25
GRM155R71H102KA01	X7R (EIA)	50	1000pF±10%	1.0	0.5	0.50
GRM15XR71H152KA86	X7R (EIA)	50	1500pF±10%	1.0	0.5	0.25
GRM155R71H152KA01	X7R (EIA)	50	1500pF±10%	1.0	0.5	0.50
GRM155R71H222KA01	X7R (EIA)	50	2200pF±10%	1.0	0.5	0.50

Continued on the following page.

Continued from the preceding page.

Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM155R71H332KA01	X7R (EIA)	50	3300pF±10%	1.0	0.5	0.50
GRM155R71H472KA01	X7R (EIA)	50	4700pF±10%	1.0	0.5	0.50
GRM15XR71E182KA86	X7R (EIA)	25	1800pF±10%	1.0	0.5	0.25
GRM15XR71E222KA86	X7R (EIA)	25	2200pF±10%	1.0	0.5	0.25
GRM155R71E682KA01	X7R (EIA)	25	6800pF±10%	1.0	0.5	0.50
GRM155R71E103KA01	X7R (EIA)	25	10000pF±10%	1.0	0.5	0.50
GRM15XR71C332KA86	X7R (EIA)	16	3300pF±10%	1.0	0.5	0.25
GRM15XR71C472KA86	X7R (EIA)	16	4700pF±10%	1.0	0.5	0.25
RM15XR71C682KA86	X7R (EIA)	16	6800pF±10%	1.0	0.5	0.25
RM155R71C153KA01	X7R (EIA)	16	15000pF±10%	1.0	0.5	0.50
RM155R71C223KA01	X7R (EIA)	16	22000pF±10%	1.0	0.5	0.50
RM155R71A333KA01	X7R (EIA)	10	, 33000pF±10%	1.0	0.5	0.50
RM155R71A473KA01	X7R (EIA)	10	47000pF±10%	1.0	0.5	0.50
RM188R71H221KA01	X7R (EIA)	50	220pF±10%	1.6	0.8	0.80
RM188R71H331KA01	X7R (EIA)	50	330pF±10%	1.6	0.8	0.80
RM188R71H471KA01	X7R (EIA)	50	470pF±10%	1.6	0.8	0.80
RM188R71H681KA01	X7R (EIA) X7R (EIA)	50	680pF±10%	1.6	0.8	0.80
RM188R71H102KA01	X7R (EIA) X7R (EIA)	50	1000pF±10%	1.6	0.8	0.80
RM188R71H102KA01	X7R (EIA) X7R (EIA)	50	1500pF±10%	1.6	0.8	0.80
			•			
RM188R71H222KA01	X7R (EIA)	50	2200pF±10%	1.6	0.8	0.80
RM188R71H332KA01	X7R (EIA)	50	3300pF±10%	1.6	0.8	0.80
RM188R71H472KA01	X7R (EIA)	50	4700pF±10%	1.6	0.8	0.80
RM188R71H682KA01	X7R (EIA)	50	6800pF±10%	1.6	0.8	0.80
RM188R71H103KA01	X7R (EIA)	50	10000pF±10%	1.6	0.8	0.80
RM188R71H153KA01	X7R (EIA)	50	15000pF±10%	1.6	0.8	0.80
RM188R71H223KA01	X7R (EIA)	50	22000pF±10%	1.6	0.8	0.80
RM188R71E333KA01	X7R (EIA)	25	33000pF±10%	1.6	0.8	0.80
RM188R71E473KA01	X7R (EIA)	25	47000pF±10%	1.6	0.8	0.80
RM188R71E683KA01	X7R (EIA)	25	68000pF±10%	1.6	0.8	0.80
RM188R71E104KA01	X7R (EIA)	25	0.1µF±10%	1.6	0.8	0.80
RM188R71C104KA01	X7R (EIA)	16	0.1µF±10%	1.6	0.8	0.80
RM188R71A154KA01	X7R (EIA)	10	0.15µF±10%	1.6	0.8	0.80
RM188R71A224KA01	X7R (EIA)	10	22000pF±10%	1.6	0.8	0.80
RM219R71H333KA01	X7R (EIA)	50	33000pF±10%	2.0	1.25	0.90
RM21BR71H473KA01	X7R (EIA)	50	47000pF±10%	2.0	1.25	1.25
RM21BR71H683KA01	X7R (EIA)	50	68000pF±10%	2.0	1.25	1.25
RM21BR71H104KA01	X7R (EIA)	50	0.1µF±10%	2.0	1.25	1.25
RM21BR71H154KA01	X7R (EIA)	50	0.15µF±10%	2.0	1.25	1.25
RM21BR71H224KA01	X7R (EIA)	50	22000pF±10%	2.0	1.25	1.25
RM21BR71E104KA01	X7R (EIA)	25	0.1µF±10%	2.0	1.25	1.25
RM21BR71E154KA01	X7R (EIA)	25	0.15µF±10%	2.0	1.25	1.25
RM219R71E224KC01	X7R (EIA)	25	22000pF±10%	2.0	1.25	0.90
RM21BR71E334KC01	X7R (EIA)	25	0.33 μF±10%	2.0	1.25	1.25
RM21BR71E474KC01	X7R (EIA)	25	0.47μF±10%	2.0	1.25	1.25
RM219R71C474KC01	X7R (EIA)	16	0.47µF±10%	2.0	1.25	0.90
RM219R71C684KC01	X7R (EIA)	16	0.68µF±10%	2.0	1.25	0.90
RM21BR71C105KA01	X7R (EIA)	16	1μF ±10%	2.0	1.25	1.25
RM319R71H334KA01	X7R (EIA)	50	0.33 μF±10%	3.2	1.6	0.90
RM31MR71H474KA01	X7R (EIA)	50	0.47μF±10%	3.2	1.6	1.15
RM319R71E684KC01	X7R (EIA) X7R (EIA)	25	0.47μF±10% 0.68μF±10%	3.2	1.6	0.90
RM319R71E105KC01	X7R (EIA) X7R (EIA)	25	0.88μF±10% 1μF ±10%	3.2	1.6	1.15
			·			
GRM319R71C105KC11	X7R (EIA)	16	1μF ±10%	3.2	1.6	0.90
SRM31MR71C155KC11	X7R (EIA)	16	1.5μF ±10%	3.2	1.6	1.15
GRM31MR71C225KA35	X7R (EIA)	16	2.2μF ±10%	3.2	1.6	1.15
GRM319R71A105KC01	X7R (EIA)	10	1μF ±10%	3.2	1.6	0.90

Continued on the following page.

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

 CAUTION (for storage and operating, rating, soldering and mounting, handling) in them to prevent smoking and/or burning, etc.

 You are able to read a detailed specification in the website (http://search.murata.co.jp/) before to require our product specification or to transact the approval sheet for product specification.

Continued from the preceding page.

Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM319R71A225KA01	X7R (EIA)	10	2.2μF ±10%	3.2	1.6	0.90
GRM32NR71H684KA01	X7R (EIA)	50	0.68µF±10%	3.2	2.5	1.35
GRM32RR71H105KA01	X7R (EIA)	50	1μF ±10%	3.2	2.5	1.80
GRM32RR71E225KC01	X7R (EIA)	25	2.2µF ±10%	3.2	2.5	1.80
GRM32MR71C225KC01	X7R (EIA)	16	2.2μF ±10%	3.2	2.5	1.15
GRM32NR71C335KC01	X7R (EIA)	16	3.3µF ±10%	3.2	2.5	1.35
GRM32RR71C475KC01	X7R (EIA)	16	4.7μF ±10%	3.2	2.5	1.80
GRM43ER71H225KA01	X7R (EIA)	50	2.2μF ±10%	4.5	3.2	2.50
GRM55RR71H105KA01	X7R (EIA)	50	1μF ±10%	5.7	5.0	1.80
GRM55RR71H155KA01	X7R (EIA)	50	1.5μF ±10%	5.7	5.0	1.80
GRM155F51H222ZA01	Y5V (EIA)	50	2200pF +80%, -20%	1.0	0.5	0.50
GRM155F51H472ZA01	Y5V (EIA)	50	4700pF +80%, -20%	1.0	0.5	0.50
GRM155F51H103ZA01	Y5V (EIA)	50	10000pF +80%, -20%	1.0	0.5	0.50
GRM155F51E223ZA01	Y5V (EIA)	25	22000pF +80%, -20%	1.0	0.5	0.50
GRM155F51C473ZA01	Y5V (EIA)	16	47000pF +80%, -20%	1.0	0.5	0.50
GRM155F51C104ZA01	Y5V (EIA)	16	10000pF +80%, -20%	1.0	0.5	0.50
RM188F51H103ZA01	Y5V (EIA)	50	10000pF +80%, -20%	1.6	0.8	0.80
RM188F51H223ZA01	Y5V (EIA)	50	22000pF +80%, -20%	1.6	0.8	0.80
GRM188F51H473ZA01	Y5V (EIA)	50	47000pF +80%, -20%	1.6	0.8	0.80
GRM188F51H104ZA01	Y5V (EIA) Y5V (EIA)	50	10000pF +80%, -20%	1.6	0.8	0.80
		25			0.8	0.80
GRM188F51E104ZA01	Y5V (EIA)		10000pF +80%, -20%	1.6		
GRM188F51C224ZA01	Y5V (EIA)	16	22000pF +80%, -20%	1.6	0.8	0.80
RM188F51C474ZA01	Y5V (EIA)	16	0.47μF +80%, -20%	1.6	0.8	0.80
RM188F51A474ZC01	Y5V (EIA)	10	0.47μF +80%, -20%	1.6	0.8	0.80
RM188F51A105ZA01	Y5V (EIA)	10	1μF +80%, -20%	1.6	0.8	0.80
RM219F51H104ZA01	Y5V (EIA)	50	10000pF +80%, -20%	2.0	1.25	0.90
GRM21BF51H224ZA01	Y5V (EIA)	50	22000pF +80%, -20%	2.0	1.25	1.25
GRM219F51E224ZA01	Y5V (EIA)	25	22000pF +80%, -20%	2.0	1.25	0.90
RM21BF51E474ZA01	Y5V (EIA)	25	0.47µF +80%, -20%	2.0	1.25	1.25
GRM219F51E105ZA01	Y5V (EIA)	25	1µF +80%, -20%	2.0	1.25	0.90
GRM21BF51E225ZA01	Y5V (EIA)	25	2.2µF +80%, -20%	2.0	1.25	1.25
GRM219F51C105ZA01	Y5V (EIA)	16	1µF +80%, -20%	2.0	1.25	0.90
SRM21BF51C225ZA01	Y5V (EIA)	16	2.2µF +80%, -20%	2.0	1.25	1.25
GRM219F51A105ZA01	Y5V (EIA)	10	1µF +80%, -20%	2.0	1.25	0.90
GRM21BF51A225ZA01	Y5V (EIA)	10	2.2µF +80%, -20%	2.0	1.25	1.25
RM21BF51A475ZA01	Y5V (EIA)	10	4.7µF +80%, -20%	2.0	1.25	1.25
GRM31MF51H474ZA01	Y5V (EIA)	50	0.47µF +80%, -20%	3.2	1.6	1.15
GRM31MF51E105ZA01	Y5V (EIA)	25	1µF +80%, -20%	3.2	1.6	1.15
GRM31MF51E475ZA01	Y5V (EIA)	25	4.7µF +80%, -20%	3.2	1.6	1.15
RM319F51C105ZA01	Y5V (EIA)	16	1µF +80%, -20%	3.2	1.6	0.90
RM31MF51C225ZA01	Y5V (EIA)	16	2.2µF +80%, -20%	3.2	1.6	1.15
GRM31MF51C475ZA12	Y5V (EIA)	16	4.7µF +80%, -20%	3.2	1.6	1.15
RM319F51A225ZA01	Y5V (EIA)	10	2.2µF +80%, -20%	3.2	1.6	0.90
RM31MF51A475ZA01	Y5V (EIA)	10	4.7μF +80%, -20%	3.2	1.6	1.15
RM31MF51A106ZA01	Y5V (EIA)	10	10μF +80%, -20%	3.2	1.6	1.15
RM31MF50J106ZA01	Y5V (EIA)	6.3	10μF +80%, -20%	3.2	1.6	1.15
RM32RF51H105ZA01	Y5V (EIA)	50	1μF +80%, -20%	3.2	2.5	1.80
GRM329F51E475ZA01	Y5V (EIA)	25	4.7μF +80%, -20%	3.2	2.5	0.90
RM32NF51E106ZA01	Y5V (EIA)	25	10μF +80%, -20%	3.2	2.5	1.35
RM32NF51C106ZA01	Y5V (EIA)	16	10μF +80%, -20%	3.2	2.5	1.35
GRM188E41H103MA01	Z5U (EIA)	50	10000pF±20%	1.6	0.8	0.80
GRM188E41H223MA01	Z50 (EIA) Z5U (EIA)	50	22000pF±20%	1.6	0.8	0.80
	Z50 (EIA) Z5U (EIA)	50	47000pF±20%	2.0	1.25	0.80
GRM216E41H473MA01						
GRM219E41H104MA01	Z5U (EIA)	50	10000pF±20%	2.0	1.25	0.90

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

 CAUTION (for storage and operating, rating, soldering and mounting, handling) in them to prevent smoking and/or burning, etc.

 You are able to read a detailed specification in the website (http://search.murata.co.jp/) before to require our product specification or to transact the approval sheet for product specification.

#### ■ Specifications and Test Methods

		Specifi	ications					
No.	Item	Temperature Compensating Type	High Dielectric Type		Test	Method		
1	Operating Temperature Range	–55 to +125℃	B1, B3, F1 : -25°C to +85°C R1, R7 : -55°C to +125°C E4 : +10°C to +85°C F5 : -30°C to +85°C		mperature : 25℃ 1, B3, F1, R1 : 2			
2	Rated Voltage	See the previous pages		The rated voltage is defined as the maximum voltage wh may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V <sup>P,P</sup> or whichever is larger, should be maintained within the rate voltage range.				
3	Appearance	No defects or abnormalities		Visual inspection				
4	Dimensions	Within the specified dimensions	3	Using calipers				
5	Dielectric Strength	No defects or abnormalities		No failure should be observed when 300% of the rated voltage (temperature compensating type) or 250% of the rated voltage (high dielectric constant type) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.				
6	Insulation Resistance	C≦0.047μF : More than 10,000 C>0.047μF : 500Ω • F	MΩ C : Nominal Capacitance	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 20°C/25°C and 75%RH max. and within 2 minutes of charging, provided charge/discharge current is less than 50mA.			℃/25℃ and	
7	Capacitance	Within the specified tolerance					20℃/25℃ at the	
8	Q/ Dissipation Factor (D.F.)	30pF and over : Q≧1000 30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	[B1, B3, R1, R6, R7, E4] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V/4V : 0.05max. (C<3.3μF) : 0.1max. (C≥3.3μF) [F1, F5] W.V. : 25Vmin. : 0.05max. (C<0.1μF) : 0.09max. (C≥0.1μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3V : 0.15max.	frequency and Char. Item Frequency Voltage	ΔC to ΔU, 1X (1000pF and below) 1±0.1MHz 0.5 to 5Vrms	ΔC to ΔU, 1X           (more than           1000pF)           R6, R7, F5           B1, B3, F1           1±0.1kHz           1±0.2Vrms	E4 1±0.1kHz 0.5±0.05Vrms	

Continued on the following page.

	Continued fr	rom the prec	eding page.						
No.	Ite	em	Specif Temperature	ications			Test Me	thod	
		1	Compensating Type	High Dielectric Type					
		No bias	Within the specified tolerance (Table A-1)	B1, B3 : Within $\pm 10\%$ (-25°C to +85°C) R1, R7 : Within $\pm 15\%$ (-55°C to +125°C) R6 : Within $\pm 15\%$ (-55°C to +85°C) E4 : Within +22/-56% (+10°C to +85°C) F1 : Within +30/-80% (-25°C to +85°C) F5 : Within +22/-82% (-30°C to +85°C)	ange should be measured after 5min. at p. stage. mpensating Type pefficient is determind using the capacitance as a reference. emperature sequentially from step 1 through $25^{\circ}/\Delta^{\circ}$ : +20°C to +125°C : other temp. $85^{\circ}/+20^{\circ}$ C to +85°C) the capacitance a specified tolerance for the temperature acitance change as Table A-1. if ti s caluculated by dividing the differences sum and minimum measured values in the				
				/	step 1, 3 a	nd 5 by th	e cap. value	in step 3	B
		50% of		B1 : Within +10/-30%	Ste	-		emperat	
		the Rated		R1 : Within +15/-40%	1				nperature±2
		Voltage		F1 : Within +30/-95%	2				5±3 (for other TC)
			/						nperature±2
								,	±3 (for other TC) nperature±2
9 Capacitance Temperature Characteristics				(2) High Dielectric Constant Type The ranges of capacitance change compared with the 2 value over the temperature ranges shown in the table s be within the specified ranges.* In case of applying voltage, the capacitance change sh measured after 1 more min. with applying voltage in equilibration of each temp. stage.				ared with the 20°C in the table should ce change should be	
					Step	Tem	perature (°C)	)	Applying Voltage (V)
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Not apply to 1X/25V	*Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10°C for one hour	$- \frac{1}{2}$ $- \frac{3}{4}$	-55± -25± -30±3 (f Referer 125 85±	ace Tempered 3 (for R1, R7 3 (for B1, B3 for F5)/10±3 ace Tempered ±3 (for R1, R 3 (for B1, B3, F1, F5, E4)	, R6) , F1) (for E4) ture±2	No bias
				and then set for 48±4 hours	5		nce Temperet	ture±2	
				at room temperature. Perform the initial	6		55±3 (for R1) 5±3 (for B1, F		50% of the rated
				measurement.	7	Referer	nce Temperet	ture±2	voltage
					8		25±3 (for R1) ±3 (for B1, F		
			No removal of the terminations	or other defect should occur	Fig. 1a usir parallel with The solderi reflow meth soldering is	ng an eute h the test ing should nod and s s uniform	ectic solder. T jig for 10±1 s d be done eith hould be con	Then app sec. Ther with a ducted v efects su	epoxy board) shown in oly 10N* force in an iron or using the vith care so that the ich as heat shock. (in mm)
10		Strength			Ту	oe	а	b	C
	of Termir	nation			GR□03		0.3	0.9	
				Solder resist	GRD15		0.4	1.5	
				Baked electrode or	GRM18 GRM21		1.0 1.2	<u>3.0</u> 4.0	
				copper foil	GRM21		2.2	5.0	
			Fig. 1a		GRM32		2.2	5.0	
			-		GRM43		3.5	7.0	
					_GRM55	)	4.5	8.0	5.6

Continued from the preceding page.

Continued on the following page.

#### Continued from the preceding page.

10	ltom	· · ·	ications	_	Toot Math	od	
lo.	Item	Temperature Compensating Type	High Dielectric Type		Test Metho	od	
	Appearance	No defects or abnormalities					
	Capacitance	Within the specified tolerance					
11 Vibrat Resist	tion stance Q/D.F.	30pF and over : Q≧1000 30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	$ \begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.025max. \\ W.V.: 16/10V: 0.035max. \\ W.V.: 6.3V/4V \\ : 0.05max. (C<3.3\mu F) \\ : 0.1max. (C\geq3.3\mu F) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.05max. (C<0.1\mu F) \\ : 0.09max. (C\geq0.1\mu F) \\ W.V.: 16V/10V: 0.125max. \\ W.V.: 6.3V: 0.15max. \\ \end{array} $	same manner au The capacitor sh having a total ar uniformly betwee frequency range be traversed in a	citor on the test jig (g nd under the same of nould be subjected to nplitude of 1.5mm, ti en the approximate l from 10 to 55Hz ar approximately 1 min riod of 2 hours in eac of 6 hours).	conditions a o a simple he frequen limits of 10 nd return to ute. This m	as (10). harmonic motion locy being varied and 55Hz. The b 10Hz, should notion should be
		No crack or marked defect show	uld occur	in Fig. 2a using direction shown done either with	citor on the test jig (g an eutectic solder. T in Fig. 3a for 5±1se an iron or using the ith care so that the s	hen apply c. The solo reflow me	a force in the dering should be thod and should
3 Sold	Deflection derability of mination	$f_{23}$ f	45	rosin (JIS-K-590 Preheat at 80 to	a           100           Fig. 2a           100           Fig. 2a           100           100           100           Fig. 2a           100           1.0           1.2           2.2	b 0.9 1.5 3.0 4.0 5.0 5.0 7.0 8.0 of ethanol ight propot seconds.	ion) .
	Appearance	No defects or abnormalities		-			
	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±7.5% F1, F5, E4 : Within ±20%	Immerse the car	acitor at 120 to 150% pacitor in an eutectic nds. Set at room ten	solder sol	lution at 270±5℃
14 to	soldering Q/D.F. 30pF and below :		$ \begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.025max. \\ W.V.: 16/10V: 0.035max. \\ W.V.: 6.3V/4V \\ : 0.05max. (C<3.3 \mu F) \\ : 0.1max. (C \geqq 3.3 \mu F) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.05max. (C<0.1 \mu F) \\ : 0.09max. (C \geqq 0.1 \mu F) \\ W.V.: 16V/10V: 0.125max. \\ W.V.: 6.3V: 0.15max. \\ \end{array} $	(temperature co constant type), t •Initial measurer Perform a heat t then set at room	mpensating tyoe) or hen measure. ment for high dielect reatment at 150+0/- temperature for 48: al measurement.	48±4 hou ric constar −10°C for c	rs (high dielectrie ht type
	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$	F (Whichever is smaller)			_	_
	Dielectric	No defects	, <u></u>				

Continued on the following page.

		Specifi	cations						
No. I	em	Temperature Compensating Type	High Dielectric Type		Tes	t Methoo	I		
		The measured and observed ch specifications in the following ta							
	Appearance	No defects or abnormalities							
	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±7.5% F1, F5, E4 : Within ±20%	Fix the capacitor manner and un Perform the five shown in the fo	der the same e cycles accor	condition	s as (10).	atments	
	Temperature Cycle       Capacitance Change         D/D.F.       Dielectric Strength         Appearance       Capacitance         Humidity       Capacitance	[B1, B3, R1, R6, R7, E4] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 63/(4)/		Set for 24±2 he hours (high die measure.	ours (temperat		0,,,,		
15 Temperature		30pF and over : Q≧1000	W.V. : 6.3V/4V	Step	1	2	3	4	
Cycle	Q/D.F.	30pF and below : Q≧400+20C	: 0.05max. (C<3.3µF) : 0.1max. (C≧3.3µF) [F1, F5]	Temp. (℃)	Min. Operating Temp.+0/-3	Room Temp.	Max. Operating Temp.+3/-0	Room Temp.	
		C : Nominal Capacitance (pF)	W.V. : 25Vmin.	Time (min.)	30±3	2 to 3	30±3	2 to 3	
			: 0.05max. (C<0.1µF) : 0.09max. (C≧0.1µF) W.V. : 16V/10V : 0.125max.	•Initial measurement for high dielectric constant type Perform a heat treatment at $150+0/-10^{\circ}$ for one hour and then set at room temperature for $48\pm4$ hours.					
			W.V. : 6.3V : 0.15max.	Perform the init			FIIOUIS.		
	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$							
		No defects							
		The measured and observed ch specifications in the following ta	,						
	Appearance	No defects or abnormalities							
		Within ±5% or ±0.5pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±12.5% F1, F5 : Within ±30%	_					
16 (Steady		30pF and over : Q≥350 10pF and over 30pF and below : Q≥275+2.5C 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)	$ \begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.05max. \\ W.V.: 16/10V: 0.05max. \\ W.V.: 6.3V/4V \\ : 0.075max. (C<3.3\mu F) \\ : 0.125max. (C\leq3.3\mu F) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.075max. (C<0.1\mu F) \\ : 0.125max. (C\geq0.1\mu F) \\ : 0.125max. (C\geq0.1\mu F) \\ W.V.: 16V/10V: 0.15max. \\ W.V.: 6.3V: 0.2max. \\ \end{array} $	Set the capacit 500±12 hours. Remove and si type) or 48±4 h temperature, th	et for 24±2 hor nours (high die	urs (temp	erature compe	ensating	

More than 1,000M $\Omega$  or 50 $\Omega$  • F (Whichever is smaller)

#### Continued from the preceding page.

I.R.

Continued on the following page.  $\fbox$ 

#### Continued from the preceding page.

			Specifi	ications	
No.	lt€	em	Temperature Compensating Type	High Dielectric Type	Test Method
			The measured and observed ch specifications in the following ta		
		Appearance	No defects or abnormalities		
		Capacitance Change	Within $\pm 7.5\%$ or $\pm 0.75$ pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±12.5% F1, F5, E4 : Within ±30% [W.V. : 10Vmax.] F1, F5 : Within +30/-40%	Apply the rated voltage at $40\pm2^{\circ}$ c and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours (temperature
17	Humidity 17 Load	Q/D.F.	30pF and over : Q≥200 30pF and below : Q≥100+10C/3 C : Nominal Capacitance (pF)	$\begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.05max. \\ W.V.: 16/10V: 0.05max. \\ W.V.: 6.3V \\ : 0.075max. (C<3.3\muF) \\ : 0.125max. (C\geq3.3\muF) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.075max. (C<0.1\muF) \\ : 0.125max. (C\geq0.1\muF) \\ W.V.: 16V/10V: 0.15max. \\ W.V.: 6.3V: 0.2max. \\ \end{array}$	<ul> <li>compensating type) or 48±4 hours (high dielectric constant type) at room temprature, then muasure. The charge/discharge current is less than 50mA.</li> <li>Initial measurement for F1, F5/10V max. Apply the rated DC voltage for 1 hour at 40±2°C. Remove and set for 48±4 hours at room temperature. Perform initial measurement.</li> </ul>
		I.R. More than $500M\Omega$ or $25\Omega \bullet F$	More than 500M $\Omega$ or 25 $\Omega$ • F (V	Whichever is smaller)	
			The measured and observed ch specifications in the following ta	,	
		Appearance	No defects or abnormalities		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±12.5% F1, F5, E4 : Within ±30% [Exept 10Vmax. and. C≧1.0μF] F1, F5 : Within +30/−40% [10Vmax. and. C≧1.0μF]	Apply 200% of the rated voltage at the maximum operating temperature ±3°C for 1000±12 hours. Set for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room
18	High 18 Temperature Load	Q/D.F.	30pF and over : Q≧350 10pF and over 30pF and below : Q≧275+2.5C 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	$ \begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.04max. \\ W.V.: 16/10V: 0.05max. \\ W.V.: 6.3V \\ : 0.075max.(C{<}3.3\mu F) \\ : 0.125max.(C{<}3.3\mu F) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.075max.(C{<}0.1\mu F) \\ : 0.125max.(C{<}0.1\mu F) \\ : 0.125max.(C{<}0.1\mu F) \\ W.V.: 16V/10V: 0.15max. \\ W.V.: 6.3V: 0.2max. \\ \end{array} $	<ul> <li>temperature, then measure.</li> <li>The charge/discharge current is less than 50mA.</li> <li>Initial measurement for high dielectric constant type.</li> <li>Apply 200% of the rated DC voltage at the maximun operating temperature ±3°C for one hour. Remove and set for 48±4 hours at room temperature.</li> <li>Perform initial measurement.</li> </ul>
		I.R.	More than 1,000MΩ or 50Ω•F (		

Continued on the following page.  $\left| \fbox \right|$ 

Continued from the preceding page.

Table A-1

		Capacitance Change from 25°C (%)							
Char.	Nominal Values (ppm/℃)*1	-55		-30		-10			
		Max.	Min.	Max.	Min.	Max.	Min.		
5C	0± 30	0.58	-0.24	0.40	-0.17	0.25	-0.11		
6C	0± 60	0.87	-0.48	0.59	-0.33	0.38	-0.21		
6P	-150± 60	2.33	0.72	1.61	0.50	1.02	0.32		
6R	$-220\pm 60$	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	-	-	-	-	-	-		

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

1	~	•	
L	1	1	

			(	Capacitance Cha	inge from 20℃ (%)	1	
Char.	Nominal Values (ppm/℃)*2	-	-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	$-150\pm 60$	-	-	1.32	0.41	0.88	0.27
3P	$-150\pm120$	-	-	1.65	0.14	1.10	0.09
4P	$-150\pm 250$	-	-	2.36	-0.45	1.57	-0.30
2R	$-220\pm 60$	-	_	1.70	0.72	1.13	0.48
3R	$-220\pm120$	_	_	2.03	0.45	1.35	0.30
4R	$-220\pm250$	_	-	2.74	-0.14	1.83	-0.09
2S	$-330\pm 60$	-	-	2.30	1.22	1.54	0.81
3S	$-330\pm120$	_	-	2.63	0.95	1.76	0.63
4S	$-330\pm 250$	-	-	3.35	0.36	2.23	0.24
2T	$-470\pm 60$	-	-	3.07	1.85	2.05	1.23
3T	-470±120	-	_	3.40	1.58	2.27	1.05
4T	$-470\pm250$	_	_	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

\*2Nominal values denote the temperature coefficient within a range of 20 $^{\circ}$ C to 125 $^{\circ}$ C (for  $\Delta$ C)/85 $^{\circ}$ C (for other TC).

## Monolithic Ceramic Capacitors GR\_R6/R7/F5/E4 (X5R/X7R/Y5V/Z5U)

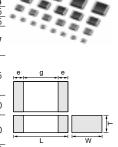
### High Dielectric Constant Type 100V

Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM188R72A222KD01	X7R (EIA)	100	2200pF±10%	1.6	0.8	0.80
GRM188R72A332KD01	X7R (EIA)	100	3300pF±10%	1.6	0.8	0.80
GRM219R72A472KA01	X7R (EIA)	100	4700pF±10%	2.0	1.25	0.90
GRM219R72A682KA01	X7R (EIA)	100	6800pF±10%	2.0	1.25	0.90
GRM21BR72A103KA01	X7R (EIA)	100	10000pF±10%	2.0	1.25	1.25
GRM31MR72A333KA01	X7R (EIA)	100	33000pF±10%	3.2	1.6	1.15
GRM31MR72A473KA01	X7R (EIA)	100	47000pF±10%	3.2	1.6	1.15
GRM32NR72A683KA01	X7R (EIA)	100	68000pF±10%	3.2	2.5	1.35
GRM32NR72A104KA01	X7R (EIA)	100	0.1µF±10%	3.2	2.5	1.35
GRM43RR72A154KA01	X7R (EIA)	100	0.15µF±10%	4.5	3.2	1.80
GRM43RR72A224KA01	X7R (EIA)	100	22000pF±10%	4.5	3.2	1.80
GRM43DR72A474KA01	X7R (EIA)	100	0.47µF±10%	4.5	3.2	2.00
GRM55DR72A105KA01	X7R (EIA)	100	1μF ±10%	5.7	5.0	2.00
GRM188F52A472ZD01	Y5V (EIA)	100	4700pF +80%, -20%	1.6	0.8	0.80
GRM32NF52A104ZA01	Y5V (EIA)	100	10000pF +80%, -20%	3.2	2.5	1.35
GRM55RF52A474ZA01	Y5V (EIA)	100	0.47µF +80%, -20%	5.7	5.0	1.80

# Monolithic Ceramic Capacitors GR\_R6/R7/F5/E4 (X5R/X7R/Y5V/Z5U)

Thin Layer Large-Capacitance type

Part Number		Dime	nsions (mi	n)		
Part Number	L	W	Т	e min.	g min.	-
GRM033	0.6 ±0.03	0.3 ±0.03	0.3 ±0.03	0.1 to 0.2	0.2	
GRM155	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4	
GRM185	1.6 ±0.1	0.8 ±0.1	0.5 +0/-0.2	0.2 to 0.5	0.5	
GRM188	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.5	
GRM216			0.6 ±0.1			* •
GRM219	2.0 ±0.1	1.25 ±0.1	0.85 ±0.1	0.2 to 0.7	0.7	
GRM21B	]		1.25 ±0.1			
GRM316			0.6 ±0.1			
GRM319	3.2 ±0.15	1.6 ±0.15	0.85 ±0.1	0.3 to 0.8	1.5	e g
GRM31M			1.15 ±0.1	0.3 10 0.8	1.5	++ + <u> </u>
GRM31C	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2			
GRM32D	22402	2 5 +0 2	2.0 ±0.2	0.3	10	
GRM32E	3.2 ±0.3	3.2 ±0.3 2.5 ±0.2	2.5 ±0.2	0.3	1.0	
GRM43D			2.0 ±0.2			
GRM43E	4.5 ±0.4	3.2 ±0.3	2.5 ±0.2	0.3	2.0	
GRM43S			2.8 ±0.2			H= L
GRM55F	5.7 ±0.4	5.0 ±0.4	3.2 ±0.2	0.3	2.0	



Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM155R60J154KE01	X5R (EIA)	6.3	0.15µF±10%	1.0	0.5	0.50
GRM155R60J224KE01	X5R (EIA)	6.3	22000pF±10%	1.0	0.5	0.50
GRM155R60J334KE01	X5R (EIA)	6.3	0.33 μF±10%	1.0	0.5	0.50
GRM155R60J474KE19	X5R (EIA)	6.3	0.47µF±10%	1.0	0.5	0.50
GRM188R60J225KE01	X5R (EIA)	6.3	2.2μF ±10%	1.6	0.8	0.80
GRM219R60J475KE01	X5R (EIA)	6.3	4.7μF ±10%	2.0	1.25	0.90
GRM21BR60J106KE01	X5R (EIA)	6.3	10μF ±10%	2.0	1.25	1.25
GRM21BR60J106ME01	X5R (EIA)	6.3	10μF ±20%	2.0	1.25	1.25
GRM32DR60J226KA01	X5R (EIA)	6.3	22μF ±10%	3.2	2.5	2.00
GRM32ER60J476ME20	X5R (EIA)	6.3	47μF ±20%	3.2	2.5	2.50
GRM43SR60J107ME20	X5R (EIA)	6.3	100μF ±20%	4.5	3.2	2.80
GRM55FR60J107KA01	X5R (EIA)	6.3	100μF ±10%	5.7	5.0	3.20
GRM55FR60J107MA01	X5R (EIA)	6.3	100μF ±20%	5.7	5.0	3.20
GRM21BF50J106ZE01	Y5V (EIA)	6.3	10µF +80%, -20%	2.0	1.25	1.25

No.	lte	em	Specifications		Test Method		
1	Operating Temperat Range		B1, B3, F1 : -25°C to +85°C R6 : -55°C to +85°C F5 : -30°C to +85°C C8 : -55°C to +105°C, C7 : -55°C to +125°C	Reference Temperature : 25°C (B1, B3, F1 : 20°C) 125°C			
2	Rated Vo	Itage	See the previous pages	may be ap When AC	voltage is defined as the maxir plied continuously to the capar voltage is superimposed on DC is larger, should be maintained age.	citor. C voltage, VPP or VOP,	
3	Appearar	nce	No defects or abnormalities	Visual insp	ection		
4	Dimensio	ns	Within the specified dimensions	Using calip	pers		
5	5 Dielectric Strength		No defects or abnormalities	No failure should be observed when 250% of the rate is applied between the terminations for 1 to 5 seconds provided the charge/discharge current is less than 50			
6	Insulatior Resistanc		More than 50Ω • F	The insulation resistance should be measured with a DC voltag not exceeding the rated voltage at Reference Temperature and 75%RH max. and within 1 minutes of charging, provided the charge/discharge current is less than 50mA.			
			Within the specified tolerance	•	itance should be measured at ire at the frequency and voltag		
7	Capacita	*Table 1 GRM155 B3/R6 1A 124 to 224 GRM185 B3/R6 1A 105 GRM188 B3/R6 1C/1A 225		C≦10	apacitance         Frequency           μF (10V min.)*1         1±0.1kHz           μF (6.3V max.)         1±0.1kHz           μF         120±24Hz	1.0±0.2Vrms 0.5±0.1Vrms	
			GRM219 B3/R6 1A 475 GRM21B B3/R6 1C/1A 106		wever the Voltage is 0.5+/-0.4 ns on the left side.	1Vrms about Table 1	
	8 Dissipation Factor (D.F.)		B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max.	.2 max. frequency and voltage shown in the table.			
8			*Table 1 GRM155 B3/R6 1A 124 to 224 GRM185 B3/R6 1A 105 GRM188 B3/R6 1C/1A 225 GRM219 B3/R6 1A 475 GRM21B B3/R6 1C/1A 106	C≦10 C≦10 C>10 *1 Ho	apacitance         Frequency $\mu$ F (10V min.)*1         1±0.1kHz $\mu$ F (6.3V max.)         1±0.1kHz $\mu$ F         120±24Hz           wever the Voltage is 0.5+/-0.1           ns on the left side.	1.0±0.2Vrms 0.5±0.1Vrms 0.5±0.1Vrms	
	No bias		B1, B3 : Within +/−10% (−25°C to +85°C) F1 : Within +30/−80% (−25°C to +85°C) R6 : Within +/−15% (−55°C to +85°C) F5 : Within +22/−82% (−30°C to +85°C) C7 : Within +/−22% (−55°C to +125°C) C8 : Within +/−22% (−55°C to +105°C)	The capacitance change should be measured after 5min. at each specified temp. stage. The ranges of capacitance change compared with the Reference Temperature value over the temperature ranges shown in the table should be within the specified ranges.* In case of applying voltage, the capacitance change should be measured after 1 more min. with applying voltage in equilibration of each temp. stage. *GRM43 B1/R6 0J/1A 336/476 only : 1.0±0.2Vrms			
				Step	Temperature (°C)	Applying Voltage (V)	
9	Capacitance Temperature			1	Reference Tempereture±2 -55±3 (for R6, C7, C8)/ -25±3 (for B1, B3, F1) -30±3 (for F5)		
	Characteristics			3	Reference Tempereture±2	No bias	
		50% of		4	85±3 (for B1, B3, F1, R6, F5) 125±3 (for C7)/	-	
		the Rated	$  B1^{\circ} V   I n n + 10/-30\%$		105±3 (for C8)/		
		Voltage			20±2	-	
				6	-25±3 (for B1, F1)	50% of the rated voltage	
				78	20±2 85±3 (for B1, F1)		
						l	
				Perform a then set fo	asurement for high dielectric co heat treatment at 150 +0/-10 r 48±4 hours at room tempera e initial measurement.	°C for one hour and	

Continued on the following page.

#### Continued from the preceding page.

Item Adhesive Strength of Termination	Specifications No removal of the terminations or other defects should occur $^{\circ}$	Solder the capacitu in Fig. 1a using an parallel with the te The soldering shou reflow method and soldering is uniforr *5N : GR 15/GR GR 03 GR 15 GRM18 GRM18 GRM21 GRM31	eutectic solde st jig for 10+/- uld be done eit should be cor n and free of d	ig (glass epoxy rr. Then apply 1 -1sec. her with an iron nducted with ca lefects such as	10N* force in n or using the are so that the
-	→ C → C → C → C → C → C → C → C → C → C	in Fig. 1a using an parallel with the ter The soldering shou reflow method and soldering is uniforr *5N : GR⊡15/GRI GR⊡03 GR⊡15 GRM18 GRM21 GRM31	eutectic solde st jig for 10+/- uld be done eit should be cor n and free of d M18, 2N : GRE a 0.3 0.4	r. Then apply 1 -1sec. her with an iron nducted with ca lefects such as ⊒33 b 0.9	10N <sup>e</sup> force in n or using the are so that the heat shock.
-	Solder resist Baked electrode or copper foil	GR□03 GR□15 GRM18 GRM21 GRM31	0.3 0.4	0.9	
-	Solder resist Baked electrode or copper foil	GR□15 GRM18 GRM21 GRM31	0.4		0.3
	Baked electrode or copper foil	GRM18 GRM21 GRM31		1.5	
	Baked electrode or copper foil	GRM21 GRM31	1.0		0.5
	copper foil	GRM31		3.0	1.2
	copper foil		1.2	4.0	1.65
	Fig. 1a		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
Appearance Capacitance Vibration D.F.	No defects or abnormalities Within the specified tolerance B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max.	Solder the capacitor same manner and The capacitor shou having a total amp uniformly between frequency range, f be traversed in app applied for a period directions (total of	under the sam Ild be subjecte litude of 1.5mr the approxima rom 10 to 55H proximately 1 r d of 2 hours in	the conditions a red to a simple h n, the frequence ate limits of 10 z and return to minute. This mo	s (10). narmonic motion cy being varied and 55Hz. The 10Hz, should otion should be
	No cracking or marking defects should occur	in Fig. 2a using an direction shown in be done either with should be conduct	eutectic solde Fig. 3a for 5+, an iron or usi ed with care so	r. Then apply a /-1 sec. The sing the reflow n o that the solde shock.	a force in the oldering should nethod and
Deflection	R230 Pressunze Flexure : ≤1 Capacitance meter 45 45		+ + + 100 Fig. 2	+0 40	t : 1.6mm
				(GR□03, GR	R□15 : t : 0.8mm)
	<b>F</b> • •	Туре	а	b	С
	⊢ıg.3a	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)
	75% of the terminations is to be soldered evenly and continuously		(25% rosin in	•	,
	Deflection	Deflection Solderability of 75% of the terminations is to be soldered evenly and	No cracking or marking defects should occur       Solder the capacition in Fig. 2a using an direction shown in be done either with should be conduct and free of defects         Deflection	No cracking or marking defects should occurSolder the capacitor on the test ji in Fig. 2a using an eutectic sold direction shown in Fig. 3a for 5+, be done either with an iron or usi should be conducted with care so and free of defects such as heat $free of defects such as heatfree of defe$	No cracking or marking defects should occurSolder the capacitor on the test jig (glass epoxy in Fig. 2a using an eutectic solder. Then apply a direction shown in Fig. 3a for 5+/-1 sec. The so be done either with an iron or using the reflow m should be conducted with care so that the solde and free of defects such as heat shock.DeflectionImage: state of the sold occurImage: state of the sold occurFig.3aSolder the capacitor on the test jig (glass epoxy in Fig. 2a using an eutectic solder. Then apply a direction shown in Fig. 3a for 5+/-1 sec. The so be done either with an iron or using the reflow m should be conducted with care so that the sold and free of defects such as heat shock.DeflectionFig.2a (GRC03. GRGRC03ORType a GRC15Odd 1.5 GRM18Odd 1.5 GRM13GRM33Odd 1.5 GRM33Odd 1.5 GRM33<

Continued on the following page.  $\square$ 

#### Continued from the preceding page.

No. Ite	em	Specifications		Test Method						
	Appearance Capacitance Change	No defects or abnormalities B1, B3, R6, C7, C8 : Within ±7.5% F1, F5 : Within ±20% B1, B3, R6, C7, C8 : 0.1 max.	Im 27 24	Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in an eutectic solder solution at 270+/-5°C for 10+/-0.5 seconds. Set at room temperature for 24+/-2 hours (temperature compensating tyoe) or 48+/-4 hours (high dielectric constant type), then measure.						
	Q/D.F.	F1, F5 : 0.2 max.								
Resistance	I.R.	More than 50Ω • F					c constant type 10℃ for one ho			
Soldering Heat	Dielectric Strength	No defects			om temperature itial measurem		/—4 hours.			
			*Preheating for GRM32/43/55							
				Step		erature		me		
				1 2		to 120℃ to 200℃		nin. nin.		
	Appearance	No defects or abnormalities	Fi	x the capaci	tor to the supp	orting jig	in the same m	anner an		
	Capacitance	B1, B3, R6, C7, C8 : Within ±7.5%			ne conditions a		he four heat tr	atments		
	Change	F1, F5 : Within ±20%	sh	nown in the f	ollowing table.					
	D.F.	B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max.			/-2 hours (temperature compensating type) or urs (high dielectric constant type) at room					
	I.R.	More than 50Ω • F			then measure.	C CONStar	ni type) at toon			
Temperature	Dielectric	No defects		Step	1	2	3	4		
5 Sudden Change	Strength			Temp. (℃)	Min. Operating Temp. +0/-3	Room Temp.	Max. Operating Temp. +3/-0	Room Temp.		
				Time (min.)	30±3	2 to 3	30±3	2 to 3		
	Appearance	No defects or abnormalities	Pe th Pe	erform a hea en set at roc erform the in	it treatment at om temperature itial measurem	150+0/ e for 48+, nent.	c constant type 10℃ for one hc /—4 hours. and 90 to 95% I	ur and		
	Capacitance Change	B1, B3, R6, C7, C8 : Within ±12.5% F1, F5 : Within ±30%	500+/-12 hours. The charge/discharge currentis less than 50mA.							
High Temperature I 6 High Humidity	D.F.	B1, B3, R6, C7, C8 : 0.2 max. F1, F5 : 0.4 max. More than 12.5Ω • F	<ul> <li>Initial measurement Perform a heat treatment at 150+0/-10°C for one then let sit for 48+/-4 hours at room temperature initial measurement.</li> </ul>							
(Steady)			Pe th	<ul> <li>Measurement.</li> <li>Measurement after test Perform a heat treatment at 150+0/-10°C for one then let sit for 48+/-4 hours at room temperature measure.</li> </ul>						
	Appearance	No defects or abnormalities				-	000+/-12 hou			
	Capacitance Change	B1, B3, R6, C7, C8 : Within ±12.5% F1, F5 : Within ±30%	hc	maximum operating temperature +/-3°C. Let sit for 48+/-4 hours at room temperature, then measure. The charge/ discharge current is less than 50mA.						
	D.F.	B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.4 max.	•11	nitial measu	rement					
Durability	I.R.	More than 25Ω • F	th		48+/-4 hours		10°C for one ho temperature. P			
			Pe th		t treatment at		10℃ for one ho temperature, th			