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

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





Dort Number	Dimensions (mm)							
Part 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		1.25 ±0.1	0.6 ±0.1		0.7			
GRM219	2.0 ±0.1		0.85 ±0.1	0.2 to 0.7				
GRM21B			1.25 ±0.1					
GRM319	2 2 4 0 15	1 4 +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

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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
GRM15XR71C682KA86	X7R (EIA)	16	6800pF±10%	1.0	0.5	0.25
GRM155R71C153KA01	X7R (EIA)	16	15000pF±10%	1.0	0.5	0.50
GRM155R71C223KA01	X7R (EIA)	16	22000pF±10%	1.0	0.5	0.50
GRM155R71A333KA01	X7R (EIA)	10	33000pF±10%	1.0	0.5	0.50
GRM155R71A473KA01	X7R (EIA)	10	47000pF±10%	1.0	0.5	0.50
GRM188R71H221KA01	X7R (EIA)	50	220pF±10%	1.6	0.8	0.80
GRM188R71H331KA01	X7R (EIA)	50	330pF±10%	1.6	0.8	0.80
GRM188R71H471KA01	X7R (EIA)	50	470pF±10%	1.6	0.8	0.80
GRM188R71H681KA01	X7R (EIA)	50	680pF±10%	1.6	0.8	0.80
GRM188R71H102KA01	X7R (EIA)	50	1000pF±10%	1.6	0.8	0.80
GRM188R71H152KA01	X7R (EIA)	50	1500pF±10%	1.6	0.8	0.80
GRM188R71H222KA01	X7R (EIA)	50	2200pF±10%	1.6	0.8	0.80
GRM188R71H332KA01	X7R (EIA)	50	3300pF±10%	1.6	0.8	0.80
GRM188R71H472KA01	X7R (EIA)	50	4700pF±10%	1.6	0.8	0.80
GRM188R71H682KA01	X7R (EIA)	50	6800pF±10%	1.6	0.8	0.80
GRM188R71H103KA01	X7R (EIA)	50	10000pF±10%	1.6	0.8	0.80
GRM188R71H153KA01	X7R (EIA)	50	15000pF±10%	1.6	0.8	0.80
GRM188R71H223KA01	X7R (EIA)	50	22000pF±10%	1.6	0.8	0.80
GRM188R71E333KA01	X7R (EIA)	25	33000pF±10%	1.6	0.8	0.80
GRM188R71E473KA01	X7R (EIA)	25	47000pF±10%	1.6	0.8	0.80
GRM188R71E683KA01	X7R (EIA)	25	68000pF±10%	1.6	0.8	0.80
GRM188R71E104KA01	X7R (EIA)	25	0.1µF±10%	1.6	0.8	0.80
GRM188R71C104KA01	X7R (EIA)	16	0.1µF±10%	1.6	0.8	0.80
GRM188R71A154KA01	X7R (EIA)	10	0.15µF±10%	1.6	0.8	0.80
GRM188R71A224KA01	X7R (EIA)	10	22000pF±10%	1.6	0.8	0.80
GRM219R71H333KA01	X7R (EIA)	50	33000pF±10%	2.0	1.25	0.90
GRM21BR71H473KA01	X/R (EIA)	50	47000pF±10%	2.0	1.25	1.25
GRM21BR/1H683KA01	X/R (EIA)	50	68000pF±10%	2.0	1.25	1.25
GRM21BR71H104KA01	X7R (EIA)	50	0.1µF±10%	2.0	1.25	1.25
GRM21BR71H154KA01	X7R (EIA)	50	0.15µF±10%	2.0	1.25	1.25
GRM21BR71H224KA01	X7R (EIA)	50	22000PF±10%	2.0	1.25	1.25
GRM21BR71E104KA01		25	0.1µF±10%	2.0	1.25	1.25
GRM210R71E134KAU1		20	0.15µF±10%	2.0	1.25	1.25
GRM219R71E224RC01	X7R (EIA) X7D (EIA)	25	0.22 UC+10%	2.0	1.25	1.25
GRM21BR71E334KC01	X7R (EIA) X7D (EIA)	25	$0.33 \mu\text{F} \pm 10\%$	2.0	1.25	1.25
GRM210R71E474KC01	X7R (EIA) X7D (EIA)	20	$0.47\mu$ F $\pm 10\%$	2.0	1.25	0.90
GRM219R71C474RC01		16	0.47µ1±1076	2.0	1.25	0.90
GRM21BR71C105KA01	Χ/R (ΕΙΑ) Χ7Ρ (ΕΙΔ)	16	1µE +10%	2.0	1.25	1.25
GRM319R71H334KA01	X7R (EIA)	50	0.33 uF+10%	3.2	1.20	0.90
GRM31MR71H474KA01	X7R (EI/)	50	0.47uF+10%	3.2	1.6	1 15
GRM319R71E684KC01	X7R (EIA)	25	0.68µF+10%	3.2	1.6	0.90
GRM31MR71E105KC01	X7R (EIA)	25	1μF +10%	3.2	1.6	1.15
GRM319R71C105KC11	X7R (EIA)	16	1μF ±10%	3.2	1.6	0.90
GRM31MR71C155KC11	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
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Part Number	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
GRM188F51H103ZA01	Y5V (EIA)	50	10000pF +80%, -20%	1.6	0.8	0.80
GRM188F51H223ZA01	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)	50	10000pF +80%, -20%	1.6	0.8	0.80
GRM188F51E104ZA01	Y5V (EIA)	25	10000pF +80%, -20%	1.6	0.8	0.80
GRM188F51C224ZA01	Y5V (EIA)	16	22000pF +80%, -20%	1.6	0.8	0.80
GRM188F51C474ZA01	Y5V (EIA)	16	0.47µF +80%, -20%	1.6	0.8	0.80
GRM188F51A474ZC01	Y5V (EIA)	10	0.47µF +80%, -20%	1.6	0.8	0.80
GRM188F51A105ZA01	Y5V (EIA)	10	1µF +80%, -20%	1.6	0.8	0.80
GRM219F51H104ZA01	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
GRM21BF51E474ZA01	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
GRM21BF51C225ZA01	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
GRM21BF51A475ZA01	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
GRM319F51C105ZA01	Y5V (EIA)	16	1µF +80%, -20%	3.2	1.6	0.90
GRM31MF51C225ZA01	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
GRM319F51A225ZA01	Y5V (EIA)	10	2.2μF +80%, -20%	3.2	1.6	0.90
GRM31MF51A475ZA01	Y5V (EIA)	10	4.7μF +80%, -20%	3.2	1.6	1.15
GRM31MF51A106ZA01	Y5V (EIA)	10	10μF +80%, -20%	3.2	1.6	1.15
GRM31MF50J106ZA01	Y5V (EIA)	6.3	10μF +80%, -20%	3.2	1.6	1.15
GRM32RF51H105ZA01	Y5V (EIA)	50	1μF +80%, -20%	3.2	2.5	1.80
<b>GRM329F51E475ZA01</b> Y5V (EIA) 25		25	4./μr +80%, -20%	3.∠ 2.2	2.5	0.90
		/h	ΙUμr +80%, -20%	3.Z	2.5	1.35
GRM32NF51E106ZA01	Y5V (EIA)	14	10uE 000/ 200/	<b>^ ^ ^</b>	<u>с</u>	1 25
GRM32NF51E106ZA01 GRM32NF51C106ZA01 GRM38E44H402MA04	Y5V (EIA) Y5V (EIA)	16	10μF +80%, -20%	3.2	2.5	1.35
GRM32NF51E106ZA01 GRM32NF51C106ZA01 GRM188E41H103MA01 GRM188E41H232MA01	Y5V (EIA) Y5V (EIA) Z5U (EIA)	16 50	10μF +80%, -20% 10000pF±20% 22000pE±20%	3.2 1.6	2.5 0.8	1.35 0.80
GRM32NF51E106ZA01 GRM32NF51C106ZA01 GRM188E41H103MA01 GRM188E41H223MA01 GRM216E41H473MA01	Y5V (EIA) Y5V (EIA) Z5U (EIA) Z5U (EIA)	23 16 50 50	10μF +80%, -20% 10000pF±20% 22000pF±20% 47000pF+20%	3.2 1.6 1.6 2.0	2.5 0.8 0.8 1.25	1.35 0.80 0.80
GRM32NF51E106ZA01 GRM32NF51C106ZA01 GRM188E41H103MA01 GRM188E41H223MA01 GRM216E41H473MA01 GRM219E41H104MA01	Y5V (EIA) Y5V (EIA) Z5U (EIA) Z5U (EIA) Z5U (EIA) Z5U (EIA)	16 50 50 50 50	10µF +80%, -20% 10000pF±20% 22000pF±20% 47000pF±20% 10000pF±20%	3.2 1.6 1.6 2.0 2.0	2.5 0.8 0.8 1.25 1.25	1.35 0.80 0.80 0.60 0.90

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#### ■ Specifications and Test Methods

		Specifi	cations				
No.	Item	Temperature Compensating Type	High Dielectric Type	Test Method			
1	Operating Temperature Range	−55 to +125℃	B1, B3, F1 : −25℃ to +85℃ R1, R7 : −55℃ to +125℃ E4 : +10℃ to +85℃ F5 : −30℃ to +85℃	Reference Temperature : 25℃ (2Δ, 3Δ, 4Δ, B1, B3, F1, R1 : 20℃)			
2	Rated Voltage	See the previous pages		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V <sup>p.p</sup> or V <sup>0.p</sup> , whichever is larger, should be maintained within the rated voltage range.			
3	Appearance	No defects or abnormalities		Visual inspection			
4	Dimensions	Within the specified dimensions		Using calipers			
5	Dielectric Strength	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 10,000MΩ C>0.047μF : 500Ω • F 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 the charge/discharge current is less than 50mA.			
7	Capacitance	Within the specified tolerance		The capacitance/D.F. should be measured at 20°C/25°C at the			
8	Q/ Dissipation Factor (D.F.)	30pF and over : Q≥1000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	$\begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.025max. \\ W.V.: 16/10V: 0.035max. \\ W.V.: 6.3V/4V \\ : 0.05max. (C<3.3\muF) \\ : 0.1max. (C\geq3.3\muF) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.05max. (C<0.1\muF) \\ : 0.09max. (C\geq0.1\muF) \\ W.V.: 16V/10V: 0.125max. \\ W.V.: 6.3V: 0.15max. \\ \end{array}$	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$			

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			Specifi	cations						
lo.	Ite	m	Temperature Compensating Type	High Dielectric Type			Test Me	ethod		
		No bias	Within the specified tolerance (Table A-1)	B1, B3 : Within±10% (-25℃ to +85℃) R1, R7 : Within±15% (-55℃ to +125℃) R6 : Within±15% (-55℃ to +85℃) E4 : Within +22/-56% (+10℃ to +85℃) F1 : Within +30/-80% (-25℃ to +85℃) F5 : Within +22/-82% (-30℃ to +85℃)	The capacitance change should be measured after 5min. at each specified temp. stage. (1)Temperature Compensating Type The temperature coefficient is determind using the capacitat measured in step 3 as a reference. When cycling the temperature sequentially from step 1 throuts $5 (5C : +25^{\circ}C \text{ to } +125^{\circ}C/\Delta C : +20^{\circ}C \text{ to } +125^{\circ}C : \text{other temp.} \text{ coeffs. } :+25^{\circ}C \text{ to } +85^{\circ}C/+20^{\circ}C \text{ to } +85^{\circ}C)$ the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A-1. The capacitance drift is caluculated by dividing the difference between the maximum and minimum measured values in th				iter 5min. at he capacitance step 1 through other temp. pacitance emperature 1. he differences values in the	
			/	· · · · · · · · · · · · · · · · · · ·	step 1, 3 ar	nd 5 by t	the cap. value	in step 3	•	
		50% of		B1 : Within +10/-30%	Ste	ep	T	emperat	ure (°C	:)
		the Rated		R1 : Within +15/-40%		)	Refere	ence Terr	nperat	$\frac{\text{ure}\pm 2}{2}$
		Voltage		F1 : Within +30/-95%	2	2	-55±3 (for	$\Delta C / -25$	±3 (fC	or other TC)
					- 4	, L	125+3 (for		-3 (for	other TC)
					5	5	Refere	ence Terr		ure+2
9	Capacitance Temperature Characteristics				<ul> <li>(2) High Dielectric Constant Type The ranges of capacitance change compared with the 20°C value over the temperature ranges shown in the table should be within the specified ranges.* In case of applying voltage, the capacitance change should b measured after 1 more min. with applying voltage in equilibration of each temp. stage.</li> </ul>				th the 20°C table should nge should be e in	
					Step	Tei	mperature (°C)	)	Apply	ving 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	1 2 3 4	Refere -55: -25: -30±3 Refere 12 85:	ence Tempere ±3 (for R1, R7 ±3 (for B1, B3 (for F5)/10±3 ence Tempere ±5±3 (for R1, R ±3 (for B1, B3, F1 F5 F4)	ture±2 , R6) , F1) (for E4) ture±2 R7)/ , R6		No bias
				and then set for $48\pm4$ hours	5	Refere	ence Tempere	ture±2		
				at room temperature. Perform the initial measurement.	6	-2	–55±3 (for R1) 25±3 (for B1, F	)/ =1)	50%	% of the rated
					7	Refere	ence Tempere	ture±2		voltage
					8	8	125±3 (for R1) 5±3 (for B1, F	)/ 1)		
		No removal of the terminations		or other defect should occur	Solder the Fig. 1a usir parallel with The solderin reflow meth soldering is *2N (GR	capacito ng an eu n the tes ng shou nod and s uniform 03), 5N	or to the test jig itectic solder. Ist jig for 10±1 s ild be done eith should be con n and free of do (GR□15, GRM	g (glass e Then app sec. her with a ducted w efects su M18)	poxy I Iy 10N an iron vith cai ch as	board) shown in force in for using the re so that the heat shock.
	Adhesive	Strenath			<b>T</b>		6	h		(in mm)
10	of Termin	ation				Je	0.3	d D Q		0.3
					03 GR□15	, ,	0.4	1.5		0.5
				Solder resist	GRM18	;	1.0	3.0		1.2
				Baked electrode or	GRM21		1.2	4.0		1.65
					GRM31	,	2.2	5.0		2.0
			Fig. 1a		GRM43		3.5	7.0		3.7
					GRM55	i	4.5	8.0		5.6
								-		

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			Specifi	cations					
No.	Ite	em	Temperature Compensating Type	High Dielectric Type		Test Met	thod		
		Appearance	No defects or abnormalities						
		Capacitance	Within the specified tolerance						
11	Vibration Resistance	Q/D.F.	30pF and over : Q≥1000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	$\begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.025max. \\ W.V.: 16/10V: 0.035max. \\ W.V.: 6.3V/4V \\ : 0.05max. (C<3.3\muF) \\ : 0.1max. (C\geq3.3\muF) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.05max. (C<0.1\muF) \\ : 0.09max. (C\geq0.1\muF) \\ W.V.: 16V/10V: 0.125max. \\ W.V.: 6.3V: 0.15max. \\ \end{array}$	Solder the capacit same manner and The capacitor sho having a total amp uniformly betweer frequency range, f be traversed in ap applied for a perior directions (total of	same manner and under the same condition. The capacitor should be subjected to a simple to the same condition of the transmitter of the same condition. The capacitor should be subjected to a simple to the approximate limits of the traversed in approximately 1 minute. The applied for a period of 2 hours in each 3 minute directions (total of 6 hours).		poxy board) in the ons as (10). iple harmonic motion juency being varied of 10 and 55Hz. The irn to 10Hz, should his motion should be utually perpendicular	
			No crack or marked defect shou	ld occur	Solder the capacit in Fig. 2a using ar direction shown in done either with a	tor on the test jig n eutectic solder. n Fig. 3a for 5±1s n iron or using th	(glass epox Then apply sec. The solo ne reflow me	y board) shown a force in the dering should be thod and should	
12	Defle Solderabi Terminati	ction ility of on	Fig. 3a 75% of the terminations are to b continuously 7b measured and observed ch specifications in the following ta	Pressurizing speed : 1.0mm/sec. Pressurize          Image: speed in the speed i	Type         GR□03         GR□15         GRM18         GRM31         GRM32         GRM43         GRM55	a care so that the heat shock. b care so that the sheat shock. b care so that the sheat shock. b care so that the sheat shock. Fig. 2 a 0.3 0.4 1.0 1.2 2.2 3.5 4.5 citor in a solution (25% rosin in w 20°C for 10 to 30 mmerse in an eu 230±5°C.	e soldering is 04.5 04.5 0 0 0 0 0 0 0 0 0 0 0 0 0	03/15 : t : 0.8mm) C 0.3 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mm) (JIS-K-8101) and ion) .	
		Appearance	No defects or abnormalities		-				
		Capacitance Change	Within $\pm 2.5\%$ or $\pm 0.25$ pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±7.5% F1, F5, E4 : Within ±20%	Preheat the capac Immerse the capac for 10±0.5 second	citor at 120 to 15 icitor in an eutec ds. Set at room to	0℃ for 1 min tic solder sol emperature f	ute. lution at 270±5℃ for 24±2 hours	
14	Resistance to Soldering Heat	Q/D.F.	30pF and over : Q≥1000 30pF and below : Q≥400+20C C : Nominal Capacitance (pF)	$\begin{array}{l} [B1, B3, R1, R6, R7, E4] \\ W.V.: 25Vmin.: 0.025max. \\ W.V.: 16/10V: 0.035max. \\ W.V.: 6.3V/4V \\ : 0.05max. (C<3.3\muF) \\ : 0.1max. (C\geq3.3\muF) \\ [F1, F5] \\ W.V.: 25Vmin. \\ : 0.05max. (C<0.1\muF) \\ : 0.09max. (C\geq0.1\muF) \\ W.V.: 16V/10V: 0.125max. \\ W.V.: 6.3V: 0.15max. \\ \end{array}$	(temperature com constant type), the •Initial measurem Perform a heat treat then set at room to Perform the initial •Preheating for G Step 1 2	pensating tyoe) en measure. ent for high diele eatment at 150+4 emperature for 4 measurement. RM32/43/55 Temperature 100°C to 120° 170°C to 200°	or 48±4 hou ectric constar 0/-10°C for c 8±4 hours.	rs (high dielectric nt type one hour and <u>Time</u> <u>1 min.</u> <u>1 min.</u>	
		I.R.	More than 10,000M $\Omega$ or 500 $\Omega$ -	F (Whichever is smaller)					
	Dielectric Strength No defects								

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			Specif						
No.	lte	em	Temperature Compensating Type	High Dielectric Type		Tes	t Methoo	ł	
			The measured and observed ch specifications in the following ta	naracteristics should safisfy the able					
		Appearance	No defects or abnormalities						
		Capacitance Change	Within $\pm 2.5\%$ or $\pm 0.25$ pF (Whichever is larger)	B1, B3, R1, R6, R7 : Within ±7.5% F1, F5, E4 : Within ±20%	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 treatr shown in the following table.				atments
		Q/D.F.		[B1, B3, R1, R6, R7, E4] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max.	Set for 24±2 h hours (high die measure.	ours (temperat	ure com t type) at	pensating type) t room tempera	) or 48±4 iture, then
15	Temperature		30pF and over : Q≧1000	W.V.: 6.3V/4V	Step	1	2	3	4
10	Cycle		30pF and below : Q≧400+20C	: 0.05/nax. (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. W.V. : 6.3V : 0.15max.	<ul> <li>Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/−10°C for one hour and then set at room temperature for 48±4 hours.</li> <li>Perform the initial measurement.</li> </ul>				
	I.R.	More than 10,000M $\Omega$ or 500 $\Omega$	• F (Whichever is smaller)		llaimeasulem	-ni.			
		Dielectric Strength	No defects						
			The measured and observed ch specifications in the following ta	naracteristics should satisfy the able					
		Appearance	No defects or abnormalities						
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	B1, B3, R1, R6, R7, C8 : Within ±12.5% F1, F5 : Within ±30%					
H 16 (\$ S	Humidity (Steady State)	Humidity Steady State) Q/D.F. $30pF and over : Q \ge 350$ $10pF and over  30pF and below :  Q \ge 275+2.5C10pF and below :  Q \ge 275+2.5C10pF and below :  Q \ge 200+10CC : Nominal Capacitan$		[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<3.3μF) : 0.125max. (C≥3.3μF) [F1, F5] W.V. : 25Vmin. : 0.075max. (C<0.1μF) : 0.125max. (C≥0.1μF) W.V. : 16V/10V : 0.15max.	Set the capacitor at 40±2°C and in 90 to 95% humiduty for 500±12 hours. Remove and set for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.				ity for ensating room

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

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No.     Item     Temperature Compensating Type     High Dielectric Type     Test Method       Image: The measured and observed characteristics should satisfy the specifications in the following table     The measured and observed characteristics should satisfy the specifications in the following table     Image: The measured and observed characteristics should satisfy the specifications in the following table       Image: Appearance     Appearance     No defects or abnormalities     Image: The following table       Image: Capacitance Change     Within ±7.5% or ±0.75pF     Image: The following table     Image: The following table       Image: Capacitance Change     Within ±7.5% or ±0.75pF     Image: The following table     Image: The following table       Image: Change     Within ±7.5% or ±0.75pF     Image: The following table     Image: The following table       Image: Change     Within ±7.5% or ±0.75pF     Image: The following table     Apply the rated voltage at 40±2°c and 90 to 95% humidity following table       Image: Change     Within ±7.5% or ±0.75pF     Image: The following table     Apply the rated voltage at 40±2°c and 90 to 95% humidity following table       Image: The multiple table     Image: The following table     The following table     Apply the rated voltage at 40±2°c and 90 to 95% humidity following table       Image: The following table     Image: The following table     Image: The following table     Apply the rated voltage at 40±2°c and 90 to 95% humidity following table       Image: The follo					Specifi	cations			
The measured and observed characteristics should satisfy the specifications in the following table         Appearance       No defects or abnormalities         Appearance       No defects or abnormalities         B1, B3, R1, R6, R7 : Within ±12.5%         F1, F5, E4 : Within ±12.5%         F1, F5, E4 : Within ±30%         [W.V. : 10Vmax.]         F1, F5 : Within ±30/-40%         [B1, B3, R1, R6, R7, E4]         W.V. : 25Vmin: : 0.05max.	o. It	0.	lte	em	Temperature Compensating Type	High Dielectric Type	Test Method		
Appearance       No defects or abnormalities         Image: Capacitance Change       Within ±7.5% or ±0.75pF (Whichever is larger)       B1, B3, R1, R6, R7 : Within ±12.5% F1, F5, E4 : Within ±30% [W.V. : 10Vmax.] F1, F5 : Within ±30/-40%         Image: Humidity       Image: B1, B3, R1, R6, R7, E4] Within ±30/-40%       Apply the rated voltage at 40±2°c and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temprature, then muasure. The charge/dischar current is less than 50mA.					The measured and observed ch specifications in the following ta	naracteristics should satisfy the ble			
Capacitance Change       Within ±7.5% or ±0.75pF (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±2°C and 90 to 95% humidity fo 500±12 hours. Remove and set for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temprature, then muasure. The charge/dischar current is less than 50mA.				Appearance	No defects or abnormalities				
Humidity       [B1, B3, R1, R6, R7, E4]       type) at room temprature, then muasure. The charge/dischar current is less than 50mA.         17       W.V.: 15(10)(+0.05max.			Humidity Load	Capacitance Change	Within ±7.5% or ±0.75pF (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 $40\pm2^{\circ}$ and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours (temperature		
Load $30pF$ and over : $Q \ge 200$ $30pF$ and below : $Q \ge 100 \pm 10C/3$ $W.V. : 10/10V \cdot 0.05max.$ $W.V. : 6.3V$ •Initial measurement for F1, F5/10V max. $Apply the rated DC voltage for 1 hour at 40\pm 2^{\circ}C.Remove and set for 48\pm 4 hours at room temperature.Perform initial measurement.Q/D.F.Q \ge 100\pm 10C/3C : Nominal Capacitance (pF)W.V. : 25Vmin.: 0.075max. (C < 0.1 µF): 0.125max. (C \ge 0.1 µF)W.V. : 16V/10V : 0.15max.W.V. : 6.3V : 0.2max.•Initial measurement for F1, F5/10V max.Apply the rated DC voltage for 1 hour at 40\pm 2^{\circ}C.Remove and set for 48\pm 4 hours at room temperature.Perform initial measurement.$	7 Humidity Load	Hu 7 Lo		Q/D.F.	30pF and over : Q≥200 30pF and below : Q≥100+10C/3 C : Nominal Capacitance (pF)	$ \begin{array}{l} [\text{B1}, \text{B3}, \text{R1}, \text{R6}, \text{R7}, \text{E4}] \\ \text{W.V.} : 25\text{Vmin.} : 0.05\text{max.} \\ \text{W.V.} : 16/10\text{V} : 0.05\text{max.} \\ \text{W.V.} : 6.3\text{V} \\ & : 0.075\text{max.} (\text{C}{<}3.3\mu\text{F}) \\ & : 0.125\text{max.} (\text{C}{\geq}3.3\mu\text{F}) \\ [\text{F1}, \text{F5}] \\ \text{W.V.} : 25\text{Vmin.} \\ & : 0.075\text{max.} (\text{C}{<}0.1\mu\text{F}) \\ & : 0.125\text{max.} (\text{C}{\geq}0.1\mu\text{F}) \\ & : 0.125\text{max.} (\text{C}{\geq}0.1\mu\text{F}) \\ \text{W.V.} : 16\text{V}/10\text{V} : 0.15\text{max.} \\ \text{W.V.} : 6.3\text{V} : 0.2\text{max.} \end{array} $	<ul> <li>Initial measurement for F1, F5/10V max.</li> <li>Apply the rated DC voltage for 1 hour at 40±2°C.</li> <li>Remove and set for 48±4 hours at room temperature.</li> <li>Perform initial measurement.</li> </ul>		
I.R.         More than 500MΩ or 25Ω • F (Whichever is smaller)				I.R.	More than 500M $\Omega$ or 25 $\Omega \bullet F$ (V	Vhichever is smaller)			
The measured and observed characteristics should satisfy the specifications in the following table					The measured and observed ch specifications in the following ta	naracteristics should satisfy the ble	-		
Appearance No defects or abnormalities				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]       Apply 200% of the rated voltage at the maximum operating temperature ±3℃ for 1000±12 hours.         Set for 24±2 hours (timperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature)       Set for 24±2 hours (timperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature)			High Temperature Load	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 $\pm 3^{\circ}$ for 1000 $\pm$ 12 hours. Set for 24 $\pm$ 2 hours (temperature compensating type) or 48 $\pm$ 4 hours (high dielectric constant type) at room temperature		
High 18       [B1, B3, R1, R6, R7, E4] W.V. : 25Vmin. : 0.04max.       The charge/discharge current is less than 50mA.         JopF and over : Q≥350       W.V. : 16/10V : 0.05max.       Initial measurement for high dielectric constant type.         J0pF and over : Q≥275+2.5C       : 0.075max.(C<3.3µF)	High 8 Temperature Load	Higt 8 Tem Loa		Q/D.F.	30pF and over : Q≧350 10pF and over 30pF and below : Q≧275+2.5C 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	[B1, B3, R1, R6, R7, E4] W.V. : 25Vmin. : 0.04max. W.V. : 16/10V : 0.05max. W.V. : 6.3V : 0.075max.(C<3.3μF) : 0.125max.(C≥3.3μF) [F1, F5] W.V. : 25Vmin. : 0.075max.(C<0.1μF) : 0.125max.(C≥0.1μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3V : 0.2max.	<ul> <li>The charge/discharge current is less than 50mA.</li> <li>Initial measurement for high dielectric constant type. 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. Perform initial measurement.</li> </ul>		
I.R. More than 1,000M $\Omega$ or 50 $\Omega$ •F (Whichever is smaller)				I.R.	More than 1,000M $\Omega$ or 50 $\Omega$ •F (	Whichever is smaller)			

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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	$-150\pm 60$	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	$-330\pm 60$	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).

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(2)							
			(	l i i i i i i i i i i i i i i i i i i i			
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	$-470\pm120$	_	_	3.40	1.58	2.27	1.05
4T	-470±250	_	<u> </u>	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°C to 125°C (for  $\Delta$ C)/85°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

Dart Number	Dimensions (mm)					
Fait 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	- S /
GRM155	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4	2.5
GRM185	1.6 ±0.1	0.8 ±0.1	0.5 +0/-0.2	0.2 to 0.5	0.5	200
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	0.2 to 0.9	15	e g
GRM31M	]		1.15 ±0.1	0.3 10 0.8	1.5	++ + · · ·
GRM31C	3.2 ±0.2	1.6 ±0.2	1.6 ±0.2			
GRM32D	22402	2 5 +0 2	2.0 ±0.2	0.2	10	
GRM32E	3.2 ±0.3	2.3 ±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			L 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.	Ite	em	S	pecifications		Те	st Method			
1	Operating Temperat Range	) ture	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℃ (B1, B3, F1 : 20℃)					
2	Rated Vo	Voltage See the previous pages			The rated voltage is defined as the maximum vo may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltay whichever is larger, should be maintained withir voltage range.		um voltage which cor. voltage, V <sup>p.p</sup> or V <sup>o.p</sup> , within the rated			
3	Appearan	nce	No defects or abnormalities		Visual insp	Visual inspection				
4	Dimensio	ns	Within the specified dimensions		Using calip	ers				
5	Dielectric	Strength No defects or abnormalities		95	No failure s is applied b provided th	No failure should be observed when 250% of the rated voltag is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA				
6	Insulation Resistanc	n Ce	More than 50Ω • F	More than 50Ω • F		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at Reference Temperature and 75%RH max. and within 1 minutes of charging, provided the charge/discharge current is less than 50mA				
			Within the specified tolera	nce *Table 1	The capac Temperatu	itance should be re at the frequence apacitance	measured at R cy and voltage Frequency	eference shown in the table.		
7	Capacita	nce		GRM155 B3/R6 1A 124 to 224	<u>C≦10</u> C≦10	με (10V min.)** μF (6.3V max.)	1±0.1kHz	0.5±0.1Vrms		
				GRM185 B3/R6 1C/1A 225	C>10	μF	120±24Hz	0.5±0.1Vrms		
				GRM219 B3/R6 1A 475 GRM21B B3/R6 1C/1A 106	*1 Hoviten	wever the Voltage	e is 0.5+/—0.1	/rms about Table 1		
8 Dis (D.			B1, B3, R6, C7, C8 : 0.1 r F1, F5 : 0.2 max.	nax.	The D.F. s	hould be measure and voltage show	ed at Referenc n in the table.	e Temperature at the		
	Dissipatic (D.F.)	on Factor		*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 C>10 *1 How item	apacitance μF (10V min.)*1 μF (6.3V max.) μF wever the Voltage ns on the left side	Frequency 1±0.1kHz 1±0.1kHz 120±24Hz is 0.5+/-0.1	Voltage           1.0±0.2Vrms           0.5±0.1Vrms           0.5±0.1Vrms		
	No bias	No bias	B1, B3 : Within +/-10% ( F1 : Within +30/-809 R6 : Within +/-15% ( F5 : Within +/22/-829 C7 : Within +/-22% ( C8 : Within +/-22% (	-25°C to +85°C) 6 (-25°C to +85°C) -55°C to +85°C) 6 (-30°C to +85°C) -55°C to +125°C) -55°C to +105°C)	The capac each speci The ranges Reference shown in th In case of a measured equilibratic	tance change shi fied temp. stage. s of capacitance of Temperature vali he table should be applying voltage, after 1 more min. n of each temp. s	build be measu change compa ue over the ter within the sp the capacitanc with applying tage.	red after 5min. at red with the nperature ranges ecified ranges.* ee change should be voltage in		
					*GRM43 E	31/R6 0J/1A 336/4	476 only : 1.0±	:0.2Vrms		
					Step	Temperatur	e (°C)	Applying Voltage (V)		
9	Capacitance Temperature				2	-55±3 (for R( -25±3 (for B -30±3 (f	5, C7, C8)/ 1, B3, F1) or F5)			
	Characteristics	racteristics		3	Reference Terr	pereture±2	No bias			
		50% of	B1: Within +10/-30%		4	85±3 (for B1, B3 125±3 (for 105±3 (for	B, F1, R6, F5) or C7)/ or C8)/			
		the Rated	F1: Within +30/-95%		5	20+	2			
		ronaye			6	-25±3 (for	B1, F1)	50% of the rated		
					7	20±	2	voltage		
					8	85±3 (for	B1, F1)	-		
					• Initial mea Perform a then set fo Perform th	asurement for hig heat treatment at r 48±4 hours at re e initial measurer	n dielectric cor 150 +0/-10°C pom temperatu nent.	stant type c for one hour and ire.		

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No.	Item	Specifications		Test Me	thod		
		No removal of the terminations or other defects should occur		Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1a using an eutectic solder. Then apply $10N^*$ force in parallel with the test jig for $10+/-1$ sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. *5N : GR $\Box$ 15/GRM18, 2N : GR $\Box$ 33			
10	Adhesive Strength of Termination	Solder resist Baked electrode or copper foil	Type           GR□03           GR□15           GRM18           GRM21           GRM31           GRM32           GRM43           GRM55	a 0.3 0.4 1.0 2.2 2.2 3.5 4.5	b 0.9 1.5 3.0 4.0 5.0 5.0 7.0 8.0	c           0.3           0.5           1.2           1.65           2.0           2.9           3.7           5.6	
	Appearance	No defects or abnormalities	Solder the capacito	r on the test ji	g (glass epoxy	board) in the	
11	Capacitance Vibration D.F.	Within the specified tolerance B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max.	same manner and of The capacitor shout having a total ampli- uniformly between frequency range, fro- be traversed in app applied for a period directions (total of 6	under the sam Id be subjecte itude of 1.5mm the approxima om 10 to 55Hz roximately 1 n I of 2 hours in 6 hours).	e conditions as d to a simple h n, the frequence te limits of 10 a e and return to hinute. This mo each 3 mutual	s (10). armonic motion y being varied and 55Hz. The 10Hz, should otion should be y perpendicular	
	No cracking or marking defects should occur		Solder the capacito in Fig. 2a using an direction shown in I be done either with should be conducte and free of defects	r on the test ji eutectic solder Fig. 3a for 5+/ an iron or usin ed with care so such as heat s	g (glass epoxy r. Then apply a -1 sec. The so og the reflow n that the solde shock. 04.5	board) shown a force in the oldering should hethod and ring is uniform	
12	Deflection	Capacitance meter	Г	100 Fig. 2a	a	t : 1.6mm	
		<del></del>			(GR□03, GR	□15 : t : 0.8mm)	
		Fig.3a	Type         GR□03         GR□15         GRM18         GRM21         GRM31         GRM32         GRM43         GRM55	a 0.3 0.4 1.0 1.2 2.2 2.2 3.5 4.5	b 0.9 1.5 3.0 4.0 5.0 5.0 7.0 8.0	c           0.3           0.5           1.2           1.65           2.0           2.9           3.7           5.6           (in mm)	
13	Solderability of Termination	75% of the terminations is to be soldered evenly and continuously	Immerse the capac rosin (JIS-K-5902) Preheat at 80 to 12 After preheating, im 2+/-0.5 seconds a	itor in a solutio (25% rosin in v 0°C for 10 to 3 nmerse in an e it 230+/—5°C.	on of ethanol ( weight propotic 0 seconds. utectic solder	IIS-K-8101) and on) . solution for	

Continued on the following page.  $\square$ 

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No.	lte	m	Specifications	Test Method
14	Resistance to Soldering Heat	Appearance Capacitance Change Q/D.F. I.R. Dielectric Strength	No defects or abnormalities B1, B3, R6, C7, C8 : Within $\pm$ 7.5% F1, F5 : Within $\pm$ 20% B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max. More than 50 $\Omega$ • F No defects	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 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°C for one hour and then set at room temperature for 48+/-4 hours.         Perform the initial measurement.
				*Preheating for GRM32/43/55
				Step lemperature lime
				2 170°C to 200°C 1 min.
		Appearance	No defects or abnormalities	Fix the capacitor to the supporting jig in the same manner and
		Capacitance	B1, B3, R6, C7, C8 : Within ±7.5%	under the same conditions as (10). Perform the five cycles according to the four heat treatments
		D.F.	B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.2 max.	shown in the following table. Set for 24+/-2 hours (temperature compensating type) or 48+/-4 hours (high dielectric constant type) at room
		I.R.	More than 50Ω • F	temperature, then measure.
15	Temperature Sudden Change	Dielectric	No defects	Step         1         2         3         4
		Strength		Temp. (°C)   Min. Operating Temp. +0/-3   Room Temp. +3/-0   Temp.
				Time (min.)         30±3         2 to 3         30±3         2 to 3
		Appearance Capacitance	No defects or abnormalities B1, B3, R6, C7, C8 : Within ±12.5%	•Initial measurement for high dielectric constant type Perform a heat treatment at $150+0/-10^{\circ}$ C for one hour and then set at room temperature for $48+/-4$ hours. Perform the initial measurement. Apply the rated voltage at $40+/-2^{\circ}$ C and 90 to 95% humidity for 500+/-12 hours. The charge/discharge currentis less than 50mA
16	High Temperature High Humidity	Change D.F. I.R.	F1, F5 : Within ±30% B1, B3, R6, C7, C8 : 0.2 max. F1, F5 : 0.4 max. More than 12.5Ω • F	•Initial measurement Perform a heat treatment at $150+0/-10^{\circ}$ for one hour and then let sit for $48+/-4$ hours at room temperature. Perform the initial measurement.
	(Steady)			<ul> <li>Measurement after test Perform a heat treatment at 150+0/−10°C for one hour and then let sit for 48+/−4 hours at room temperature, then measure.</li> </ul>
		Appearance	No defects or abnormalities	Apply 150% of the rated voltage for 1000+/-12 hours at the
17	Durability	Capacitance Change	B1, B3, R6, C7, C8 : Within ±12.5% F1, F5 : Within ±30%	maximum operating temperature $+/-3^{\circ}$ . Let sit for $48+/-4$ hours at room temperature, then measure. The charge/ discharge current is less than 50mA
		D.F. B1, B3, R6, C F1, F5 : 0.4 m	B1, B3, R6, C7, C8 : 0.1 max. F1, F5 : 0.4 max.	Initial measurement
		I.R.	More than 25Ω • F	Perform a heat treatment at 150+0/10°C for one hour and then let sit for 48+/4 hours at room temperature. Perform the initial measurement.
				<ul> <li>Measurement after test Perform a heat treatment at 150+0/-10°C for one hour and then let sit for 48+/-4 hours at room temperature, then measure.</li> </ul>