FOR FLOW AND REFLOW SOLDERING CHIP MONOLITHIC CERAMIC CAPACITOR GRM SERIES

1.SCOPE

This product specification is applied to CHIP MONOLITHIC CERAMIC CAPACITOR used for General Electronic equipment.

2.MURATA PART NO. SYSTEM 2.1 NEW PART NO.

(EX.) GRM 102 K 188 B1 1H D 1 2 4 (5) 8 3 6 7

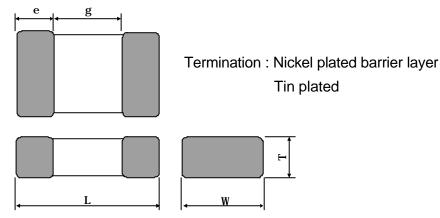
① Type : According to 3.1
 ② Dimensions : According to 3.1
 ③ Temperature Characteristics : According to 3.2
 ④ DC Rated Voltage : According to 3.3
 ⑤ Nominal Capacitance : According to 3.4
 ⑥ Capacitance Tolerance : According to 3.5

Murata's Control : Murata's Control Code

® Packaging Code : According to 3.6

3.TYPE

3.1 TYPE & DIMENSIONS



(Unit:mm)

·		1	•		(Unit:I	nm)	
TYF	PΕ	L	W	Т	е	g	
GRM03	3	0.6+/-0.03	0.3+/-0.03	0.3+/-0.03	0.1 to 0.2	0.2 min.	
GRM15	5	1.0+/-0.05	0.5+/-0.05	0.5+/-0.05	0.15 to 0.35	0.3 min.	
GRM18	3	1.6+/-0.1	0.8+/-0.1	0.8+/-0.1	0.2 to 0.5	0.5 min.	
	6			0.6+/-0.1			
GRM21	9 A	2.0+/-0.1	1.25+/-0.1	0.85+/-0.1	0.2 to 0.7	0.7 min.	
OTTIVIZ		2.017 0.1	1.201/ 0.1	1.0+0/-0.2	0.2 10 0.7	0.7 111111.	
	В			1.25+/-0.1			
	6			0.6+/-0.1			
	9	3.2+/-0.15	1.6+/-0.15	0.85+/-0.1			
GRM31	М			1.15+/-0.1	0.3 to 0.8	1.5 min.	
X		3.2+/-0.2	1.6+/-0.2	1.2+/-0.1			
	С			1.6+/-0.2			
	9			0.85			
				+0.15/-0.05			
	М		2.5+/-0.2	1.15+/-0.1			
GRM32	N	3.2+/-0.3		1.35+/-0.15	0.3 min.	1.0 min.	
GINIVISZ	С	3.2+/-0.3		1.6+/-0.2	0.5 11111.	1.0 111111.	
	R			1.8+/-0.2			
	D			2.0+/-0.2			
	Е			2.5+/-0.2			
	N			1.35+/-0.15			
	С			1.6+/-0.2			
GRM43	R	4.5+/-0.4	3.2+/-0.3	1.8+/-0.2	0.3 min.	2.0 min.	
	D	1		2.0+/-0.2			
	Е			2.5+/-0.2			
	М			1.15+/-0.1			
	N			1.35+/-0.15			
	С	1		1.6+/-0.2			
GRM55	R	5.7+/-0.4	5.0+/-0.4	1.8+/-0.2	0.3 min.	2.0 min.	
	D	1		2.0+/-0.2			
	E	1		2.5+/-0.2			
			l	2.07/-0.2			

^{1.}Thickness dimensions(T): According to appendix.

^{2.}GRM18 Series Bulk case packaging is L:1.6+/-0.07mm W/T:0.8+/-0.07mm.

^{3.}GRM21 Series B1 0J 335/475K is L:2.0+/-0.15mm W/T:1.25+/-0.15mm.

^{4.}GRM31 Series B3/R1 1E 225K/M, B1/R1 1C 105/155/225K/M, B1 1A 335K/M,

B1 0J 475K/M, R7 2A 474/684K/M is L:3.2+/-0.2mm, W:1.6+/-0.2 mm.

3.2 TEMPERATURE CHARACTERISTICS

(1)	Temi	perature	Compe	ensating	Tvpe
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Code	TEMPERATURE CHARACTERISTICS	Temp. Range	Temp. coeff.(ppm/°C)
2C	CH		0 +/-60
3C	CJ		0 +/-120
4C	CK	-55 to 125°C	0 +/-250
5C	C0G		0+/-30
6C	C0H		0+/-60
2P	PH	25 to 95°C	-150 +/-60
3P	PJ	-25 to 85°C	-150 +/-120
6P	P2H	-55 to 85°C	-150+/-60
2R	RH		-220 +/-60
3R	RJ	-25 to 85°C	-220 +/-120
4R	RK		-220+/-250
6R	R2H	-55 to 85°C	-220+/-60
2S	SH		-330 +/-60
3S	SJ	-25 to 85°C	-330 +/-120
4S	SK		-330+/-250
6S	S2H	-55 to 85°C	-330+/-60
2T	TH		-470 +/-60
3T	TJ	-25 to 85°C	-470 +/-120
4T	TK		-470+/-250
6T	T2H	-55 to 85°C	-470+/-60
3U	UJ	-25 to 85°C	-750 +/-120
4U	UK	-25 to 65°C	-750 +/-250
7U	U2J	-55 to 85°C	-750+/-120
1X	SL	20 to 85°C	+350 to -1000

(2) High Dielectric Constant Type

(2) High Dielec	tric Constant Type					
Code	TEMPERATURE CHARACTERISTICS	Temp. Range	Cap. Change(Within%)	Standard Temp.		
B1*	В	-25 to 85°C +/-10				
В3	Ь	-25 to 85°C	+/-10	20°C		
R1*	R	-55 to 125°C	+/-15	20 C		
F1*	F	-25 to 85°C	+30/-80			
R7	X7R	-55 to 125°C	+/-15			
R6	X5R	-55 to 85°C	+/-15			
C7	X7S	-55 to 125°C	+/-22	25°C		
C8	X6S	-55 to 105°C	+/-22			
F5	Y5V	-30 to 85°C	+22/-82			

^{*:} Add 50% of the rated voltage.

3.3 DC RATED VOLTAGE

Code	0J	1A	1C	1E	1H	2A
DC Rated voltage	6.3V	10V	16V	25V	50V	100V

3.4 NOMINAL CAPACITANCE

Nominal Capacitance shall be expressed by three digits. The first two digits represents significant figures. The last specifies the number of zero to follow. The letter R is used as the decimal point. According to appendix.

(EX.)

Code	Capacitance
R50	0.5pF
5R0	5.0pF
220	22pF
221	220pF

3.5 CAPACITANCE TOLERANCE

Code	Туре	Temperature Characteristics	Capaci	tance Tolerance	Capacitance Step
С	Ta a wat		<10pF	+/-0.25pF	0.5,1,2,3,4,5,7(pF)
D	Temperature	ΔC to ΔX	< 10pr	+/-0.5pF	5,6,7,8,9(pF)
R	Compensating	ΔΟ ΙΟ ΔΛ	≧10pF	+/-2.5%	10(pF)
J	Туре		≡IUPF	+/-5%	E24 Step
K	High	D4/D2/DC/D4/D7		+/-10%	E12 Step
М		B1/B3/R6/R1/R7		+/-20%	
Z		F1/F5		+80/-20%	E6 Step

^{*}E24 step is also available for GRM03/15/18 1 to 9.1pF.

E Step

	-																					
E24	1 1.1	1.2 1.3	1.5	1.6	1.8	2	2.2	2.4	2.7	3	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
E12	1	1.2	1.5		1.	8	2	.2	2.	7	3.3	3	3.	9	4.	.7		6	6.	8	8.	2
F6		1		1.	5			2.	2			3.	.3			4.	7			6.	8	

3.6 PACKAGING

Packaging is the following method. According to Packaging Methods

Packaging Code	Specification	Packaging Unit
В	Bulk Packaging in a bag	1000pcs/bag (Only GRM43S,GRM55E/F: 500pcs./bag)
D	φ178mm Paper Tape Carrier Packaging	
L	φ178mm Plastic Tape Carrier Packaging	
E	φ178mm Special Dimension Carrier Packaging	
J	φ330mm Paper Tape Carrier Packaging	According to Capacitance Value and Tolerance
K	φ330mm Plastic Tape Carrier Packaging	
F	φ330mm Special Dimension Carrier Packaging	
С	Bulk Case Packaging	

4.SPECIFICATIONS

Refer to P10 to P13 for Appendix 1 to 3. Refer to P14 to P16 for Appendix 4. Refer to P17 to P19 for Appendix 5. Refer to P20 to P21 for Appendix 6.

Appendix 1. CAPACITANCE VALUE AND TOLERANCE 50V max. < Temperature Compensating Type>

<u> </u>		1100	omper	Satirit							
	DC		Т		Tem	perature	Characte	eristics ar	nd Capacitance(p	F)	φ178
Туре	RATED VOLTAGE (V)	Code	Thickness (mm)	ΔC	ΔΡ	ΔR	ΔS	ΔΤ	ΔU	1X	Packag- ing Unit (pcs/Reel)
	50			-	-	-	-	-	1 to 15	-	
GRM03	25	3	0.3+/-0.03	0.5 to 100	-	1to 100	1to 100	1to 100	16 to 100	-	15000
GRM15	50	5	0.5+/-0.05	0.5 to 1000	3to 30	3to 33	3to 39	3to 100	3 to 200	0.5 to 200	10000
CITIVITO	25		0.017 0.00	180 to 270	-	-	-	-	-	220 to 390	10000
GRM18	50	8	0.8 +/-0.1	0.5to 2700	3to 160	3to 180	3to 220	3to 470	3 to 750 1000 to 10000	0.5 to 750 1000 to 10000	4000
Ortivito	25	Ü	0.0 17 0.1	560 to 1500	-	-	-	-	-	820 to 1500	4000
		6	0.6 +/-0.1	0.5 to 4700	3to 160	3to 180	3to 240	3to 130	3 to 1300 10000, 12000, 15000, 18000	0.5 to 1300 10000, 12000, 15000, 18000	4000
50 GRM21	50	9	0.85+/-0.1	1000, 5100 to 15000	180 to 360	200 to 470	270 to 470	150 to 390	1500 to 2200 22000 to 27000	1500 to 2200 22000 to 27000	4000
	Α	1.0+0/-0.2	-	-	-	-	-	33000	33000	3000	
		В	1.25+/-0.1	18000 to 22000	390 to 620	510 to 750	510 to 820	430 to 1800	2400 to 3300 39000 to 47000	2400 to 3300 39000 to 47000	3000
	25	9	0.85+/-0.1	-	-	-	-	-	-	3600 to 4700	4000
	20	В	1.25+/-0.1	-	-	-	-	-	-	5100 to 6800	3000
		6	0.6+/-0.1	0.5 to 750	3 to 330	3 to 390	3 to 510	3 to 390	3 to 1800	0.5 to 1800	
ODMO4	50	9	0.85+/-0.1	820 to 22000, 27000, 33000	360 to 910	430 to 820	560 to 1100	430 to 750	2000 to 6200 56000	2000 to 6200 56000	4000
GRM31		М	1.15+/-0.1	39000 to 47000	1000 to 1600	910 to 1600	1200 to 2000	820 to 4300	6800 to 8200 68000to100000	6800 to 8200 68000to100000	3000
		С	1.6+/-0.2	56000 to 82000	-	1	-	1	-	-	2000
	25	М	1.15+/-0.1	-	-	-	-	-	-	9100 to 16000	3000
		С	1.6+/-0.2	100000	-	-	-	-	-	-	2000
GRM32	50	N	1.35+/- 0.15	-	-	-	-	-	-	9100 to 12000	2000
GRM43	50	R	1.8+/-0.2	-	-	-	-	-	-	13000 to 16000	1000
		М	1.15+/-0.1	-	-	-	-	-	-	18000	
GRM55	50	N	1.35+/- 0.15	-	-	-	-	-	-	20000 to 22000	1000
-		R	1.8+/-0.2	- 70cC\	/F 0 to 0	- 155\	- (Mara 41	- 10-5	- \ (10~F)	24000 to 39000	
Capacit	ance Tolera	nce		7.0pF) .25pF	(5.0 to 9. D:+/-0.5		(More tr J:+/-5%	nan 10pF) (10pF) R:+/-2.5%		

^{1.}Inner electrode: Nickel ,Palladium or Silver/Palladium

Appendix 2-1. CAPACITANCE VALUE AND TOLERANCE 50V max. <High Dielectric Constant Type>

	DC		Т		Temperat	ure Characteristics a	nd Capacit	ance(pF)		φ178
Туре	RATED VOLTAGE (V)	Code	Thickness (mm)	B1	B3/R6	R1/R7	R7	F1/F5	F5	Packag- ing Unit (pcs/Reel)
	25			100 to 1500	-	100 to 1500	-	-	-	(1 7
GRM03	16	3	0.3+/-0.03	100 to 1000	1800to3300	100 to 1000, 1800 to 3300	-	-	-	15000
-	10 6.3			1200 to 10000 1200 to 10000	-	1200 to 10000 1200 to 10000	-	1500 to 10000	-	
	50			220 to 4700	-	220 to 4700	-	1000 to 15000	-	
GRM15	25	5	0.5+/-0.05	5600 to 22000	27000 to 47000	5600 to 47000	-	22000 to 100000	-	10000
Or aviro	16	Ŭ	0.017 0.00	27000 to 47000	56000 to 100000	15000 to 100000	-	33000 to 100000	-	10000
	10			56000 to 100000	-	27000 to 47000	-	150000 to 470000	-	
	50			220 to 47000	56000 to 100000	220 to 100000	-	1000 to 220000	-	
	25			8200 to 150000	180000 to 220000	8200 to 220000	-	15000 to 100000 220000 to 470000	-	
GRM18	16	8	0.8 +/-0.1	12000 to 330000	390000 to 470000	12000 to 470000	-	33000 to 1000000	-	4000
	10			120000 to 220000, 330000 to 1000000	470000, 1000000	120000 to 220000	-	470000 to 1000000	-	
<u> </u>	6.3	6	0.6+/-0.1	330000 to 1000000 220 to 22000	-	- 220 to 22000	-	- 1000 to 68000	-	
	50	9	0.85+/-0.1	27000 to 39000	330000	27000 to 39000	330000	1000 to 68000	470000 to 1000000	4000
	30	В	1.25+/-0.1	47000 to 100000	470000	47000 to 100000	150000to	220000	-	3000
F		6	0.6+/-0.1	10000 to 33000	-	10000 to 33000	220000	33000 to 150000	-	
		9	0.85+/-0.1	39000 to 68000 220000 to 270000	470000, 680000 to	39000 to 68000 220000 to 270000	-	220000,1000000	-	4000
	25	В	1.25+/-0.1	82000 to 180000 330000 to 470000	1000000 560000, 1500000	4700000 82000 to 180000 330000 to 820000	-	330000 to 470000 1500000,4700000	-	3000
			1.25+/-0.15	-	1000000	1000000	-	-	-	0000
GRM21		6	0.6+/-0.1	15000 to 56000	-	15000 to 56000	-	100000,220000	-	
	16	9	0.85+/-0.1	68000 to 100000 220000 to 270000 470000 to 680000	-	68000 to 100000 220000 to 270000 470000 to 680000	-	150000,330000 470000,1000000	-	4000
	. •	В	1.25+/-0.1	120000 to 180000 330000 to 390000 820000 to1000000	-	120000 to 180000 330000 to 390000 820000 to1000000	-	470000 to 680000 150000 to 2200000	-	3000
ļ		6	0.6+/-0.1	220000 to 390000	-	220000 to 390000	-	330000 to 680000	-	4000
	10	9	0.85+/-0.1	1000000	-	-	-	1000000,3300000	-	4000
		В	1.25+/-0.1	680000 to 820000 1000000,2200000	-	680000 to1000000	-	1500000to 2200000 4700000	-	3000
	6.3	В	1.25+/-0.1	2200000 3300000,4700000	-	-	-	-	-	3000
		6	0.6+/-0.13	220 to 15000	-	220 to 15000	-	1000 to 47000	-	4000
Ī	·	9	0.85+/-0.1	220 to 100000	-	220 to 100000	270000 to 330000	68000 to 330000	-	
	50	М	1.15+/-0.1	120000 to 220000	1000000	120000 to 220000	390000 to	470000	-	3000
ļ		С	1.6+/-0.2	-	1500000,	-	470000	-	-	2000
		6	0.6+/-0.1	18000 to 33000	2200000	18000 to 33000	_	68000 to 150000	_	
		9	0.85+/-0.1	39000 to 150000 270000 to 680000	-	39000 to 150000	-	220000 to 470000	-	4000
	25		1.15+/-0.1	180000 to 220000	_	270000 to 680000 180000 to 220000	_	680000 to 4700000	_	
	20	М	1.15+/-0.15	820000to1000000	2200000	820000 to1000000 2200000		-		3000
		С	1.6+/-0.15	-	3300000,	2200000	-	- 6800000to10000000	-	2000
					4700000	47000 to 56000		220000		2000
GRM31		6	0.6+/-0.1	47000 to 56000 68000 to 220000	-	47000 to 56000 68000 to 220000	-	ZZUUUU	-	
		9	0.85+/-0.1	330000, 470000 to 560000 1000000	-	330000, 470000 to 560000 1000000	-	330000 to 470000 1000000	-	4000
	16	М	1.15+/-0.1	270000 680000 to 820000	-	270000 680000 to 820000	-	680000 to 4700000	-	3000
			1.15+/-0.15	1500000, 2200000	3300000,	1500000, 2200000	-	-	-	
-		С	1.6+/-0.2	4700000 820000 to 1000000	4700000	3300000, 4700000		- 2200000	-	4000
	10	9	0.85+/-0.1	820000 to 1000000 2200000, 3300000	-	820000 to 1000000	-	2200000 to 3300000 4700000 to	-	4000
	10	M	1.15+/-0.1	-	-	2200000	-	10000000	-	3000
		C M	1.6 +/-0.2 1.15+/-0.1	4700000, 10000000 4700000	-	10000000	-	1000000	-	2000 3000
i	6.3	С	1.6 +/-0.2	4700000, 10000000	-		-	-	-	2000
	Capacitance			or Silvor/Palladium	K:+/-10%, N	1 +/-20%		Z:+80/-209	%	

1.Inner electrode : Nickel , Palladium , or Silver/Palladium

Appendix 2-2. CAPACITANCE VALUE AND TOLERANCE 50V max.

<High Dielectric Constant Type>

			ı	16	emperature	Characteristics and	Capacitance	e (pr)	1	ф178	
Type	RATED		Thickness	B1	DO/DC	D4/D7	DZ		F5	Packag-	
,,	VOLTAGE	Code	(mm)	ВТ	B3/R6	R1/R7	R7	F1/F5	l Lo	ing Unit (pcs/Reel)	
	(V)	М	1.15+/-0.1	390000 to470000	_	390000 to470000				3000	
		IVI	1.15+/-0.1		-		-	-	-	3000	
	50	N	1.35+/-0.15	180000 to220000 560000 to680000	-	180000 to220000 560000 to680000	-	680000	-	2000	
	50	R	1.8 +/-0.2	820000 to 1000000	•	820000 to 1000000	ı	1000000	-	1000	
		D	2.0+/-0.2	-	3300000	-	ı	-	10000000	1000	
		Е	2.5+/-0.2	-	4700000	-	-	-	-	1000	
		9	0.85+/-0.1	-	-	-	-	4700000	-	4000	
	25	Ν	1.35+/-0.15	-	-	-	1500000	10000000	-	2000	
GRM32	25	R	1.8 +/-0.2	2200000	-	-	2200000	-	-	1000	
OINIOZ		D	2.0+/-0.2	3300000,4700000	-	3300000,4700000		-	-	1000	
		М	1.15+/-0.1	2200000	-	2200000	-	-	-	3000	
	16	N	1.35+/-0.15	3300000	-	3300000	-	10000000	-	2000	
		R	1.8 +/-0.2	4700000	-	4700000	-	-	-	1000	
		D	2.0+/-0.2	10000000	10000000	10000000	-	-	-	1000	
		9	0.85+/-0.1	-	-	-	-	10000000	-	4000	
	10	D	2.0+/-0.2	-	-	-	10000000	-	-	1000	
	10	Е	2.5 +/-0.2	10000000	-	-	-	-	-	1000	
								1000000			
		R	1.8 +/-0.2	270000 to 680000	-	270000 to 680000	-	to	-	1000	
GRM43	50		0.0 / 0.0			450000		2200000		500	
O		D	2.0 +/-0.2	-	-	1500000	-	-	-	500	
		Е	2.5 +/-0.2	-	-	2200000	-	-	-	500	
	25	Е	2.5 +/-0.2	-	-	4700000	-	-	-	500	
		_						3300000			
		R	1.8 +/-0.2	560000 to 1500000	-	560000 to 1500000	-	to	-	1000	
GRM55	50		0.0.7.0.0		40000000	000000		4700000		4000	
330		D	2.0+/-0.2	-	10000000	3300000	-	-	-	1000	
		E	2.5+/-0.2	-	-	4700000	-	-	-	500	
	25	_D_	2.0+/-0.2	10000000	-	10000000	-		-	1000	
	apacitance			adium or Cilvar/F	K:+/-10%,	M:+/-20%		Z:+80)/-20%		

^{1.}Inner electrode: Nickel, Palladium, or Silver/Palladium

Appendix 3. CAPACITANCE VALUE AND TOLERANCE(100V)

	DC					tics and Capacitanc		φ178
Туре	RATED VOLTAGE		Т	Tempe Compens	erature ating Type		ielectric nt Type	Packag- ing Unit
	(V)	Code	Thickness (mm)	ΔC	1X	R7	F5	(pcs/Reel)
GRM15	100	5	0.5+/-0.05	-	-	220 to 4700	-	10000
GRM18	100	8	0.8+/-0.1	0.5 to 1000	0.5 to 430	220 to 3300, 100000	1500 to 4700	4000
		6	0.6+/-0.1	100 to 560	-	-	-	
GRM21	100	9	0.85+/-0.1	0.5 to 91, 620 to 1500	0.5 to 750	220 to 6800	680 to 6800	4000
		В	1.25+/-0.1	-	820 to 2000	8200 to 47000	10000 to 22000	3000
		9	0.85+/-0.1	0.5 to 5600	0.5 to 1800	220 to 15000, 100000	1000 to 22000	4000
GRM31	100	М	1.15+/-0.1	-	2000 to 4700	18000 to 82000 150000, 220000	33000 to 47000	3000
			1.15+/-0.15	-	-	470000, 680000	-	
		С	1.6+/-0.2	-	-	1000000	-	2000
		М	1.15+/-0.1	-	-	47000	68000	3000
		N	1.35+/-0.15	-	5100 to 6800	56000 to 100000	68000 to 100000	2000
GRM32	100	C	1.6+/-0.2	-	-	680000,1000000	-	2000
		D	2.0+/-0.2	-	-	1500000	-	1000
		E	2.5+/-0.2	-	-	1000000,2200000	-	1000
		N	1.35+/-0.15		7500 to 8200	-	-	
001440	400	R	1.8+/-0.2	6200 to 12000	9100 to 16000	120000 to 220000	150000 to 330000	1000
GRM43	100	D	1.6+/-0.2	-	-	390000 to 470000 1500000	-	
		Е	2.5+/-0.2	-	-	2200000	-	500
		M	1.15+/-0.1	-	18000	-	-	
		N	1.35+/-0.15	13000 to 16000	20000 to 22000	270000	-	
001455	400	R	1.8+/-0.2	18000 to 30000	24000 to 39000	330000 to 560000	470000 to 680000	1000
GRM55	100	D	1.6+/-0.2	-	-	820000 to 1000000 3300000	-	
		Е	2.5+/-0.2	-	-	4700000	-	500
C	Capacitance	•			C:+/-0.25pF D:+/-0.5pF) J:+/-5%	K:+/-10% M:+/-20%	Z:+80/-20%	

^{1.}Inner electrode : Nickel , Palladium , or Silver/Palladium

JEMCG0-4240B

FUKUI MURATA MFG. CO., LTD.

Appendix 4. CAPACITANCE VALUE

RATED /OLTAGE (V) 6.3 10 6.3 16 25 16 10 6.3 4 25	5 5 8	Thickness (mm) 0.3+/-0.03 0.5+/-0.05 0.5+0/-0.1	B1 0.015 to 0.033 - 0.15to 0.33 -	B3/R6 0.047 to 0.10 0.15to 1.0 0.47, 1.0 1.0	R7 -	R1/R7	C8 -	C7	F1/F5	Packag- ing Unit (pcs/Reel)
6.3 10 6.3 16 25 16 10 6.3 4	5	0.5+/-0.05	0.033 - 0.15to 0.33	0.10 0.15to 1.0 0.47, 1.0	-	-	-	-	_	
6.3 16 25 16 10 6.3 4	5	0.5+0/-0.1	-	0.47, 1.0	-			1	_	15000
16 25 16 10 6.3 4	5	0.5+0/-0.1	-			-	-	-	0.22to 1.0	10000
25 16 10 6.3 4			-	1 0	-	-	-	-	1.0	
16 10 6.3 4	8	0.8+/-0.1	-		-	-	-	-	-	
10 6.3 4	8	0.8+/-0.1		0.47, 1.0	-	-	-	-	-	
6.3 4	8	0.8+/-0.1	-	0.47 1.0, 2.2	-	-	-	1.0	-	4000
4			-	2.2	-	-	-	1.0	2.2, 4.7	
			2.2	2.2, 4.7	-	-	-	2.2	2.2, 4.7	
25			-	-	-	-	4.7	2.2	-	
25	6	0.6+/-0.1	-	1.0	-	-	-	-	-	4000
	В	1.25+/-0.15	-	2.2, 3.3, 4.7	2.2	-	-	-	-	3000
	6	0.6+/-0.1	-	1.0	-	-	-	-	-	4000
16	9	0.85+/-0.1	-	2.2	-	-	-	-	-	4000
16	В	1.25+/-0.1	-	2.2, 3.3,	-	-	-	-	-	3000
	6	0.6+/-0.1	1.0	4.7 2.2	_	_	_	_	-	
	9	0.6+/-0.1	2.2	3.3, 4.7	-	-	-	-	-	4000
10		1.25+/-0.1		10	-	_	-		_	0000
	В	1.25+/-0.15	-	3.3, 4.7	-	-	-	3.3,4.7	-	3000
	9	0.85+/-0.1	4.7	4.7, 10	-	-	-	-	-	4000
6.3	В	1.25+/-0.1	10	10	-	-	-	-	10	3000
		1.25+/-0.15	-	22	-	-	-	-	-	0000
0.5	6	0.6+/-0.1	-	2.2	-	-	-	-	-	4000
25	9 C	0.85+/-0.1 1.6+/-0.2	-	4.7 10	-	-	-	-	-	
	6	0.6+/-0.2	-	2.2	-	-	-	-	-	2000
16	9	0.85+/-0.1	-	4.7	-	_	_	_	-	4000
	6	0.6+/-0.1	-	3.3, 4.7	-	-	-	-	_	4000
10	9	0.85+/-0.1	4.7	10	-	-	-	-	-	4000
	M	1.15+/-0.1	-	10	-	-	-	-	-	3000
	С	1.6+/-0.2	-	-	-	-	-	-	22	2000
	9	0.85+/-0.1	10	10	-	-	-	-	-	4000
6.3	М	1.15+/-0.1	-	10	-	-	-	-	-	3000
	С	1.6+/-0.2	-	15, 22, 47	-	-	-	-	22	2000
25	Е	2.5+/-0.2	-	22	-	-	-	-	-	1000
16	C	1.6+/-0.2	-	-	-	-	-	-	22	2000
			-		-	-	-	-	-	1000
10				1					- 22	2000 2000
10					-		-	-	-	1000
	D	2.0+/-0.2	22	33	-	-	-	-	-	1000
6.3	E	2.5+/-0.2	-	47, 100	-	-	-	-	100	1000
4			-	-	-	-	100	-	-	1000
				-	-	-	-	-	-	500
	D	2.0+/-0.2	-	33	-		-	-	-	1000
10	Е	2.5+/-0.2	22	47	-	22	-	-	-	500
0.5				-	-	-	-	-	-	1000
6.3					-		-	-	-	500
6.0				100	-	-	-			500 300
RM55 6.3 F 3.2+/-0.2 Capacitance Tolerance				Not apply to	GRM2 GRM3 GRM3 GRM3 GRM3	21BB3/R60 31CB3/R60 32DB3/R60 32EB3/R60 32EB3/R60 32EC80G1(G226M J476M J336M J476M J107M)7M		Z: +80/-20%	300
	16 10 6.3 6.3	10 E N 10 C E 6.3 E 4 E 16 E 10 D E 0.3 E S 6.3 F	10 E 2.5+/-0.2 N 1.35+/-0.15 C 1.6+/-0.2 E 2.5+/-0.2 6.3 E 2.5+/-0.2 4 E 2.5+/-0.2 10 D 2.0+/-0.2 10 D 2.0+/-0.2 E 2.5+/-0.2 D 2.0+/-0.2 E 2.5+/-0.2 S 2.8+/-0.2 6.3 F 3.2+/-0.2	10	To E 2.5+/-0.2 - 22, 47	The color of the	To E 2.5+/-0.2 - 22, 47 - - -	To E 2.5+/-0.2 - 22, 47 - - - -	To E 2.5+/-0.2 - 22, 47 - - - - -	To E 2.5+/-0.2 - 22, 47 - - - - - - - - -

Appendix 5. CAPACITANCE VALUE

No	MURATA New P/N	SIZE(mm)		T(mm)		DC RATED VOLTAGE	CAP.		CAP.TOL.	
		L	W	,		(V)				
1	GRM 31M F5 1C 106 Z A12 L	3.2	1.6	1.15+/-0.1	F5	16	10	μF	+80/-20%	

No	MURATA New P/N	CUSTOMER P/N	φ178 PACKAGING Q'TY (pcs/Reel)
1	GRM 31M F5 1C 106 Z A12 L		3000

^{1.} Inner electrode : Nickel, Palladium, or Silver/Palladium.

Appendix 6. CAPACITANCE VALUE

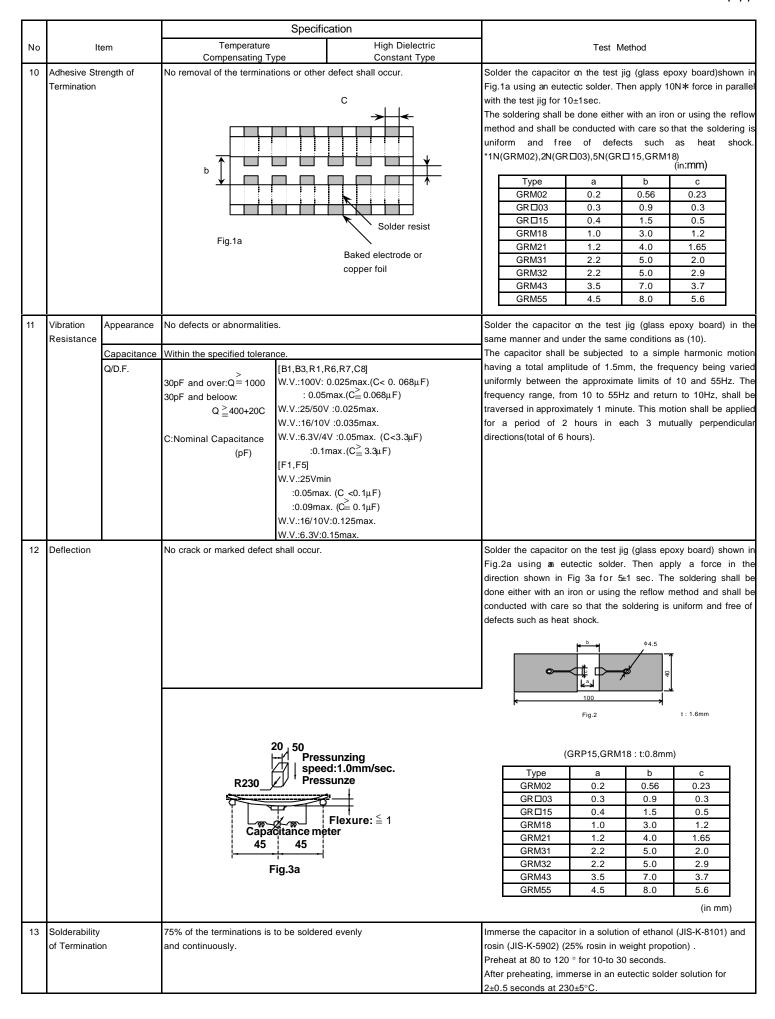
No	MURATA New P/N	SIZE(mm)		T(mm)		DC RATED VOLTAGE			CAP.TOL.
		L	W	(,		(V)	-		
1	GRM 188 R6 0J 106 M E47 D	1.6	0.8	0.8+/-0.1	R6	6.3	10	μF	+/-20%

No	MURATA New P/N	CUSTOMER P/N	φ178 PACKAGING Q'TY (pcs/Reel)
1	GRM 188 R6 0J 106 M E47 D		4000

1. Inner electrode: Nickel, Palladium, or Silver/Palladium.

■ SPECIFICATIONS AND TEST METHODS

	Item	1	Temperature Compensating T		ation High Dielectric	\dashv			Test Met	hod	
1 C		1	·		High Dielectric	- [Test Met	hod	
	Inerating Tempe		· · · · ·	ype	Constant Type						
	Range	erature	ΔC,1X:– 55°C to 125°C Other :–25°C to 85°C		B1,B3,F1:-25°C to 85°C R1,R7:-55°C to 125°C R6:-55°C to 85°C C8:-55°C to 105°C F5:-30°C to 85°C		tandard To		ature : 20 °C 5 °C)		
2 R	Rated Voltage		See the previous pages.			m W V	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 rate voltage range.				
3 A	Appearance		No defects or abnormalitie	defects or abnormalities.			isual inspe				
_	Dimension		Within the specified dimen			U	sing calip	ers.	ased on Microsco	ope)	
5 D	Dielectric Streng	th	No defects or abnormalitie	2 S.		No failure shall be observed when 300% of the (temperature compensating type) or 250% of the (high dielectric constant type) is applied terminations for 1 to 5 seconds, provided the ch current is less than 50mA.			f the rated volta ed between t		
6 Ir	nsulation Resist	ance	$C \stackrel{>}{=} 0.047 \mu F$:More than 10 $C > 0.047 \mu F$:500 $\Omega \cdot F$						sistance shall be e rated voltage a n 2 minutes current is less th	at 20°C /2 of chargir	5°C and 75%F
	Capacitance		Within the specified tolerar			_	•		D.F. shall be mea		
8 C	Q/Dissipation Fac	ctor (D.F.)	100=F==d===0 >4000	[B1,B3,R1,F	a	t the frequ	iency a	and voltage show	n in the tal	ole.	
	30pF and below: Q ≧ 400 C:NominalCapaci		•	: 0.05	0.025 max.(C< 0.068μ F) max.($C = 0.068\mu$ F) 1/2:0.025max.		Item	Char.	Δ C to 3U,1X (1000pF and below)	(more the	to 3U,1X nan 1000pF) R6,R7,F1,F5
					':0.035max.		Freque	ncv	1±0.1MHz		0.1kHz
			C:NominalCapacitance (pF)	:0.1r	V :0.05max.(C<3.3μF) nax.(C≧ 3.3μF)		Voltad		0.5 to 5Vrms).2Vrms
				[F1,F5] W.V.:25Vmii :0.05max :0.09max W.V.:16/10V W.V.:6.3V:0				change shall be			
Т	remperature Characteristics			R1,R7 : With (- R6 : With (- C8 : With (- F1 : Withi	-25°C to +85°C) hn ±15% -55°C to +125°C) n ±15% -55°C to +85°C) nn ±22% -55°C to +105°C) in +30/-80% -25°C to +85°C)	T W 5 ca te T b	he temper neasured in then cycling (+20°C to apacitance emperature he capacit etween the	ature C rature on step in step ing the on +125° e shall e coeff tance of e maxi	age. Compensating Tyles coefficient is determined as as a reference temperature sequence in the sequence of th	ermind usir uentially fr effs.:+20°C ecified tole itance char d by dividir um measu	om step 1 through to +85°C) the rance for the age as Table A-1 ag the difference
				F5 :Within	n +22/-82%		Step		Tompore	turo/0C\	
				,	-30°C to +85°C)	4	1 3tep		Tempera 20		
		50% of the rated		B1: Within + R1: Within +			2	-55±3	(for ÄC)/-25±3(fo		
		voltage		F1: Within +			3		20		
							4		125±3(for ÄC)/85		er TC)
		Capacitance	Within±0.2% or±0.05pF			T va w	(2) High Dielectric Constant Type The ranges of capacitance change compared wit value over the temperature ranges shown in the tal within the specified ranges.*				
		Drift	(Whichever is larger.) *Not apply to 1X/25V			m	neasured a	after 1	ig voltage, the ca more min. with a ach temp. stage.	pplying vol	
							Step		Temperature(°C	C)	Applying voltage(V)
				<u> </u>		4	1	EF . 1	20±2/25±2	201/	
				type	surement for high dielectric constar		2	-25±	3(for R1,R7,R6,0 :3(for B1,B3,F1)/ :3(for F5)		No bias
			one hour an temperature	d then set for 48±4 hours at room		3	105±	20±2/25±2 3(for R1,R7)/ 3(for C8) 3(for B1,B3,R6,,F	-1,F5)	140 DIGS	
1						╠	5 6	-55±3	20±2 3(for R1)/		50% of
								-25+	:3(for B1,F1)		
						۱ŀ	7		20±2		the rated voltage



											P12					
No		Item	Temperature	Specifi	High Diele		1	7	Test Metho	od						
	D i - t -		Compensating Ty		Constant	Туре	Doobootika		0.1- 45000	Man A malaceta						
14	Resista Solderin		The measured and observed the specifications in the follo		stics shall satisfy		Immerse th	e capacitor at 12 ne capacitor in a C for 10±0.5 se	n eutectic :	solder Solution	perature for					
		Appearance	No defects or abnormalities.					s (temperature	-		48±4 hours					
Ī		Capacitance	Within ±2.5% or± 0.25pF	B1,B3,R1	R6,R7,C8:Within ±7.5	%	, •	ctric constant typ Soldering metho								
		Change	(Whichever is larger)		:Within ±20%			er type: SnAgCu								
			30pF and over:Q <u>≥</u> 1000		,R6,R7,C8] : 0.025max.(C< 0. 068	Bu F)	Initial measurement for high dielectric constant type									
		Q/D.F.	30pF and beloow:		$5 \text{max.} (C = 0.068 \mu \text{F})$	γ.)		surement for nig heat treatment a			our and then					
			Q ₌ 400+20C		OV :0.025max.		set at room	temperature for	r 48±4 hou							
					0V :0.035max. /4V:0.05max. (C<3.3µI	F)	Perform the	e initial measure	ment.							
			C:Nominal Capacitance (pF)	:0.	Imax.(C= 3.3μF)	,	*Preheati	ng for GRM32/43	3/55							
			(ρι)	[F1,F5] W.V.:25Vr	nin		Step	Temp	erature		me					
				_	ax. (C<0.1μF)		1 2		to 120°C to 200°C	1 m						
					ax. (C≥ 0.1μF)					•	-					
				W.V.:16/10	0V:0.125max. :0.15max.											
		I.R.	More than 10,000MΩ or 500	Ω·F			1									
İ		Dielectric	(Whichever is smaller) No defects.				┪									
		Strength	-				 		,,	• 4						
15	Temper	ature Cycle	The measured and observed the specifications in the follo		stics shall satisfy		manner an	acitor to the sup	e condition	ns as (10).						
		Appearance	No defects or abnormalities.					e five cycles according shown in the foll	-							
		Capacitance	Within ±2.5% or± 0.25pF		R6,R7,C8 :Within ±7.5	5%	treatments shown in the following table. Set for 24±2 hours (temperature compensating type) or 44 hours (high dielectric constant type) at room									
		Change	(Whichever is larger)		:Within ±20%			dielectric consta e, then measure		t room						
			>		,R6,R7,C8]) 厂 \	Step	1	2	3	4					
			30pF and over:Q = 1000	W.V.:100V: 0.025max.(C< 0.068μF) : 0.05max.(C $\stackrel{>}{=}$ 0.068μF) W.V.:25/50V:0.025max.		μ Γ)	Temp.	Min.	Room	Max.	Room					
		Q/D.F.	30pF and beloow: Q≧ 400+20C				()	Operating	Temp.	Operating	Temp.					
			<u> </u>		W.V.:16/10V :0.035max. W.V.:6.3V/4V :0.05max.(C<3.3μF)		Time	Temp.+0/-3	240.2	Temp.+3/-0	2 4 5 2					
			C:Nominal Capacitance		$I \max (C = 3.3 \mu F)$,	(min)	30±3	2 to 3	30±3	2 to 3					
			(pF)	[F1,F5]												
				W.V.:25Vr :0.05m	nın ax. (C<0.1μF)											
				:0.09m	ax. (C=⊂ 0.1μF)		Initial mea	asurement for hig	gh dielectr	ic constant type						
				W.V.:16/1 W.V.:6.3V	0V:0.125max.			heat treatment a			our and then					
					io. romax.			i temperature foi e initial measure		Irs.						
		I.R.	More than 10,000M Ω or 500	Ω·F												
]	Dielectric	(Whichever is smaller) No defects.				┪									
		Strength					1									
16	Humidity (Steady	•	The measured and observed the specifications in the follo		stics shall satisfy		Set the cap for 500±12	acitor at 40±2°C hours.	and in 90	to 95% humidu	ity					
		Appearanc	No defects or abnormalities.				Remove ar	nd set for 24±2 h	, ,	•						
		e Capacitan	Within ±5% or± 0.5pF	B1.B3.R1	R6,R7,C8:Within ±12.	5%		e) or 48±4 hou erature, then me		alelectric consta	ant type) at					
		се	(Whichever is larger)		Within ±30%	- · -	1									
		Change	30pF and over:Q <u>≥</u> 350	[D1 D2 D4	D6 D7 Col		4									
			10pF and over:Q= 350		,R6,R7,C8] : 0.05max.(C < 0.068	uF)										
		0/5 =	30pF and below:	: 0.07	$75 \text{max.} (C = 0.068 \mu F)$											
		Q/D.F.	$Q_{=}^{>}$ 275+2.5C 10pF and below:		0V :0.05max. 0V :0.05max.											
			Q= 200+10C	W.V.:6.3V	/4V:0.075max.(C<3.3μ	F)										
			C:Nominal Canasitarias	:0.1	25max.(C ₌ 3.3μF)											
			C:Nominal Capacitance (pF)	[F1,F5]												
			,	W.V.:25Vn												
					ax. (C<0.1μF) nax. (C ≧ 0.1μF)											
				W.V.:16/10)V:0.15max.											
		I.R.	More than 1,000M Ω or 50 Ω	W.V.:6.3V	0.2max.		4									
		1.15.	(Whichever is smaller)	• F												
			, ,													
<u></u>							J									

					P13
				Specification	
No	Item		Temperature Compensating Type	High Dielectric Constant Type	Test Method
17	Humidity Load		The measured and observed the specifications in the follow	· · · · · · · · · · · · · · · · · · ·	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
	Арр	earance	No defects or abnormalities.		compensating type) or 48±4 hours (high dielectric constant type)
		pacitance ange	Within ±7.5% or±0.75pF (Whichever is larger)	B1,B3,R1,R6,F7,C8:Within ±12.5% F1,F5 :Within ±30% [W.V.:10Vmax.] F1 :Within+30/-40%	 at room temprature, then muasure. The charge/discharge current is less than 50mA. Initial measurement for F1/10Vmax.
	Q/D		30pF and over:Q ≥ 200 30pF and below: Q = 100+10C/3 C:Nominal Capacitance (pF)	$[B1,B3,R1,R6,R7C8] \\ W.V.:100V: 0.05max. (C < 0.068 \mu F) \\ : 0.075max. (C = 0.068 \mu F) \\ W.V.:25/50V: 0.05max. \\ W.V.:16/10V: 0.05max. \\ W.V.:6.3V: 0.075max. (C < 3.3 \mu F) \\ : 0.125max. (C \geq 3.3 \mu F) \\ [F1,F5] \\ W.V.:25Vmin \\ : 0.075max. (C < 0.1 \mu F) \\ : 0.125max. (C \geq 0.1 \mu F) \\ : 0.125max. (C \geq 0.1 \mu F) \\ W.V.:16/10V: 0.15max. \\ W.V.:6.3V: 0.2max. \\ W.V.:6.3V: 0.2max. \\ \end{tabular}$	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.
	I.R.	-	More than $500M\Omega$ or $25\Omega \cdot F$	(Whichever is smaller)	
18	High Temperature Load	е	The measured and observed the specifications in the follow	•	Apply 200% of the rated voltage at The maximum operating temperature ±3 for 1000±12 hours.
	Арр	earance	No defects or abnormalities.		Set for 24±2 hours (temperature compensating type)
		pacitance ange	Within ±3% or ±0.3pF (Whichever is larger)	B1B3,,R1,R6,R7,C8:Within ±12.5% F1,F5 :Within ±30% [Except 10 ymax and $C = 1.0, \mu F$] F1,F5 :Within+30/-40% [10 ymax and $C \ge 1.0, \mu F$]	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 at the maximun operating temperature ±3°C for one hour. Remove and set for 48±4 hours
	Q/D	NF.	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)	$[B1,B3,R1,R6,R7,C8] \\ W.V.:100V: 0.05max.(C < 0.068\mu F) \\ : 0.075max.(C \geq 0.068\mu F) \\ W.V.:25/50V: 0.04max. \\ W.V.:16/10V: 0.05max. \\ W.V.:6.3V/4V: 0.075max. (C < 3.3\mu F) \\ : 0.125max.(C \geq 3.3\mu F) [F1,F5] \\ W.V.:25Vmin \\ : 0.075max. (C < 0.1 \mu F) \\ : 0.125max. (C \geq 0.1 \mu F) W.V.:16/10V: 0.15max. \\ W.V.:6.3V: 0.2max. \\ W.V.:$	at room temperature. Perform initial measurement.
	I.R.		More than 1,000MΩor 50Ω ·I	•	╡

Γah	le.	Α.	.1

	Naminal Values			Capacitance Chan	ge from 20°C (%)		
Char.	Nominal Values (ppm/) Note 1	-58	5	-2	25		10
	(ppiii/) Note i	Max.	Min.	Max.	Min.	Max.	Min.
2C	0± 60	0.82	-0.45	0.49	-0.27	0.33	-0.18
3C	0±120	1.37	-0.90	0.82	-0.54	0.55	-0.36
4C	0±250	2.56	-1.88	1.54	-1.13	1.02	-0.75
2P	-150± 60	-	-	1.32	0.41	0.88	0.27
3P	-150±120	-	_	1.65	0.14	1.10	0.09
4P	-150±250	-	-	2.36	-0.45	1.57	-0.30
2R	-220± 60	-	-	1.70	0.72	1.13	0.48
3R	-220±120	-	_	2.03	0.45	1.35	0.30
4R	-220±250	-	_	2.74	-0.14	1.83	-0.09
2S	-330± 60	-	-	2.30	1.22	1.54	0.81
3S	-330±120	-	_	2.63	0.95	1.76	0.63
4S	-330±250	-	-	3.35	0.36	2.23	0.24
2T	-470± 60	-	-	3.07	1.85	2.05	1.23
3T	-470±120	-	_	3.40	1.58	2.27	1.05
4T	-470±250	-	-	4.12	0.99	2.74	0.66
3U	-750±120	-	-	4.94	2.84	3.29	1.89
4U	-750 250	-	_	5.65	2.25	3.77	1.50
1X	+350 -1000	-	_	-	_	-	_

aD	le A-2										
			Capacitance Change from 25 °C (%)								
	Char.	Nominal Values	-55		-(30	-10				
		(nnm/°C.) Note 1	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			

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

■SPECIFICATIONS AND TEST METHODS

No	Ite		IND TEST WETHODS Specification	Test Method				
			Specification					
1	Operating Tem Range	perature	B1,B3,F1,F5 :-25°C to 85°C R1,R7:-55°C to 125°C C6,R6:-55°C to 85°C C7:-55°C to 125°C C8:-55°C to 105°C	Standard Temperature : 20°C (R6,R7,C6,C7,C8,F5 : 25°C)				
2	Rated Voltage			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.(GRM02 size is based on Microscope)				
	Dimension		Within the specified dimensions	Using calipers.				
5	Dielectric Strer	ngth	No defects or abnormalities.	No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.				
6	Insulation Resi	stance	More than $50\Omega \cdot F$	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at Standard Temperature and 75%RH max. and within 1 minutes of charging, provided the charge/discharge current is less than 50mA.				
7	Capacitance		Within the specified tolerance.	The capacitance shall be measured at Standard Temperature at the frequency and voltage shown in the table.				
			*Table 1	Capacitance Frequency Voltage				
			GRM155 B3/R6 1A 124 to 105 GRM185 B3/R6 1C/1A 105	*1 C ≤ 10µF (10V min) 1+/-0.1kHz 1.0+/-0.2Vms				
			GRM188 B3/R6 1C/1A 225 GRM219 B3/R6 1A 475	$ \begin{array}{c cccc} C \leq 10 \mu F \\ (6.3 \text{V max.}) & 1 + / -0.1 \text{kHz} & 0.5 + / -0.1 \text{V rms} \\ \hline C > 10 \mu F & 120 + / -24 \text{Hz} & 0.5 + / -0.1 \text{V rms} \\ \end{array} $				
			GRM21B B3/R6 1C/1A 106	C / 10μι 120+/-24112 0.5+/-0.1VIIIIS				
			GRM319 B3/R6 1A 106	*1 However the Voltage is 0.5+/-0.1Vrms about Table 1 items on the left side.				
8	Dissipation Fac	ctor (D.F.)	B1,B3,R1,R6,R7,C7,C8 : 0.1 max. C6 :0.125 max	The D.F. shall be measured at Standard Temperature at the Frequency and voltage shown in the table.				
			F1,F5 : 0.2 max	Capacitance Frequency Voltage				
			*Table 1 GRM155 B3/R6 1A 124 to 105 CRM155 B3/R6 1A 104 to 105	*1 C \leq 10 μ F (10V min) 1+/-0.1kHz 1.0+/-0.2Vrms				
			GRM185 B3/R6 1C/1A 105 GRM188 B3/R6 1C/1A 225 GRM219 B3/R6 1A 475	$C \le 10\mu F$ (6.3V max.) 1+/-0.1kHz 0.5+/-0.1Vrms				
			GRM21B B3/R6 1C/1A 106 GRM319 B3/R6 1A 106	C > 10μF 120+/-24Hz 0.5+/-0.1Vrms *1 However the Voltage is 0.5+/-0.1Vrms about Table 1				
9	Capacitance Temperature Characteristics		B1,B3 : Within +/-10% (-25°C to +85°C) R1,R7 : Within ±15% (-55°C to +125°C) F1,F5 : Within +30/-80% (-25°C to +85°C) R6 : Within +/-15% (-55°C to +85°C) C6 : Within +/-22% (-55°C to +85°C) C7 : Within +/-22% (-55°C to +125°C) C8 : Within +/-22% (-55°C to +105°C)	items on the left side. The capacitance change shall be measured after 5min. at each specified temp.stage. The ranges of capacitance change compared with the Standard Temperature value over the temperature ranges shown in the table shall be within the specified ranges.* In case of applying voltage, the capacitance change shall be measured after 1 more min. with applying voltage in equilibration of each temp. stage.				
		50% of the rated voltage	B1: Within +10/-30% R1: Within +15/-40% F1: Within +30/-95%	*GRM43 B1/R6 0J/1A 336/476 only : 1.0±0.2Vrms				
				Step Temperature(°C) Applying voltage(V)				
				1 20+/-2 * 2 -55+/-3(for R1,R6,R7,C6,C7,C8) -25+/-3(for B1,B3,F1,F5) 3 20+/-2 * *				
				4 85+/-3(for B1,B3,F1,F5,R6,C6) 125+/-3(for R1,R7,C7) 105+/-3(for C8) R6,C7,C8: 25+/-2°C				
				5 20+/-2 6 -55±3(for R1) -25+/-3(for B1,F1,F5) 7 20+/-2				
				8 125±3(for R1) 85±3(for B1,F1,F5)				
				*Initial measurement for high dielectric constant type Perform a heat treatment at 150 +0/-10°C for one hour and then set for 48±4 hours at room temprature. Perform the initial measure-ment.				

No	Item		Specification	Test Method
10	Adhesive Strength of Termination	b	reminations or other defect shall occur. C C C A A A A A A A A A A A A A A A A	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+/-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. *1N: GR□02,2N: GR□03,5N: GR□15/GRM18, Type a b c GRM02 0.2 0.56 0.23 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
11	Vibration Resistance	Appearance Capacitance	No defects or abnormalities. Within the specified tolerance.	Solder the capacitor on 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
		Q/D.F.	B1,B3,R1,R6,R7,C7,C8:0.1max. C6 : 0.125 max F1,F5 : 0.2 max	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).
12	Deflection	f s s		Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2a using an eutectic solder. Then apply a force in the direction shown in Fig 3a for 5+/-1 sec. 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.
		R230 Ca 4	Pressunzing speed:1.0mm/sec. Pressunze Flexure:≤1 pacitance meter 45 Fig.3a	(GRM02,GR□03/15:t:0.8mm) Type a b c GRM02 0.2 0.56 0.23 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 2.0 GRM32 2.2 5.0 2.9 GRM43 3.5 7.0 3.7 GRM55 4.5 8.0 5.6 (in mm)
13	Solderability of Termination	75% of the termina and continuously.	tions is to be soldered evenly	Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight propotion) . Preheat at 80 to 120°C for 10-to 30 seconds. After preheating, immerse in an eutectic solder solution for 2+/-0.5 seconds at 230+/-5°C.

No	Item		Specification	Test Method						
14	Resistance to Soldering Heat	Appearance	No defects or abnormalities.	Immerse	the capacitor at the capacitor in	an eute	ctic solder sol	ution at		
		Capacitance Change	B1,B3,R1,R6,R7,C6,C7,C8:Within+/-7.5% F1,F5 : Within +/-20%	tempera		l+/-2 ł	nours (tem	perature		
		Q/D.F.	B1,B3,R1,R6,R7,C7,C8: 0.1 max. C6 : 0.125 max F1,F5 : 0.2 max	constan	sating tyoe) or t type), then mea 2- Soldering meth	isure. iod:Reflo	, 0	alelectric		
		I.R.	More than $50\Omega \cdot F$	· Initial n	older type: SnAgC neasurement for a heat treatmen	high diel	ectric constar	nt type one hour		
		Dielectric Strength	No defects .	and ther	n set at room tem the initial measu	perature				
				*Prehea	ting for GRM32/4	13/55				
				Step 1 2	100°C to	o 120°C	Tir 1 n	nin.		
15	Temperature Sudden Change	Appearance	No defects or abnormalities.	manner	capacitor to the so and under the sa the five cycles a	ame cond	ditions as (10)			
		Capacitance Change Q/D.F.	B1,B3,R1,R6,R7,C6,C7,C8:Within+/-7.5% F1,F5 : Within +/-20% B1,B3,R1,R6,R7,C7,C8: 0.1 max. C6 : 0.125 max F1,F5 : 0.2 max	treatmer Set for 2 or 48+/-	nts shown in the 24+/-2 hours (ter 4 hours (high die ture, then measu	following mperatur lectric co	table. e compensat	ing type		
		I.R.	More than $50\Omega \cdot F$	Step	1	2	3	4		
		Dielectric Strength	No defects.	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 to3		
				Perform and ther	neasurement for a heat treatmen n set at room tem the initial measu	t at 150 · perature	+0/-10°C for (oné hour		
16	High Temperature	Appearance	No defects or abnormalities.		e rated voltage a for 500+/-12 ho		. ,			
	High Humidity	Capacitance Change	B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30%	currentis	s less than 50mA		J	Ü		
	(Steady)	Q/D.F.	B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. F1,F5 : 0.4 max	Perform	measurement a heat treatmer n let sit for 48+/-					
		I.R.	More than 12.5 Ω · F		the initial measu					
				Perform	irement after tes a heat treatmen n let sit for 48+/- asure.	t at 150+				
17	Durability	Appearance	No defects or abnormalities.	the max	50% of the rated imum operating t	emperati	ure +/-3°C. Lo	et sit for		
		Capacitance Change	B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30%	The cha	nours at room ten rge/ discharge co measurement	urrent is	less than 50n	nA.		
		Q/D.F.	B1,B3,R1,R6,R7,C6,C7,C8: 0.2max. F1,F5 : 0.4max	and the	a heat treatmer n let sit for 48+/- the initial measu	4 hours				
		I.R.	More than $25\Omega \cdot F$	Perform the initial measurement. • Measurement after test Perform a heat treatment at 150+0/-10°C for one ho and then let sit for 48+/-4 hours at room temperature then measure.						

No	Item	Specification	Test Method
1	Operating Temperature	R7/C7 :-55°C to +125°C	Standard Temperature:25 °C
	Range	R6:-55°C to +85°C	
2	Rated Voltage	F5:-30°C to +85°C 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 P-P or VO-P, whichever is larger, shall be maintained within the rated voltage range.
3	Appearance	No defects or abnormalities.	Visual inspection.
4	Dimension	Within the specified dimensions.	Using calipers.
5	Dielectric Strength	No defects or abnormalities.	No failure shall be observed when 250% of the rated
Ü	Eloisoulo Guorigui	The defecte of abriormalistics.	voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.
6	Insulation Resistance	$C \stackrel{\leq}{=} 0.047 \mu F: More than 10000 M\Omega$ (GRM188R61C334-105K : 100Ω · F) C > 0.047 μ F: 500Ω · F C : Nominal Capacitance	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, provided the charge/discharge current is less than 50mA. * 5 minutes (GRM188R6/334-105K)
7	Capacitance	Within the specified tolerance.	The capacitance/D.F. shall be measured at 25 °C at the frequency and voltage shown in the table.
8	Q/Dissipation Factor (D.F.)	$ \begin{array}{l} [R6,R7,C7] \\ \text{W.V.:}100\text{V} : 0.05\text{max.} \\ \text{W.V.:}35/25/16\text{V} : 0.035\text{max.} \\ \text{W.V.:}10\text{V} : 0.05\text{max.}(\text{C} < 3.3\mu\text{F}) \\ : 0.1\text{max.}(\text{C} \ge 3.3\mu\text{F}) \\ [\text{F5}] \\ \text{W.V.:}50\text{V} \\ : 0.07\text{max.}(\text{C} < 0.1\mu\text{F}) \\ : 0.09\text{max.}(\text{C} \ge 0.1\mu\text{F}) \\ \text{W.V.:}35/25/16\text{V} : 0.125\text{max.} \end{array} $	Char. R6,R7,F5,C7 Item Frequency 1±0.1kHz Voltage 1±0.2Vrms
9	Capacitance Temperature Characteristics	R7: Withn ±15%	The capacitance change shall be measured after 5min. at each specified temp.stage. The ranges of capacitance change compared with the 25 °C value over the temperature ranges shown in the table shall be within the specified ranges.* Step Temperature(°C) 1 25±2 2 -55±3(for R6, R7, C7)/ -30±3(for F5) 3 25±2 4 125±3(for R7, C7)/ 85±3(for R6,F5) * Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10°C for one hour and then set for 48±4 hours at room temperature. Perform the initial measurement.
10	Adhesive Strength of Termination	No removal of the terminations or other defect shall occur. C	Solder the capacitor on the test jig (glass epoxy board) shown in Fig.1a using a n 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. *5N (GRP/M15, GRM18) 2N (GRP/M03) Type a b c GRP/M03 GRP/M03 0.3 0.9 0.3 GRP/M15 0.4 1.5 0.5 GRM18 1.0 3.0 1.2 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

No		Item	SAND TEST METHODS Specification		Test Method				
11	Vibration	1	No defects or abnormalities.	Solder the	Solder the capacitor o n the test jig (glass epoxy board)				
	Resistance		Within the specified tolerance. [R6,R7,C7] W.V.:100V :0.05max. W.V.:35/25/16V :0.035max. W.V.:10V :0.05max. (C< 3.3μF) :0.1max.(C≧ 3.3μF) [F5] W.V.:50V :0.07max.(C< 0.1μF) :0.09max.(C≧ 0.1μF) W.V.:35/25/16V::0.125max.	in thesame manner and under the same conditi (10). The capacitor shall be subjected to a simple harmoni motion having a total amplitude of 1.5mm, the freque being varied uniformly between the approximate limi 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed inapproximate 1 minute. This motion shall be appliedfor a period of hours in each 3 mutually perpendicular directions (total of 6 hours).		simple harmonic mm, the frequency proximate limits of om 10 to 55Hz inapproximately for a period of 2			
12 Deflection			No crack or marked defect shall occur.	shown in F force in the The solder the reflow	capacitor on the test jig (glasig.2a using an eutectic sold edirection shown in Fig 3a ring shall be done either with method and shall be conducted soldering is uniform and free eat shock.	er. Then apply a for 5±1 sec. n an iron or using cted with care			
			Pressunzing speed:1.0mm/sec. Pressunze R230 Flexure:≦1 Capacitance meter 45 Fig.3		Fig 2 (GRP. Type a b GRP/M03 0.3 0.0 GRP/M15 0.4 1.0 GRM18 1.0 4.0 GRM31 2.2 5.0 GRM31 2.2 5.0 GRM32 2.2 5.0 GRM43 3.5 7.0 GRM55 4.5 8.0 GRM55 4.5 8.0 GRM55	9 0.3 5 0.5 0 1.2 0 1.65 0 2.0 0 2.9 0 3.7			
13	Solderabilit of Termina	•	75% of the terminations is to be soldered evenly and continuously.	and rosin (Preheat at After prehe	he capacitor in a solution of (JIS-K-5902) (25% rosin in was 80 to 120 °C for 10-to 30 separing, immerse in an eutectonds at 230±5°C.	veight propotion) . econds.			
14	Resistance Soldering H		The measured and observed characteristics shall satisfy the specifications in the following table.	Immerse t 270±5°C f	e capacitor at 120 to 150 ° 0 he capacitor in a n eutectic sor 10±0.5 seconds. Set at ro	solder solution at nom temperature			
	A	opearance	No defects or abnormalities.		hours (high dielectric consta				
		apacitance	R6,R7:Within ±7.5%						
		Change F5 :Within ±20% [R6,R7,C7] W.V.:100V :0.05max Q/D.F. W.V.:35/25/16V :0.035max. W.V.:10V:0.05max. (C< 3.3μF)		 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. 					
l l			W.V.:50V :0.07max.(C < 0.1μF)		ng for GRM32/43/55				
			10.00may (0 > 0.4v.F)	Step	Temperature	Time			
			$(0.09 \text{max.}) (C \ge 0.1 \mu \text{f})$	4	10000 1- 10000	4			
	I.F	R.	:0.09max.(C = 0.1μF) W.V.:35/25/16V.:0.125max. More than 10,000MΩ or 500Ω · F	1 2	100°C to 120°C	1 min.			

No		Item	Specification		-	Test Metho	od			
15	Tempera	ature Cycle	The measured and observed characteristics shall satisfy		pacitor to the s					
		A = = = = = = = = = = = = = = = = = = =	the specifications in the following table.		nd under the sa					
		Appearance	No defects or abnormalities.		erform the five cycles according to the four heat eatments shown in the following table.					
		Capacitance	R6,R7,C7 :Within ±7.5%	Set for or	48±4 hours (hi	gh dielectr	ic constant type))		
		Change	F5 :Within ±20% [R6,R7,C7]	at room temperature, then measure.						
			W.V.:100V :0.05max	Step	1	2	3	4		
		0.55	W.V.:35/25/16V :0.035max.	Temp.	Min.	Room	Max.	Room		
		Q/D.F.	W.V.:10V :0.05max.(C< 3.3μF) :0.1max.(C ≧ 3.3F)	(°C)	Operating	Temp.	Operating	Temp.		
			[F5]	Time	Temp.+0/-3		Temp.+3/-0			
			W.V.:50V	(min)	30±3	2to3	30±3	2to3		
			:0.07max.(C < 0.1μF) :0.09max.(C $\stackrel{>}{=}$ 0.1μF)							
			W.V.:35/25/16Vmax.:0.125max.	. Initial me	easurement for	high dieled	ctric constant ty	ne		
		I.R.	More than 10,000M Ω or 500 Ω · F				/-10°C for one I			
		Dialanteia	(Whichever is smaller)				or 48± 4 hours.			
		Dielectric Strength	No defects.	Perform the initial measurement.						
16	Humidity	/	The measured and observed characteristics shall satisfy	Sit the ca	pacitor at 40± 2	² C and in	90 to 95% hum	duty		
	(Steady		the specifications in the following table.	for 500±1		4 5		·		
		Appearance	No defects or abnormalities.	then mea		4 nours a	t room tempera	ture,		
		Capacitance	R6,R7,C7:Within ±12.5%	a lon mea	ouio.					
		Change	F5 :Within ±30% [R6,R7,C7]							
			W.V.:100V :0.075max							
		0/0.5	W.V.:35/25/16V :0.05max.							
		Q/D.F.	W.V.:10V:0.075max(C< 3.3 μ F) :0.125max.(C \geq 3.3 μ F)							
			[F5]							
			W.V.:50V							
			:0.1max.(C < 0.1µF) :0.125max.(C ≧ 0.1µF)							
			0.125 max. (C = 0.1 m) W.V.:35/25/16V.:0.15max.	4						
		I.R.	More than 1,000MΩ or 50Ω · F							
		Diala stais	(Whichever is smaller)							
		Dielectric Strength	No defects.							
17	Humidity		The measured and observed characteristics shall satisfy				and 90 to 95			
		A	the specifications in the following table.				t for 48±4 hou	rs at roon		
		Appearance	No defects or abnormalities.	temprature, then muasure. The charge/discharge current is less than 50mA. *GRM188R61A105K:6.3V						
		Capacitance Change	R6,F7,C7:Within ±12.5% F5 :Within ±30%							
				· Initial m	easurement for	F 5 / 25Vr	max.			
			[R6,R7,C7] W.V.:100V :0.075max	Apply the	rated DC volta	ge for 1 ho	ur at 40± 2°C.			
			W.V.:35/25/16V :0.05max.		and set for 48±4 nitial measurem		room temperatu	ıre.		
		Q/D.F.	W.V.:10V:0.075max(C< 3.3μF)	Penonni	illiai measuren	ieni.				
		Ī	1 U 1/5max (U.1 3 3UE)							
			:0.125max.(C ≧ 3.3μF) [F5]							
			[F5] W.V.:50V							
			[F5]							
			[F5] W.V.:50V :0.1max.($C < 0.1\mu F$) :0.125max.($C \stackrel{?}{=} 0.1\mu F$) W.V.:35/25/16Vmax.:0.15max.							
		I.R.	[F5] W.V.:50V :0.1max.(C < 0.1μF) :0.125max.(C $\stackrel{?}{=}$ 0.1μF) W.V.:35/25/16Vmax.:0.15max. More than 500M Ω or 25 Ω · F							
		Dielectric	[F5] W.V.:50V :0.1max.($C < 0.1\mu F$) :0.125max.($C \stackrel{?}{=} 0.1\mu F$) W.V.:35/25/16Vmax.:0.15max.							
40	Lligh T-	Dielectric Strength	[F5] W.V.:50V :0.1max.(C < 0.1μF) :0.125max.(C \geq 0.1μF) W.V.:35/25/16Vmax.:0.15max. More than 500MΩ or 25Ω · F (Whichever is smaller) No defects .	Apply 400	:0/ of the	voltore	ho movimus			
18	High Te Load	Dielectric	$[F5] $W.V.:50V $: 0.1 max.(C < 0.1 \mu F) $: 0.125 max.(C \stackrel{?}{=} 0.1 \mu F) $W.V.:35/25/16V max.:0.15 max.$ More than $500 M\Omega or $25\Omega \cdot F$ (Whichever is smaller) $No defects $.$ The measured and observed characteristics shall satisfy		5% of the rated temperature ±:					
18	Load	Dielectric Strength	[F5] W.V.:50V :0.1max.(C < 0.1μF) :0.125max.(C \geq 0.1μF) W.V.:35/25/16Vmax.:0.15max. More than 500MΩ or 25Ω · F (Whichever is smaller) No defects .	operating Set for or	temperature ±3 48±4 hours (hi	3°C for 100 gh dielectri		e) at		
18	Load	Dielectric Strength mperature	[F5] W.V.:50V $: 0.1 max. (C < 0.1 μF) \\ : 0.125 max. (C ≥ 0.1 μF) \\ W.V.:35/25/16 V max.: 0.15 max. $ More than $500 M\Omega$ or $25\Omega \cdot F$ (Whichever is smaller) No defects . The measured and observed characteristics shall satisfy the specifications in the following table. No defects or abnormalities. $R6,R7,C7:Within \pm 12.5\%$	operating Set for or room Ten	temperature ±3 48±4 hours (hipperature, then	3°C for 100 gh dielectri measure.	00±12 hours. c constant type	e) at		
18	Load	Dielectric Strength mperature Appearance	[F5] W.V.:50V $:0.1\text{max.}(C<0.1\mu\text{F}) \\ :0.125\text{max.}(C \ge 0.1\mu\text{F}) \\ :0.125\text{max.}(C \ge 0.1\mu\text{F}) \\ W.V.:35/25/16V\text{max.}:0.15\text{max.} \\ \text{More than } 500\text{M}\Omega \text{ or } 25\Omega \cdot \text{F} \\ \text{(Whichever is smaller)} \\ \text{No defects}. \\ \text{The measured and observed characteristics shall satisfy the specifications in the following table.} \\ \text{No defects or abnormalities.} \\ \text{R6,R7,C7:Within } \pm 12.5\% \\ \text{F5} : \text{Within } \pm 30\%[\text{Except } 25\text{Vmax and } C \ge 1.0. \mu\text{F}] \\ \text{The max} = 1.0. \mu\text{F}	operating Set for or room Ten	temperature ±3 48±4 hours (hi	3°C for 100 gh dielectri measure.	00±12 hours. c constant type	e) at		
18	Load	Dielectric Strength mperature Appearance Capacitance	[F5] W.V.:50V $: 0.1 max. (C < 0.1 μF) \\ : 0.125 max. (C ≥ 0.1 μF) \\ W.V.:35/25/16 V max.: 0.15 max. $ More than $500 M\Omega$ or $25\Omega \cdot F$ (Whichever is smaller) No defects . The measured and observed characteristics shall satisfy the specifications in the following table. No defects or abnormalities. $R6,R7,C7:Within \pm 12.5\%$	operating Set for or room Ten The charg	temperature ±3 48±4 hours (high perature, then ge/discharge cu easurement for	3°C for 100 gh dielectri measure. Irrent is les	00±12 hours. c constant type s than 50mA. ctric constant type	,		
18	Load	Dielectric Strength mperature Appearance Capacitance Change	[F5] W.V.:50V $:0.1\text{max.}(C<0.1\mu\text{F})$ $:0.125\text{max.}(C\stackrel{>}{=} 0.1\mu\text{F})$ $:0.125\text{max.}(C\stackrel{>}{=} 0.1\mu\text{F})$ $:0.125\text{max.}(C^{>}{=} 0.1\mu\text{F})$ W.V.:35/25/16Vmax.:0.15max. More than 500MΩ or 25Ω · F (Whichever is smaller) No defects . The measured and observed characteristics shall satisfy the specifications in the following table. No defects or abnormalities. R6,R7,C7:Within $\pm 12.5\%$ F5 :Within $\pm 30\%$ [Except 25Vmax and C $\stackrel{>}{=} 1.0.\mu\text{F}$] [R6,R7,C7] W.V.:100V :0.075max W.V.:35/25/16V :0.05max.	operating Set for or room Ten The chard Initial m Apply 125	temperature ±3 48±4 hours (higherature, then ge/discharge cue easurement for 5% of the rated	3°C for 100 gh dielectri measure. Irrent is les high diele DC voltage	00±12 hours. c constant type s than 50mA. ctric constant type at the	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance	[F5] W.V.:50V :0.1 max.(C < 0.1 μF) :0.125max.(C \geq 0.1 μF) :0.125max.(C \geq 0.1 μF) W.V.:35/25/16Vmax.:0.15max. More than 500MΩ or 25Ω · F (Whichever is smaller) No defects . The measured and observed characteristics shall satisfy the specifications in the following table. No defects or abnormalities. R6,R7,C7:Within ±12.5% F5 :Within ±30%[Except 25Vmax and C \geq 1.0. μF] [R6,R7,C7] W.V.:100V :0.075max	operating Set for or room Ten The chard Initial m Apply 125 maximun	temperature ±3 48±4 hours (higherature, then ge/discharge cue easurement for 5% of the rated	3°C for 100 gh dielectri measure. Irrent is les high diele DC voltage erature ± 3	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance Change	[F5] W.V.:50V $: 0.1 \text{max.} (C < 0.1 \mu F) \\ : 0.125 \text{max.} (C \geqq 0.1 \mu F) \\ : 0.125 \text{max.} (C \end{Bmatrix} 0.1 \mu F) \\ W.V.:35/25/16V \text{max.} : 0.15 \text{max.} \\ \text{More than } 500 \text{M}\Omega \text{ or } 25\Omega \cdot \text{F} \\ \text{(Whichever is smaller)} \\ \text{No defects}. \\ \text{The measured and observed characteristics shall satisfy the specifications in the following table.} \\ \text{No defects or abnormalities.} \\ \text{R6,R7,C7:Within } \pm 12.5\% \\ \text{F5} : Within } \pm 30\% \text{[Except } 25 \text{Vmax and } \text{C} \end{Bmatrix} 1.0. \mu \text{F}] \\ \text{[R6,R7,C7]} \\ \text{W.V.:} 100V : 0.075 \text{max} \\ \text{W.V.:} 35/25/16V : 0.05 \text{max.} \\ \text{W.V.:} 10V:0.075 \text{max} (C \leqslant 3.3 \mu F) \\ : 0.125 \text{max.} (C \lessapprox 3.3 \mu F) \\ \text{[F5]} \\ \text{[F5]}$	operating Set for or room Ten The charg Initial m Apply 125 maximun and set fo	temperature ±3 48±4 hours (hin perature, then ge/discharge cu easurement for 5% of the rated operating temp	3°C for 100 gh dielectri measure. urrent is les high diele DC voltage erature ± 3 t room tem	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance Change	[F5] W.V.:50V $:0.1\text{max.}(C<0.1\mu\text{F})$ $:0.125\text{max.}(C \stackrel{>}{=} 0.1\mu\text{F})$ $:0.125\text{max.}(C \stackrel{>}{=} 0.1\mu\text{F})$ $:0.125\text{max.}(C \stackrel{>}{=} 0.1\mu\text{F})$ $W.V.:35/25/16V\text{max.}:0.15\text{max.}$ More than 500MΩ or 25Ω · F (Whichever is smaller) No defects . The measured and observed characteristics shall satisfy the specifications in the following table. No defects or abnormalities. R6,R7,C7:Within $\pm 12.5\%$ F5 :Within $\pm 30\%$ [Except 25Vmax and C $\stackrel{>}{=} 1.0.\mu\text{F}$] [R6,R7,C7] WV::100V :0.075max W.V.:35/25/16V :0.05max. W.V.:10V:0.075max(C $\stackrel{>}{=} 3.3\mu\text{F}$) :0.125max.(C $\stackrel{>}{=} 3.3\mu\text{F}$) :0.125max.(C $\stackrel{>}{=} 3.3\mu\text{F}$) [F5] W.V.:50V	operating Set for or room Ten The charg Initial m Apply 125 maximun and set fo	temperature ±348±4 hours (higher perature, then ge/discharge cue asurement for 5% of the rated operating temper 48±4 hours a	3°C for 100 gh dielectri measure. urrent is les high diele DC voltage erature ± 3 t room tem	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance Change	[F5] W.V.:50V $: 0.1 \text{max.} (C < 0.1 \mu F) \\ : 0.125 \text{max.} (C \stackrel{?}{=} 0.1 \mu F) \\ W.V.:35/25/16V \text{max.} : 0.15 \text{max.} \\ \text{More than } 500 \text{M}\Omega \text{ or } 25 \Omega \cdot \text{F} \\ \text{(Whichever is smaller)} \\ \text{No defects.} \\ \text{The measured and observed characteristics shall satisfy the specifications in the following table.} \\ \text{No defects or abnormalities.} \\ \text{R6,R7,C7:Within } \pm 12.5\% \\ \text{F5} : \text{Within } \pm 30\% [\text{Except } 25 \text{Vmax and } \text{C} \stackrel{?}{=} 1.0. \ \mu \text{F}] \\ \text{[R6,R7,C7]} \\ \text{WV::} 100 \text{V} : 0.075 \text{max} \\ \text{W.V::} 35/25/16 \text{V} : 0.05 \text{max.} \\ \text{W.V::} 100 \text{V} : 0.075 \text{max.} (\text{C} < 3.3 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} < 0.1$	operating Set for or room Ten The charg Initial m Apply 125 maximun and set fo	temperature ±348±4 hours (higher perature, then ge/discharge cue asurement for 5% of the rated operating temper 48±4 hours a	3°C for 100 gh dielectri measure. urrent is les high diele DC voltage erature ± 3 t room tem	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance Change	[F5] W.V.:50V $: 0.1 \text{max.} (C < 0.1 \mu F) \\ : 0.125 \text{max.} (C \geqq 0.1 \mu F) \\ : 0.125 \text{max.} (C \geqq 0.1 \mu F) \\ W.V.:35/25/16V \text{max.} : 0.15 \text{max.} \\ \text{More than } 500 \text{M}\Omega \text{ or } 25 \Omega \cdot \text{F} \\ \text{(Whichever is smaller)} \\ \text{No defects.} \\ \text{The measured and observed characteristics shall satisfy the specifications in the following table.} \\ \text{No defects or abnormalities.} \\ \text{R6,R7,C7:Within } \pm 12.5\% \\ \text{F5} : \text{Within } \pm 30\% [\text{Except } 25 \text{Vmax and } \text{C} \geqq 1.0. \mu \text{F}] \\ \text{[R6,R7,C7]} \\ \text{W.V.:} 100V : 0.075 \text{max} \\ \text{W.V.:} 35/25/16V : 0.05 \text{max.} \\ \text{W.V.:} 35/25/16V : 0.05 \text{max.} \\ \text{W.V.:} 50V : 0.125 \text{max.} (\text{C} \geqq 3.3 \mu \text{F}) \\ : 0.125 \text{max.} (\text{C} \end{Bmatrix} 0.1 \mu \text{F}) \\ \text{W.V.:} 35/25/16V \text{max.} : 0.15 \text{max.} \\ \text{More than } 1,000 \text{M}\Omega \text{ or } 50\Omega \cdot \text{F} \\ \end{aligned}$	operating Set for or room Ten The charg Initial m Apply 125 maximun and set fo	temperature ±348±4 hours (higherature, then ge/discharge cueasurement for 5% of the rated operating temper 48±4 hours a	3°C for 100 gh dielectri measure. urrent is les high diele DC voltage erature ± 3 t room tem	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		
18	Load	Dielectric Strength mperature Appearance Capacitance Change Q/D.F.	[F5] W.V.:50V $: 0.1 \text{max.} (C < 0.1 \mu F) \\ : 0.125 \text{max.} (C ≥ 0.1 \mu F) \\ W.V.:35/25/16V \text{max.} : 0.15 \text{max.} \\ \text{More than } 500 \text{M}\Omega \text{ or } 25 \Omega \cdot \text{F} \\ \text{(Whichever is smaller)} \\ \text{No defects.} \\ \text{The measured and observed characteristics shall satisfy the specifications in the following table.} \\ \text{No defects or abnormalities.} \\ \text{R6,R7,C7:Within } \pm 12.5\% \\ \text{F5} : \text{Within } \pm 30\% [\text{Except } 25 \text{Vmax and } \text{C} ≥ 1.0. \mu \text{F}] \\ \text{[R6,R7,C7]} \\ \text{W.V.:} 100 V : 0.075 \text{max} \\ \text{W.V.:} 35/25/16V : 0.05 \text{max.} \\ \text{W.V.:} 50V \\ : 0.125 \text{max.} (C ≥ 3.3 \mu \text{F}) \\ : 0.125 \text{max.} (C ≥ 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (C ≥ 0.1 \mu \text{F}) \\ : 0.125 \text{max.} (C ≥ 0.1 \mu \text{F}) \\ \text{W.V.:} 35/25/16 \text{Vmax.} : 0.15 \text{max.} \\ \text{W.V.:} 35/25/16 \text{Vmax.} : 0.$	operating Set for or room Ten The charg Initial m Apply 125 maximun and set fo	temperature ±348±4 hours (higherature, then ge/discharge cueasurement for 5% of the rated operating temper 48±4 hours a	3°C for 100 gh dielectri measure. urrent is les high diele DC voltage erature ± 3 t room tem	00±12 hours. c constant type s than 50mA. ctric constant ty e at the 3°C for one hou	/pe.		

		SPECIF	ICATION	S AND TES	T METH	IOD	S			P 2	0	
No	Item	0. 20		fication					Test Method	<u>-</u>		
1	Operating Temperature Range	R6: -55°C to +										
2	Rated Voltage	See the previo	ous pages.			The rated voltage is defined as the maximum voltage which applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{P-P} or V' whichever is larger, shall be maintained within the rate range.			-P or V ^{O-P} ,			
3	Appearance	No defects or	abnormalities	S.			al inspection.					
4	Dimensions	Within the spe					g calipers.					
5	Dielectric Strength		abnormalities	S.		appli betw char	ed een the term ge/discharge	nations for current is I	ed when 2509 1 to 5 second ess than 50m/	s, provided A.	d the	
6	Insulation Resistance	50Ω·F min.				exce minu	eding the rate tes of chargir	ed voltage a	III be measured at 25 °C and 75	5%RH max	and within	1
	Capacitance	Within the spe	ecified toleran	ce.			capacitance/[voltage show		e measured at le.	25 °C at th	ne frequenc	у
8	Dissipation Factor (D.F.)	0.125 max.					Capacit		Frequency	Vo	ltage]
	(5.1.)						C≦10μF (1		1± 0.1kHz	1.0 ± 0	0.2 Vrms	
							C≦10μF (6.3	3V max.)	1± 0.1kHz	0.5± 0).1 Vrms	1
							C > 10		120± 24Hz	0.5± 0).1 Vrms	1
9	Capacitance					The	capacitance c	change sha	Il be measured	d affter 5 m	in.at each	
40	Temperature Characteristics	R6 -55°C	C to +85°C	e Temp. 25°C With	o.Change nin ±15%	The over spec	the temperat ified ranges.	acitance cl ure ranges	hange compar shown in the t	able shall	be within the	е
10	Adhesive Strength of Termination	occur.	Fig.1	Solder re	esist ectrode or	using test j or us	g a eutectic soig for 10±1 seing the reflow the soldering Type GR □ 03 GR □ 15 GRM18 GRM21 GRM31	older. Then ec. The sole weethed a is uniform 5N (GR 🗆15) a 0.3 0.4 1.0 1.2 2.2	est jig (glass ep apply *10N for dering shall be nd shall be co and free of def , GRM18)/2N (GF 0.9 1.5 3.0 4.0	orce in paradone either nducted we fects such R IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	allel with the er with an iro ith care so	e on
							GRM32	2.2	5.0	2.9	-	
							GRM43 GRM55	3.5 4.5	7.0 8.0	3.7 5.6	1	
L							3111100		0.0	<u> </u>	J 	
11	Vibration	Appearance Capacitance D.F		or abnormalities. Decified tolerance.		the s capa total betw the a to 59 minu This	ame manner citor shall be amplitude of geen approximate li 5Hz and retu te. motion shall l	and under subjected to foot 1.5mm, mits of 10 arm to 10H; be applied to	st jig (glass ep the same cond o a simple hard the frequence and 55Hz. The z, shall be tra- for a period of ctions (total of	ditions as (formonic motions) by being frequency aversed in the course in the cours in	no). The on having a varied unifor range, from approximar	ormly n 10

		SPECII	FICATIONS AND TEST METH	10[DS .			Р	21		
No	Item		Specification	T -		Tes	t Method				
12	Deflection	No cracking	or marking defects shal occur. 50	Solder the capacitor to 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 uniformand free of defects such as heat shock.						in	
		R230	Pressunze			Туре		а	b	С	
						GR □03			0.9	0.3	
		L	-ooc Flexure≦1	j		GR□15			1.5	0.5	_
		Capacii 45	tance meter 45		Ф4.5 /	GRM18			3.0	1.2	-
		- 45 - -	45	- ø	40	GRM21 GRM31			4.0 5.0	1.65 2.0	\dashv
		Fig	.3 <u> </u>	<u></u>		GRM32	_	-	5.0	2.9	_
			100		→	GRM43	3	.5	7.0	3.7	
			Fig2			GRM55	4	.5	8.0	5.6	
								(in:n	nm)		
13	Solderability of Termination	75% of the te and continuo	erminations is to be soldered evenly busly.	°C for	merse the capaci S-K-5902) (25% 10 to 30 second	rosin in weights. After prehe	ght propo eating, im	ortion). Pr	ehea	t at 80 to	120
11	Resistance	Annogrange	No marking defeate		ution for 2 ± 0.5 seheat the capacite			r 1 minuto	lmon	0.000	
14	to Soldering Heat		No marking defects. R6: Within ± 15%								j
		Change		the capacitor in a eutectic solder solution at 270 \pm 5 °C for seconds. Let sit at room temperature for 48 \pm 4 hours,				- 1-			
		D.F.	0.125 max.	land:	n measure. tial measurement erform a heat trea	atment at 150	0 1 +1.0°C	for one ho	our ar	nd	
		I.R.	$50\Omega\cdot F$ min.	then let sit for 48 \pm 4 hours at room temperature. Perform							
		Dielectric Strength	No failure	th	e initial measurer	ment.					
15	Temperature		No marking defects.	Fix the capacitor to the suppor							
	Sudden Change	Change	R6 : Within ±7.5%	and under the same conditions as (10). Perform the five according to the four heat treatments listed in the following table. Let sit for 48 ±4 hours at room temperates							
		D.F.	0.125 max.		n measure.	SIL 101 40 ±4	nouis at	room tem	perai	uie,	
		I.R.	50Ω·F min.		Step Temp.(°C)	1 Min. Operating	Room Temp.	3 Max. Operati	na	Room Temp.	
		Dielectric Strength	No failure		Time(min.)	Temp.± $\frac{0}{3}$ 30±3	2 to 3	Temp.±	3 0	2 to 3	
				Initial measurement Perform a heat treatment at 150 ± 10 °C for one hour and then let sit for 48 ±4 hours at room temperature. Performthe initial measurement.					al		
16	High	Appearance	No marking defects.	Apı	ply the rated volt	age at 40 ± 2	2 °C and	90 to 95%	hum	idityfor	
	Temperature High Humidity	Capacitance Change	R6: Within ±12.5%) ±12hours. e charge/dischar	ge current is	less thar	50mA.			
	(Steady)	D.F.	0.25max.	F	itial measuremen Perform a heat tre hen let sit for 48	eatment at 15					
		I.R.	12.5 Ω ·F min.	th	e initial measurer	ment.					
		Dielectric Strength	No failure	Р	easurement after erform a heat trea en let sit for 48 ±	atment at 150					
17	Durability	Appearance	No marking defects.	ma	ply 100% of the ximum operating	temperature	± 3°C.		s at t	he	
		Capacitance Change	R6: Within ±12.5%	The charge/ discharge current is less than 50mA.							
		D.F.	0.25max.	Р	itial measuremen erform a heat trea	atment at 150					
		I.R.	25Ω·F min.	th	en let sit for 48 ± e initial measurer	nent.	om temp	erature. P	enor	111	
		Dielectric Strength	No failure	Р	easurement afte erform a heat trea en let sit for 48 ±	atment at 150					

There are three type of packaging for chip monolithic ceramic capacitor.

Please specify the packaging code.

1.Bulk Packaging(Packaging Code=B) : In a bag.

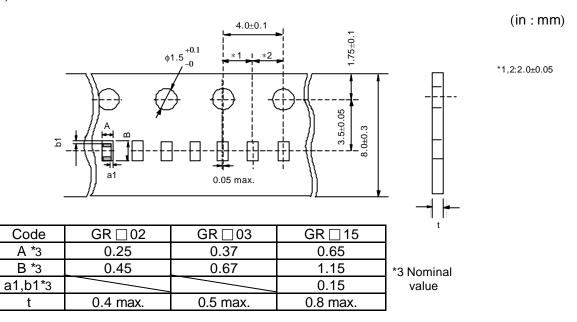
Minimum Quantity:1000(pcs./bag), Only GRM43S, GRM55E/F: 500(pcs./bag)

2.Tape Carrier Packaging(Packaging Code:D/E/F/L/J/K)

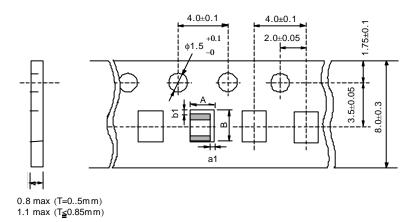
2.1 Minimum Quantity(pcs./reel)

. i willindin Quantity(pcs./reel)								
		φ178	reel	ф330	reel			
	ype	Paper Tape	Plastic Tape	Paper Tape	Plastic Tape			
		Code:D/E	Code:L	Code:F/J	Code:K			
GR □ 02		20000						
GR □ 03		15000		50000				
GR □ 15		10000		50000				
GR □ 18		4000		10000				
GR□21	5/6/9	4000		10000				
GN_Z1	A/B		3000		10000			
	6/9	4000		10000				
GR□31	M/X		3000		10000			
GIN_51	С		2000		6000			
	5/6/9	4000		10000				
	A/M		3000		10000			
GR□32	N		2000		8000			
GK_52	С		2000		6000			
	R/D/E		1000		4000			
	M		1000		5000			
	N/C/R		1000		4000			
GR□43	D		1000		4000			
GN_43	E		500		2000			
	S		500		1500			
	М		1000		5000			
	N/C/R		1000		4000			
GR□55	D		1000		4000			
GK_33	E		500					
	F/X		300		1500			

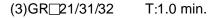
2.2 Dimensions of Tape (1)GR \square 02/03/15



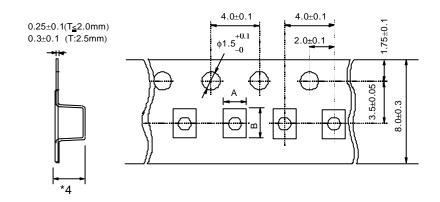
(2)GR□18/21/31/32 T:0.85 max.



Code	GR⊡18	GR <u></u> 21	GR∐31	GR <u></u> 32
Α	1.05±0.1	1.55±0.15	2.0±0.2	2.8±0.2
В	1.85±0.1	2.3±0.15	3.6±0.2	3.6±0.2
a1,b1	0.25±0.2	0.4±0.2	0.4±0.2	0.4+0.3/-0.2

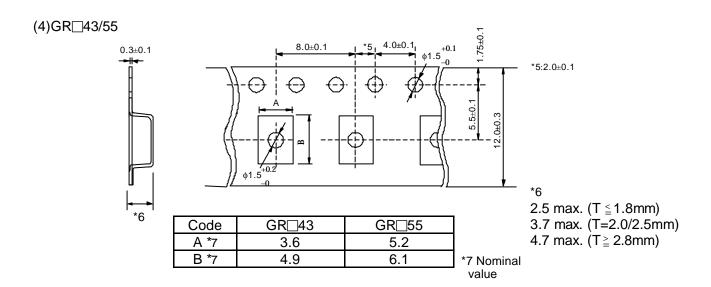


(in:mm)



Code	GR∐21	GR∐31	GR∐32
Α	1.45±0.2	1.9±0.2	2.8±0.2
В	2.25±0.2	3.5±0.2	3.5±0.2

*4 1.7 max. (T ≦1.25mm) 2.5 max. (T:1.35/1.6mm) 3.0 max. (T:1.8/2.0mm) 3.7 max. (T≧ 2.5mm)

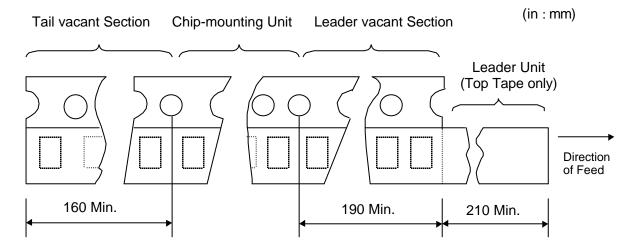


(in:mm) Fig.1 Package Chips Chip Fig.2 Dimensions of Reel 2.0±0.5 ф 178±2.0 / ф 330±2.0 $\varphi~21{\pm}0.8$ ф 50 min. Fig.3 Taping Diagram W W_1 GR<u></u>32 max. 16.5 max 10±1.5 GR₄₃,GRM55 20.5 max 14±1.5 Top Tape: Thickness 0.06 Feeding Hole: As specified in 2.2. Hole for Chip:As specified in 2.2. Bottom Tape: Thickness 0.05 (Only a bottom tape existence) Base Tape: As specified in 2.2.

2.3 Tapes for capacitors are wound clockwise shown in Fig.3.

(The sprocket holes are to the right as the tape is pulled toward the user.)

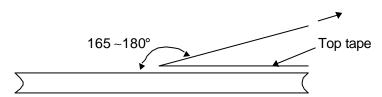
2.4 Part of the leader and part of the vacant section are attached as follows.



- 2.5 Accumulate pitch : 10 of sprocket holes pitch = 40 ± 0.3 mm
- 2.6 Chip in the tape is enclosed by top tape and bottom tape as shown in Fig.1.
- 2.7 The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
- 2.8 There are no jointing for top tape and bottom tape.
- 2.9 There are no fuzz in the cavity.
- 2.10 Break down force of top tape: 5N min.

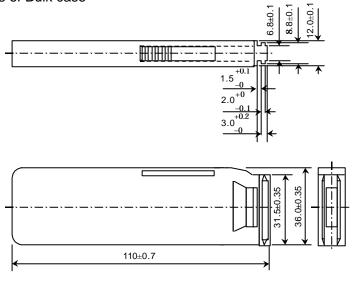
Break down force of bottom tape: 5N min. (Only a bottom tape existence)

- 2.11 Reel is made by resin and appeaser and dimension is shown in Fig 2. There are possibly to change the material and dimension due to some impairment.
- 2.12 Peeling off force: 0.1 to 0.6N^{*8} in the direction as shown below.
 - *8 GR □ 03:0.05N~0.5N



2.13 Label that show the customer parts number, our parts number, our company name, inspection number and quantity, will be put in outside of reel.

3.Bulk Case Packaging (Packaging Code=C) Fig.4 Dimensions of Bulk case



3.1 Minimum Quantity(pcs./case)

GR □15		50000
GR		15000
GR □21 6		10000
	В	5000

- 3.2 Case is made by resin of transparence or semitransparency, and appeaser and dimension is shown in Fig.4.
 - There are possibility to change the material and dimension due to some impairment.
- 3.3 Case must be marked in Customer 's part number, MURATA part number, MURATA name, Inspection number and quantity(pcs.).

∆CAUTION

■Limitation of use

Please contact our sales representatives or product engineers before using our products for the applications listed below which require of our products for other applications than specified in this product.

- ① Aircraft equipment ② Aerospace equipment ③ Undersea equipment ④ Power plant control equipment
- ©Medical equipment ©Transportation equipment(vehicles,trains,ships,etc.) ©Traffic signal equipment

∆CAUTION

■Storage and Operating Conditions

Chip monolithic ceramic capacitors(chips) can experience degradation of termination solderability when subjected to high temperature or humidity, or if exposed to sulfur or chlorine gases.

Storage environment must be at an ambient temperature of 5-40 C. and an ambient humidity of 20-70%RH. Use chip within 6 months. If 6 months or more have elapsed, check solderability before use. (Reference Data 1/ Solderability) Insulation Resistance shall be deteriorated on specific condition of high humidity or incorrosion gas such as hydrogen sulfide, sulfurous acid gas, cholorine. Those condition are not suitable for use.

△CAUTION

■Handling

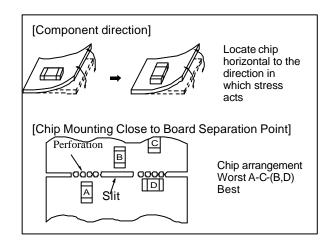
- 1.Inspection
- · Thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints. Provide support pins on the back side of the PCB to prevent warping or flexing.
- 2.Board Separation (or Depane-lization)
- · Board flexing at the time of separation causes cracked chips or broken solder.
- · Severity of stresses imposed on the chip at the time of board break is in the order of: Pushback<Slitter<V Slot<Perforator.
- · Board separation must be performed using special jigs, not with hands.
- 3. Reel and bulk case
 - · In the handling of reel and case, please pay attention not to drop it. Please do not use chip of the case which dropped.

ACAUTION

■Soldering and Mounting

1.Mounting Position

Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

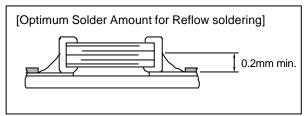


2. Solder Paste Printing

 Overly thick application of solder paste results in excessive fillet height solder.

This makes the chip more susceptible to mechanical and thermal stress on the board and may cause cracked chips.

- Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
- Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm min.



3.Chip Placing

- •An excessively low bottom dead point of the suction nozzle imposes great force on the chip during mounting, causing cracked chips. So adjust the suction nozzle's bottom dead point by correcting warp in the board.
 - Normally, the suction bottom dead point must be set on the upper surface of the board. Nozzle pressure for chip mounting must be a 1 to 3N static load.
- Dirt particles and dust accumulated between the suction nozzle and the cylinder inner wall prevent the nozzle from moving smoothly. This imposes great force on the chip during, causing cracked chips. And the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips. The suction nozzle and the locating claw must be maintained, checked and replaced periodically.

4.Reflow Soldering

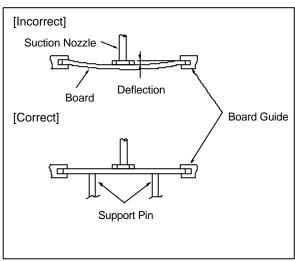
- •Sudden heating of the chip results in distortion due to excessive expansion and construction forces within the chip causing cracked chips. So when preheating, keep temperature differential, ΔT , within the range shown in Table 1. The smaller the ΔT , the less stress on the chip.
- Solderability of Tin plating termination chip might be deteriorated when low temperature soldering profile where peak solder temperature is below the Tin melting point is used.
 - Please confirm the solderability of Tin plating termination chip before use.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and solvent within the range shown in the above table.

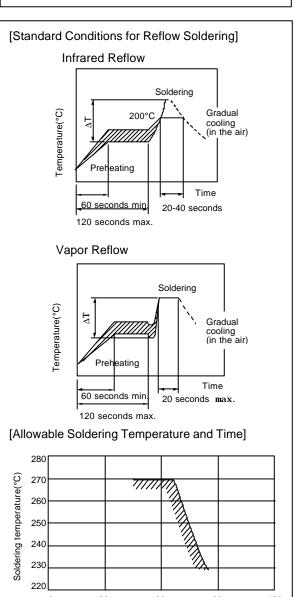
Table 1

Part Number	Temperature Differential
GR□02/03/15	Δ T < 190°C
GR□18/21/31	Δ 1 = 190 C
GR□32/43/55	Δ T $\stackrel{<}{=}$ 130°C

Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.





Soldering time(sec.)

In case of repeated soldering, the accumulated Soldering time must be within the range shown

above.

5.Leaded Component Insertion

If the PCB is flexed when leaded components (such as transformers and ICs) are being mounted, chips may crack and solder joints may break.

Before mounting leaded components, support the PCB using backup pins or special jigs prevent warping.

6.Flow Soldering

- Sudden heating of the chip results in thermal distortion causing cracked chips. And an excessively long soldering time or high soldering temperature results in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
- When preheating, keep temperature differential between solder temperature and chip surface temperature, ΔT, within the range shown in Table 2. The smaller the ΔT, the less stress on the chip.

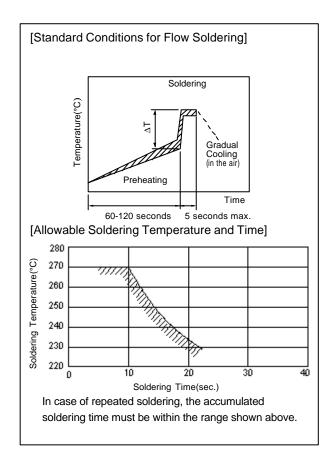
When components are immersed in solvent after mounting, be sure to maintain the temperature difference between the component and solvent within the range shown in Table 2.

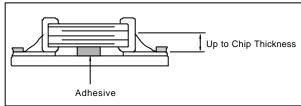
Don't apply flow soldering to chips not listed in Table 2.

Table 2

Part Number	Temperature Differential	
GR□18/21/31	Δ T ≤ 150°C	

Optimum Solder Amount for Flow Soldering





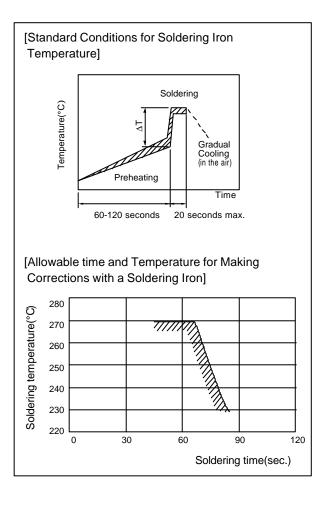
7. Correction with a Soldering Iron

(1) For Chip Type Capacitors

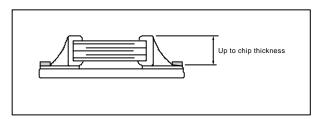
•Sudden heating of the chip results in distortion due to a high internal temperature differential, causing cracked chips. When preheating, keep temperature differential, ΔT , within the range shown in Table 3. The smaller the ΔT , the less stress on the chip.

Table 3

Part Number	Temperature Differential
GR□03/15 GR□18/21/31	Δ T ≦ 190°C
GR□32/43/55	Δ T ≦ 130°C



 Optimum Solder Amount when Corrections Are Made Using a Soldering Iron



8.Washing

Excessive output of ultrasonic oscillation during cleaning causes PCBs to resonate, resulting in cracked chips or broken solder. Take note not to vibrate PCBs.

Failure to follow the above cautions may result, worst case, in a short circuit and fuming when the products is use.

NOTICE

■Soldering and Mounting

1.PCB Design

(1)Notice for Pattern Forms

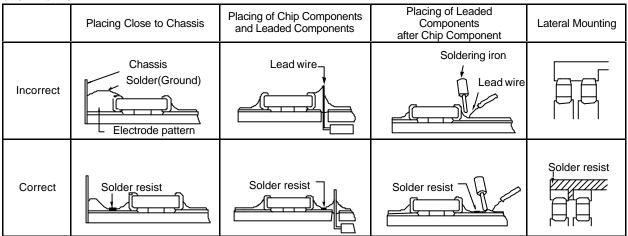
Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.

They are also more sensitive to mechanical and thermal stresses than leaded components.

Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

It has a possibility to happen the chip crack by the expansion and shrinkage of metal board. Please contact us if you want to use the ceramic capacitor on metal board such as Aluminum.

Pattern Forms



(2)Land Dimensions

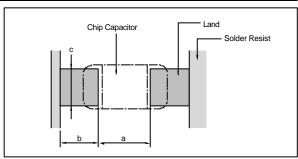


Table 1 Flow Soldering Method

Dimensions Part Number	Dimensions(L X W)	а	b	С
GR□18	1.6 X 0.8	0.6-1.0	0.8-0.9	0.6-0.8
GR □21	2.0 X 1.25	1.0-1.2	0.9-1.0	0.8-1.1
GR□31	3.2 X 1.6	2.2-2.6	1.0-1.1	1.0-1.4

(in : mm)

Table 2 Reflow Soldering Method

Dimensions				
	Dimensions(L X W)	a	b	С
Part Number				
GR□02	0.4 X 0.2	0.16-0.2	0.12-0.18	0.2-0.23
GR□03	0.6 X 0.3	0.2-0.3	0.2-0.35	0.2-0.4
GR□15	1.0 X 0.5	0.3-0.5	0.35-0.45	0.4-0.6
GR□18	1.6 X 0.8	0.6-0.8	0.6-0.7	0.6-0.8
GR□21	2.0 X 1.25	1.0-1.2	0.6-0.7	0.8-1.1
GR □ 31	3.2 X 1.6	2.2-2.4	0.8-0.9	1.0-1.4
GR□32	3.2 X 2.5	2.0-2.4	1.0-1.2	1.8-2.3
GR□43	4.5 X 3.2	3.0-3.5	1.2-1.4	2.3-3.0
GR□55	5.7 X 5.0	4.0-4.6	1.4-1.6	3.5-4.8

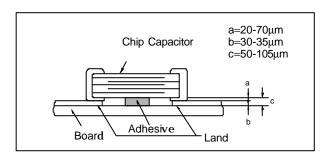
(in:mm)

2. Adhesive Application

Thin or insufficient adhesive causes chips to loosen or become disconnected when flow soldered. The amount of adhesive must be more than dimension c shown in the drawing below to obtain enough bonding strength.

The chip's electrode thickness and land thickness must be taken into consideration.

●Low viscosity adhesive causes chips to slip after mounting. Adhesive must have a viscosity of 5000pa-s(500ps)min. (at 25°C)



3. Adhesive Curing

Insufficient curing of the adhesive causes chips to disconnect during flow soldering and causes deteriorated insulation resistance between outer electrodes due to moisture absorption.

Control curing temperature and time in order to prevent insufficient hardening.

Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.

4.Flux Application

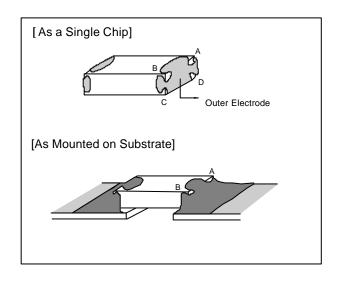
- •An excessive amount of flux generates a large quantity of flux gas, causing deteriorated solderability. So apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering).
- •Flux containing too high a percentage of halide may cause corrosion of the outer electrodes unless sufficiently cleaned. Use flux with a halide content of 0.2% max.

 But do not use strongly acidic flux.

Wash thoroughly because water-soluble flux causes deteriorated insulation resistance between outer electrodes unless sufficiently cleaned.

5.Flow Soldering

Set temperature and time to ensure that leaching of the outer electrode does not exceed 25% of the chip end area as a single chip(full length of the edge A-B-C-D shown below) and 25% of the length A-B shown below as mounted on substrate.



■Others

1.Resin Coating

When selecting resin materials, select those with low contraction.

2.Circuit Design

These capacitors on this catalog are not safety recognized products.

3.Remarks

The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions. Select optimum conditions for operation as they determine the reliability of the product after assembly.

ANOTE

- 1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- 2. Your are requested not to use our product deviating from this product specification.
- Please return one copy of these specifications upon your acceptance.
 If the copy is not returned by a day mentioned in a cover the specifications will be deemed to have been accepted.
- 4. We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.