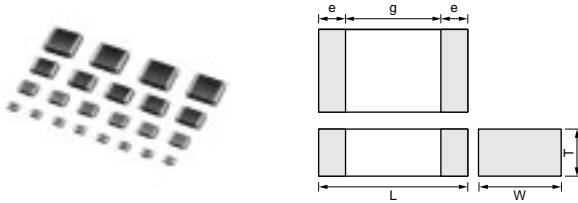


Monolithic Ceramic Capacitors GR_R6/R7/F5/E4 (X5R/X7R/Y5V/Z5U)

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



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRP155	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4
GRM155					
GRM188*	1.6 ±0.1	0.8 ±0.1	0.8 ±0.1	0.2 to 0.5	0.5
GRM216	2.0 ±0.1	1.25 ±0.1	0.6 ±0.1	0.2 to 0.7	0.7
GRM219			0.85 ±0.1		
GRM21B			1.25 ±0.1		
GRM319	3.2 ±0.15	1.6 ±0.15	0.85 ±0.1	0.3 to 0.8	1.5
GRM31M			1.15 ±0.1		
GRM31C			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)
GRP155R61A683KA01	X5R (EIA)	10	68000pF±10%	1.0	0.5	0.50
GRP155R61A104KA01	X5R (EIA)	10	0.1µF±10%	1.0	0.5	0.50
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
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
GRM188R60J225KE01	X5R (EIA)	6.3	2.2µF ±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
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
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
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
GRM55DR61H106KA01	X5R (EIA)	50	10µF ±10%	5.7	5.0	2.00
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

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Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM15XR71H221KA86	X7R (EIA)	50	220pF±10%	1.0	0.5	0.25
GRP155R71H221KA01	X7R (EIA)	50	220pF±10%	1.0	0.5	0.50
GRM15XR71H331KA86	X7R (EIA)	50	330pF±10%	1.0	0.5	0.25
GRP155R71H331KA01	X7R (EIA)	50	330pF±10%	1.0	0.5	0.50
GRM15XR71H471KA86	X7R (EIA)	50	470pF±10%	1.0	0.5	0.25
GRP155R71H471KA01	X7R (EIA)	50	470pF±10%	1.0	0.5	0.50
GRM15XR71H681KA86	X7R (EIA)	50	680pF±10%	1.0	0.5	0.25
GRP155R71H681KA01	X7R (EIA)	50	680pF±10%	1.0	0.5	0.50
GRM15XR71H102KA86	X7R (EIA)	50	1000pF±10%	1.0	0.5	0.25
GRP155R71H102KA01	X7R (EIA)	50	1000pF±10%	1.0	0.5	0.50
GRM15XR71H152KA86	X7R (EIA)	50	1500pF±10%	1.0	0.5	0.25
GRP155R71H152KA01	X7R (EIA)	50	1500pF±10%	1.0	0.5	0.50
GRP155R71H222KA01	X7R (EIA)	50	2200pF±10%	1.0	0.5	0.50
GRP155R71H332KA01	X7R (EIA)	50	3300pF±10%	1.0	0.5	0.50
GRP155R71H472KA01	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
GRP155R71E682KA01	X7R (EIA)	25	6800pF±10%	1.0	0.5	0.50
GRP155R71E103KA01	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
GRP155R71C153KA01	X7R (EIA)	16	15000pF±10%	1.0	0.5	0.50
GRP155R71C223KA01	X7R (EIA)	16	22000pF±10%	1.0	0.5	0.50
GRP155R71A333KA01	X7R (EIA)	10	33000pF±10%	1.0	0.5	0.50
GRP155R71A473KA01	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	X7R (EIA)	50	47000pF±10%	2.0	1.25	1.25
GRM21BR71H683KA01	X7R (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	X7R (EIA)	25	0.1μF±10%	2.0	1.25	1.25
GRM21BR71E154KA01	X7R (EIA)	25	0.15μF±10%	2.0	1.25	1.25
GRM219R71E224KC01	X7R (EIA)	25	22000pF±10%	2.0	1.25	0.90

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Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM21BR71E334KC01	X7R (EIA)	25	0.33 μ F \pm 10%	2.0	1.25	1.25
GRM21BR71E474KC01	X7R (EIA)	25	0.47 μ F \pm 10%	2.0	1.25	1.25
GRM219R71C474KC01	X7R (EIA)	16	0.47 μ F \pm 10%	2.0	1.25	0.90
GRM219R71C684KC01	X7R (EIA)	16	0.68 μ F \pm 10%	2.0	1.25	0.90
GRM21BR71C105KA01	X7R (EIA)	16	1 μ F \pm 10%	2.0	1.25	1.25
GRM319R71H334KA01	X7R (EIA)	50	0.33 μ F \pm 10%	3.2	1.6	0.90
GRM31MR71H474KA01	X7R (EIA)	50	0.47 μ F \pm 10%	3.2	1.6	1.15
GRM319R71E684KC01	X7R (EIA)	25	0.68 μ F \pm 10%	3.2	1.6	0.90
GRM31MR71E105KC01	X7R (EIA)	25	1 μ F \pm 10%	3.2	1.6	1.15
GRM319R71C105KC11	X7R (EIA)	16	1 μ F \pm 10%	3.2	1.6	0.90
GRM31MR71C155KC11	X7R (EIA)	16	1.5 μ F \pm 10%	3.2	1.6	1.15
GRM31MR71C225KA35	X7R (EIA)	16	2.2 μ F \pm 10%	3.2	1.6	1.15
GRM319R71A105KC01	X7R (EIA)	10	1 μ F \pm 10%	3.2	1.6	0.90
GRM319R71A225KA01	X7R (EIA)	10	2.2 μ F \pm 10%	3.2	1.6	0.90
GRM32NR71H684KA01	X7R (EIA)	50	0.68 μ F \pm 10%	3.2	2.5	1.35
GRM32RR71H105KA01	X7R (EIA)	50	1 μ F \pm 10%	3.2	2.5	1.80
GRM32RR71E225KC01	X7R (EIA)	25	2.2 μ F \pm 10%	3.2	2.5	1.80
GRM32MR71C225KC01	X7R (EIA)	16	2.2 μ F \pm 10%	3.2	2.5	1.15
GRM32NR71C335KC01	X7R (EIA)	16	3.3 μ F \pm 10%	3.2	2.5	1.35
GRM32RR71C475KC01	X7R (EIA)	16	4.7 μ F \pm 10%	3.2	2.5	1.80
GRM43ER71H225KA01	X7R (EIA)	50	2.2 μ F \pm 10%	4.5	3.2	2.50
GRM55RR71H105KA01	X7R (EIA)	50	1 μ F \pm 10%	5.7	5.0	1.80
GRM55RR71H155KA01	X7R (EIA)	50	1.5 μ F \pm 10%	5.7	5.0	1.80
GRP155F51H222ZA01	Y5V (EIA)	50	2200pF +80%, -20%	1.0	0.5	0.50
GRP155F51H472ZA01	Y5V (EIA)	50	4700pF +80%, -20%	1.0	0.5	0.50
GRP155F51H103ZA01	Y5V (EIA)	50	10000pF +80%, -20%	1.0	0.5	0.50
GRP155F51E223ZA01	Y5V (EIA)	25	22000pF +80%, -20%	1.0	0.5	0.50
GRP155F51C473ZA01	Y5V (EIA)	16	47000pF +80%, -20%	1.0	0.5	0.50
GRP155F51C104ZA01	Y5V (EIA)	16	10000pF +80%, -20%	1.0	0.5	0.50
GRP155F51A224ZD02	Y5V (EIA)	10	22000pF +80%, -20%	1.0	0.5	0.50
GRP155F51A474ZD02	Y5V (EIA)	10	0.47 μ F +80%, -20%	1.0	0.5	0.50
GRP155F50J105ZD02	Y5V (EIA)	6.3	1 μ F +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	0.47 μ F +80%, -20%	1.6	0.8	0.80
GRM188F51A474ZC01	Y5V (EIA)	10	0.47 μ F +80%, -20%	1.6	0.8	0.80
GRM188F51A105ZA01	Y5V (EIA)	10	1 μ F +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	0.47 μ F +80%, -20%	2.0	1.25	1.25
GRM219F51E105ZA01	Y5V (EIA)	25	1 μ F +80%, -20%	2.0	1.25	0.90
GRM21BF51E225ZA01	Y5V (EIA)	25	2.2 μ F +80%, -20%	2.0	1.25	1.25
GRM219F51C105ZA01	Y5V (EIA)	16	1 μ F +80%, -20%	2.0	1.25	0.90
GRM21BF51C225ZA01	Y5V (EIA)	16	2.2 μ F +80%, -20%	2.0	1.25	1.25
GRM219F51A105ZA01	Y5V (EIA)	10	1 μ F +80%, -20%	2.0	1.25	0.90
GRM21BF51A225ZA01	Y5V (EIA)	10	2.2 μ F +80%, -20%	2.0	1.25	1.25
GRM21BF51A475ZA01	Y5V (EIA)	10	4.7 μ F +80%, -20%	2.0	1.25	1.25
GRM21BF50J106ZE01	Y5V (EIA)	6.3	10 μ F +80%, -20%	2.0	1.25	1.25
GRM31MF51H474ZA01	Y5V (EIA)	50	0.47 μ F +80%, -20%	3.2	1.6	1.15
GRM31MF51E105ZA01	Y5V (EIA)	25	1 μ F +80%, -20%	3.2	1.6	1.15

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Part Number	TC Code	Rated Voltage (Vdc)	Capacitance*	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM31MF51E475ZA01	Y5V (EIA)	25	4.7 μ F +80%, -20%	3.2	1.6	1.15
GRM319F51C105ZA01	Y5V (EIA)	16	1 μ F +80%, -20%	3.2	1.6	0.90
GRM31MF51C225ZA01	Y5V (EIA)	16	2.2 μ F +80%, -20%	3.2	1.6	1.15
GRM31MF51C475ZA12	Y5V (EIA)	16	4.7 μ F +80%, -20%	3.2	1.6	1.15
GRM319F51A225ZA01	Y5V (EIA)	10	2.2 μ F +80%, -20%	3.2	1.6	0.90
GRM31MF51A475ZA01	Y5V (EIA)	10	4.7 μ F +80%, -20%	3.2	1.6	1.15
GRM31MF51A106ZA01	Y5V (EIA)	10	10 μ F +80%, -20%	3.2	1.6	1.15
GRM31MF50J106ZA01	Y5V (EIA)	6.3	10 μ F +80%, -20%	3.2	1.6	1.15
GRM32RF51H105ZA01	Y5V (EIA)	50	1 μ F +80%, -20%	3.2	2.5	1.80
GRM329F51E475ZA01	Y5V (EIA)	25	4.7 μ F +80%, -20%	3.2	2.5	0.90
GRM32NF51E106ZA01	Y5V (EIA)	25	10 μ F +80%, -20%	3.2	2.5	1.35
GRM32NF51C106ZA01	Y5V (EIA)	16	10 μ F +80%, -20%	3.2	2.5	1.35
GRM188E41H103MA01	Z5U (EIA)	50	10000pF \pm 20%	1.6	0.8	0.80
GRM188E41H223MA01	Z5U (EIA)	50	22000pF \pm 20%	1.6	0.8	0.80
GRM216E41H473MA01	Z5U (EIA)	50	47000pF \pm 20%	2.0	1.25	0.60
GRM219E41H104MA01	Z5U (EIA)	50	10000pF \pm 20%	2.0	1.25	0.90
GRM319E41H224MA01	Z5U (EIA)	50	22000pF \pm 20%	3.2	1.6	0.90

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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

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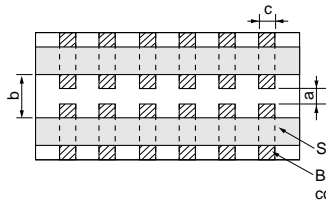
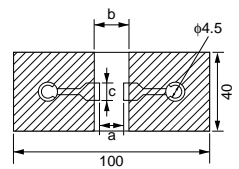
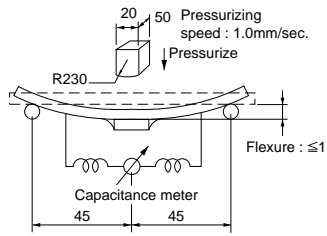
■ Specifications and Test Methods

No.	Item	Specification		Test Method																								
		Temperature Compensating Type	High Dielectric Type																									
1	Operating Temperature	-55 to +125°C	R6 : -55 to +85°C R7 : -55 to +125°C E4 : +10 to +85°C F5 : -30 to +85°C																									
2	Rated Voltage	See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P} , whichever is larger, shall be maintained within the rated voltage range.																								
3	Appearance	No defects or abnormalities.		Visual inspection.																								
4	Dimensions	Within the specified dimensions.		Using calipers on micrometer.																								
5	Dielectric Strength	No defects or abnormalities.		No failure shall be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V																								
6	Insulation Resistance	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging.																								
7	Capacitance	Within the specified tolerance.		The capacitance/Q/D.F. shall be measured at 25°C at the frequency and voltage shown in the table.																								
8	Q/ Dissipation Factor (D.F.)	30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≥3.3μF)	<table border="1"> <thead> <tr> <th>Item</th> <th>Char.</th> <th>Frequency</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>ΔC to 7U, 1X (1000pF and below)</td> <td></td> <td>1±0.1MHz</td> <td>0.5 to 5Vrms</td> </tr> <tr> <td>ΔC to 7U, 1X (more than 1000pF)</td> <td></td> <td>1±0.1kHz</td> <td>1±0.2Vrms</td> </tr> <tr> <td>R6, R7, F5 (10μF and below)</td> <td></td> <td>1±0.1kHz</td> <td>1±0.2Vrms</td> </tr> <tr> <td>R6, R7, F5 (more than 10μF)</td> <td></td> <td>120±24Hz</td> <td>0.5±0.1Vrms</td> </tr> <tr> <td>E4</td> <td></td> <td>1±0.1kHz</td> <td>0.5±0.05Vrms</td> </tr> </tbody> </table>	Item	Char.	Frequency	Voltage	ΔC to 7U, 1X (1000pF and below)		1±0.1MHz	0.5 to 5Vrms	ΔC to 7U, 1X (more than 1000pF)		1±0.1kHz	1±0.2Vrms	R6, R7, F5 (10μF and below)		1±0.1kHz	1±0.2Vrms	R6, R7, F5 (more than 10μF)		120±24Hz	0.5±0.1Vrms	E4		1±0.1kHz	0.5±0.05Vrms
			Item		Char.	Frequency	Voltage																					
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R6, R7, F5 (10μF and below)		1±0.1kHz	1±0.2Vrms																									
R6, R7, F5 (more than 10μF)		120±24Hz	0.5±0.1Vrms																									
E4		1±0.1kHz	0.5±0.05Vrms																									
[E4] W.V. : 25Vmin. : 0.025max.	[F5] W.V. : 25Vmin. : 0.05max.(C<10μF) : 0.09max.(C≥1.0μF) W.V. : 16V : 0.07max.(C<1.0μF) : 0.09max.(C≥1.0μF) W.V. : 10Vmax. : 0.125max.																											
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance. (Table A)	<p>R6 : Within±15% (-55 to +85°C) R7 : Within±15% (-55 to +125°C) E4 : Within +22/-56% (+10 to +85°C) F5 : Within +22/-82% (-30 to +85°C)</p> <p>The capacitance change shall be measured after 5 Min. at each specified temperature stage. (1) Temperature Compensating Type The temperature coefficient is determined using the Capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 (C0Δ : +25°C to +125°C : other temp. coeffs. : +25°C to +85°C) the capacitance shall be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1,3 and 5 by the cap value in step 3.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25±2</td> </tr> <tr> <td>2</td> <td>-55±3 (for ΔC to 7U/1X/R6/R7) -30±3 (for F5) 10±3 (for E4)</td> </tr> <tr> <td>3</td> <td>25±2</td> </tr> <tr> <td>4</td> <td>125±3 (for ΔC/R7) 85±3 (for other TC)</td> </tr> <tr> <td>5</td> <td>25±2</td> </tr> </tbody> </table> <p>(2) High Dielectric Constant Type The ranges of capacitance change compared with the above 25°C value over the temperature ranges shown in the table shall be within the specified ranges.</p>	Step	Temperature(°C)	1	25±2	2	-55±3 (for ΔC to 7U/1X/R6/R7) -30±3 (for F5) 10±3 (for E4)	3	25±2	4	125±3 (for ΔC/R7) 85±3 (for other TC)	5	25±2												
		Step	Temperature(°C)																									
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5	25±2																											
Temperature Coefficient	Within the specified tolerance. (Table A)	—																										
Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Not apply to 1X/25V	—																										

Continued on the following page.

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No.	Item	Specification		Test Method																																				
		Temperature Compensating Type	High Dielectric Type																																					
10	Adhesive Strength of Termination	No removal of the terminations or other defect shall occur.		<p>Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. *2N (GRP03) 5N (GRP15, GRM18)</p>  <table border="1" data-bbox="938 616 1452 840"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr><td>GRP03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr> <tr><td>GRP15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr> <tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr> <tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr> <tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr> <tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr> <tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr> <tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr> </tbody> </table> <p style="text-align: right;">(in mm)</p>	Type	a	b	c	GRP03	0.3	0.9	0.3	GRP15	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
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11	Appearance	No defects or abnormalities.		<p>Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).</p>																																				
	Capacitance	Within the specified tolerance.																																						
	Vibration Resistance	Q/D.F.	<p>30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)</p> <p>[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF)</p> <p>[E4] W.V. : 25Vmin. : 0.025max.</p> <p>[F5] W.V. : 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≥1.0μF)</p> <p>W.V. : 16V : 0.07max. (C<1.0μF) : 0.09max. (C≥1.0μF)</p> <p>W.V. : 10Vmax.:0.125max.</p>																																					
12	Deflection	No crack or marked defect shall occur.		<p>Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  <table border="1" data-bbox="367 1758 885 1993"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr><td>GRP03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr> <tr><td>GRP15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr> <tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr> <tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr> <tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr> <tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr> <tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr> <tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr> </tbody> </table> <p style="text-align: right;">(in mm)</p>	Type	a	b	c	GRP03	0.3	0.9	0.3	GRP15	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
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No.	Item	Specification		Test Method	
		Temperature Compensating Type	High Dielectric Type		
13	Solderability of Termination	75% of the terminations is to be soldered evenly and continuously.		Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C.	
14	Resistance to Soldering Heat	The measured and observed characteristics shall satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 ± ₁ 8°C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. *Preheating for GRM32/43/55	
		Appearance	No marking defects.		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)		R6, R7 : Within ±7.5% E4, F5 : Within ±20%
		Q/D.F.	30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)		[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≥1.0μF) W.V.:16V : 0.07max. (C<1.0μF) : 0.09max. (C≥1.0μF) W.V. : 10Vmax. : 0.125max.
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
Dielectric Strength	No failure				
15	Temperature Cycle	The measured and observed characteristics shall satisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure.	
		Appearance	No marking defects.		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)		R6, R7 : Within ±7.5% E4, F5 : Within ±20%
		Q/D.F.	30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF)		[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF) [E4] W.V. : 2.5Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≥1.0μF) W.V. : 16V : 0.07max. (C<1.0μF) : 0.09max. (C≥1.0μF) W.V. : 10Vmax. : 0.125max.
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)		
Dielectric Strength	No failure				

Step	Temperature	Time
1	100°C to 120°C	1 min.
2	170°C to 200°C	1 min.

Step	1	2	3	4
Temp.(°C)	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

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No.	Item	Specification		Test Method	
		Temperature Compensating Type	High Dielectric Type		
16	Humidity Steady State	The measured and observed characteristics shall satisfy the specifications in the following table.		Sit the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.	
		Appearance	No marking defects.		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)		R6, R7 : Within ±12.5% E4, F5 : Within ±30%
		Q/D.F.	30pF and over : Q≥350 10pF and over 30pF and below : Q≥275+5C/2 10pF and below : Q≥200+10C C : Nominal Capacitance (pF)		[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 10Vmax. : 0.15max.
		I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		
17	Humidity Load	The measured and observed characteristics shall satisfy the specifications in the following table.		Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F5/10Vmax. Apply the rated DC voltage for 1 hour at 40±2°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.	
		Appearance	No marking defects.		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)		R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% [W.V. : 10Vmax.] F5 : Within +30/-40%
		Q/D.F.	30pF and over : Q≥200 30pF and below : Q≥100+10C/3 C : Nominal Capacitance (pF)		[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 10Vmax. : 0.15max.
		I.R.	More than 500MΩ or 25Ω • F (Whichever is smaller)		
		Dielectric Strength	No failure		

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No.	Item	Specification		Test Method
		Temperature Compensating Type	High Dielectric Type	
18		The measured and observed characteristics shall satisfy the specifications in the following table.		Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. *150% for 500V and C≥10μF
	Appearance	No marking defects.		
	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% (Cap<1.0μF) F5 : Within +30/-40%(Cap≥1.0μF)	
	Q/D.F.	30pF and over : Q≥350 10pF and over : Q≥275+5C/2 30pF and below : Q≥200+10C C : Nominal Capacitance (pF)	[R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V : 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max [F5] W.V. : 25Vmin. : 0.075max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≥1.0μF) W.V. : 10Vmax. : 0.15max.	
	I.R.	More than 1,000MΩ or 50Ω•F(Whichever is smaller)		
	Dielectric Strength	No failure		
19	Notice	When mounting capacitor of 500V rated voltage, perform the epoxy resin coating(min.1.0mm thickness)		

Table A

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

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