CHIP MONOLITHIC CERAMIC CAPACITOR

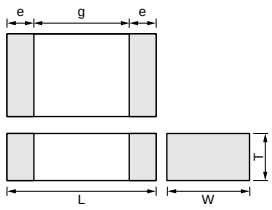
High-power Type GRM600 Series

■ Features

1. Mobile Telecommunication and RF module, mainly.
2. Quality improvement of telephone call, Low power Consumption, yield ratio improvement.

■ Application

VCO, PA, Mobile Telecommunication



Part Number	Dimensions (mm)				
	L	W	T	e	g min.
GRM615	1.0 ±0.05	0.5 ±0.05	0.5 ±0.05	0.15 to 0.3	0.4

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Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM615C0G010B50	50	C0G	1.0 –0.1pF	1.00	0.50	0.50
GRM615C0G010C50	50	C0G	1.0 –0.25pF	1.00	0.50	0.50
GRM615C0G020B50	50	C0G	2.0 –0.1pF	1.00	0.50	0.50
GRM615C0G020C50	50	C0G	2.0 –0.25pF	1.00	0.50	0.50
GRM615C0G030B50	50	C0G	3.0 –0.1pF	1.00	0.50	0.50
GRM615C0G030C50	50	C0G	3.0 –0.25pF	1.00	0.50	0.50
GRM615C0G040B50	50	C0G	4.0 –0.1pF	1.00	0.50	0.50
GRM615C0G040C50	50	C0G	4.0 –0.25pF	1.00	0.50	0.50
GRM615C0G050B50	50	C0G	5.0 –0.1pF	1.00	0.50	0.50
GRM615C0G050C50	50	C0G	5.0 –0.25pF	1.00	0.50	0.50
GRM615C0G060C50	50	C0G	6.0 –0.25pF	1.00	0.50	0.50
GRM615C0G060D50	50	C0G	6.0 –0.5pF	1.00	0.50	0.50
GRM615C0G070C50	50	C0G	7.0 –0.25pF	1.00	0.50	0.50
GRM615C0G070D50	50	C0G	7.0 –0.5pF	1.00	0.50	0.50
GRM615C0G080C50	50	C0G	8.0 –0.25pF	1.00	0.50	0.50
GRM615C0G080D50	50	C0G	8.0 –0.5pF	1.00	0.50	0.50
GRM615C0G090C50	50	C0G	9.0 –0.25pF	1.00	0.50	0.50
GRM615C0G090D50	50	C0G	9.0 –0.5pF	1.00	0.50	0.50
GRM615C0G0R5B50	50	C0G	0.5 –0.1pF	1.00	0.50	0.50
GRM615C0G0R5C50	50	C0G	0.50 –0.25pF	1.00	0.50	0.50
GRM615C0G100C50	50	C0G	10 –0.25pF	1.00	0.50	0.50
GRM615C0G100D50	50	C0G	10.0 –0.5pF	1.00	0.50	0.50
GRM615C0G110G50	50	C0G	11 –2%	1.00	0.50	0.50
GRM615C0G120G50	50	C0G	12 –2%	1.00	0.50	0.50
GRM615C0G120J50	50	C0G	12 –5%	1.00	0.50	0.50
GRM615C0G130G50	50	C0G	13 –2%	1.00	0.50	0.50
GRM615C0G150G50	50	C0G	15 –2%	1.00	0.50	0.50
GRM615C0G150J50	50	C0G	15 –5%	1.00	0.50	0.50
GRM615C0G160G50	50	C0G	16 –2%	1.00	0.50	0.50
GRM615C0G180G50	50	C0G	18 –2%	1.00	0.50	0.50
GRM615C0G180J50	50	C0G	18 –5%	1.00	0.50	0.50
GRM615C0G1R1B50	50	C0G	1.1 –0.1pF	1.00	0.50	0.50
GRM615C0G1R2B50	50	C0G	1.2 –0.1pF	1.00	0.50	0.50
GRM615C0G1R3B50	50	C0G	1.3 –0.1pF	1.00	0.50	0.50
GRM615C0G1R5B50	50	C0G	1.5 –0.1pF	1.00	0.50	0.50
GRM615C0G1R5C50	50	C0G	1.5 –0.25pF	1.00	0.50	0.50
GRM615C0G1R6B50	50	C0G	1.6 –0.1pF	1.00	0.50	0.50
GRM615C0G1R8B50	50	C0G	1.8 –0.1pF	1.00	0.50	0.50

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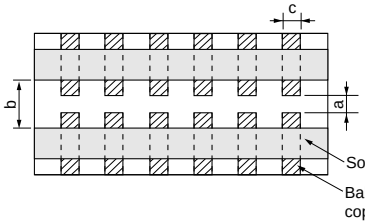
Part Number	Rated Voltage (Vdc)	TC Code	Capacitance (pF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GRM615C0G200G50	50	C0G	20 –2%	1.00	0.50	0.50
GRM615C0G2R2B50	50	C0G	2.2 –0.1pF	1.00	0.50	0.50
GRM615C0G2R4B50	50	C0G	2.4 –0.1pF	1.00	0.50	0.50
GRM615C0G2R7B50	50	C0G	2.7 –0.1pF	1.00	0.50	0.50
GRM615C0G3R3B50	50	C0G	3.3 –0.1pF	1.00	0.50	0.50
GRM615C0G3R6B50	50	C0G	3.6 –0.1pF	1.00	0.50	0.50
GRM615C0G3R9B50	50	C0G	3.9 –0.1pF	1.00	0.50	0.50
GRM615C0G4R3B50	50	C0G	4.3 –0.1pF	1.00	0.50	0.50
GRM615C0G4R7B50	50	C0G	4.7 –0.1pF	1.00	0.50	0.50
GRM615C0G5R1C50	50	C0G	5.1 –0.25pF	1.00	0.50	0.50
GRM615C0G5R6C50	50	C0G	5.6 –0.25pF	1.00	0.50	0.50
GRM615C0G6R2C50	50	C0G	6.2 –0.25pF	1.00	0.50	0.50
GRM615C0G6R8C50	50	C0G	6.8 –0.25pF	1.00	0.50	0.50
GRM615C0G7R5C50	50	C0G	7.5 –0.25pF	1.00	0.50	0.50
GRM615C0G8R2C50	50	C0G	8.2 –0.25pF	1.00	0.50	0.50
GRM615C0G9R1C50	50	C0G	9.1 –0.25pF	1.00	0.50	0.50

Specifications and Test Methods

No.	Item		Specification: Temperature Compensating Type	Test Method
1	Operating Temperature Range		−55 to +125℃	
2	Rated Voltage		See the previous pages.	The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{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.
5	Dielectric Strength		No defects or abnormalities.	No failure shall be observed when 300% 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 Resistance (I.R.)		10,000MΩ min. or 500Ω • F min. (Whichever is smaller)	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance.	The capacitance/Q shall be measured at 25℃ at the frequency and voltage shown in the table. Item \ Char. : C0G(1000pF and below) Frequency : 1±0.1MHz Voltage : 0.5 to 5Vr.m.s.
8	Q		30pF min. : Q≧1,000 30pF max. : Q≧400+20C C : Nominal Capacitance (pF)	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance. (Table A-1)	The capacitance change shall be measured after 5 min. at each specified temperature stage. 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, (C0G : +25℃ to+125℃ : other temp. coeffs. : +25℃ to 85℃) 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. Step | Temperature(℃) 1 | 25±2 2 | −55±3 3 | 25±2 4 | 125±3 5 | 25±2
		Temperature Coefficent	Within the specified tolerance. (Table A-1)	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.)	
10	Adhesive Strength of Termination		No removal of the terminations or other defect shall occur.	Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply a 5N 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.



Type	a	b	c
GRM615	0.4	1.5	0.5

(in mm)

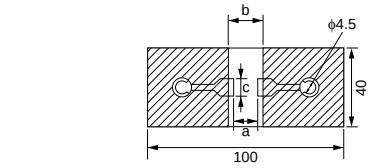
Fig.1

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specification Temperature Compensating Type	Test Method
11	Vibration Resistance	Appearance	No defects or abnormalities.	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).
		Capacitance	Within the specified tolerance.	
		Q	30pF min. : Q≧1,000 30pF max. : Q≧400+20C C : Nominal Capacitance (pF)	
12	Deflection		No cracking or marking defects shall occur.	Solder the capacitor to the test jig (glass epoxy boards) 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..
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℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.
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℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.
		Appearance	No marking defects.	
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	
		Q	30pF and over : Q≧1,000 30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	
		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 at room temperature, then measure.
		Appearance	No marking defects.	
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	
		Q	30pF and over : Q≧1,000 30pF and below : Q≧400+20C C : Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	
		Dielectric Strength	No failure	
16	Humidity, Steady State		The measured and observed characteristics shall satisfy the specifications in the following table.	Sit the capacitor at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) at room temperature, then measure.
		Appearance	No marking defects.	
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	
		Q	30pF and over. : Q≧350 10pF and over, 30pF and below : Q≧275+ $\frac{5}{2}$ C 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	
		I.R.	More than 10,000MΩ or 500Ω • F (Whichever is smaller)	



Type	a	b	c
GRM615	0.4	1.5	0.5

(in mm)

Fig.2

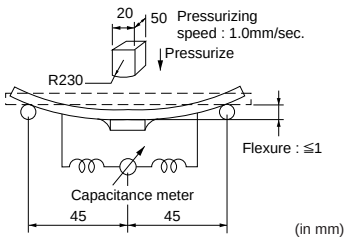


Fig.3

Step	1	2	3	4
Temp.(℃)	Min. Operating Temp. $^{+0}_{-3}$	Room Temp.	Max. Operating Temp. $^{+3}_{-0}$	Room Temp.
Time(min.)	30±3	2 to 3	30±3	2 to 3

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Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specification Temperature Compensating Type	Test Method
17	Humidity Load		The measured and observed characteristics shall satisfy the specifications in the following table.	Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects.	
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	
		Q	30pF and over : Q≧200 30pF and below : Q≧100+$\frac{10}{3}$C C : Nominal Capacitance (pF)	
		I.R.	More than 500MΩ or 25Ω • F (Whichever is smaller)	
		Dielectric Strength	No failure	
18	High Temperature Load		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℃. Let sit for 24±2 hours (temperature compensating type) at room temperature, then measure. The charge/discharge current is less than 50mA.
		Appearance	No marking defects.	
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	
		Q	30pF and over. : Q≧350 10pF and over, 30pF and below : Q≧275+$\frac{5}{2}$C 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	
		I.R.	More than 1,000MΩ or 50Ω • F (Whichever is smaller)	
		Dielectric Strength	No failure	
19	ESR		0.5pF≦C≦1pF : 350MΩ . pF below 1pF<C≦5pF : 300MΩ below 5pF<C≦10pF : 250MΩ below	The ESR shall be measured at room Temp. and frequency 1±0.2GHz with the equivalent of BOONTON Model 34A.
			10pF<C≦20pF : 400MΩ below	The ESR shall be measured at room Temp. and frequency 500±50MHz with the equivalent of HP8753B.

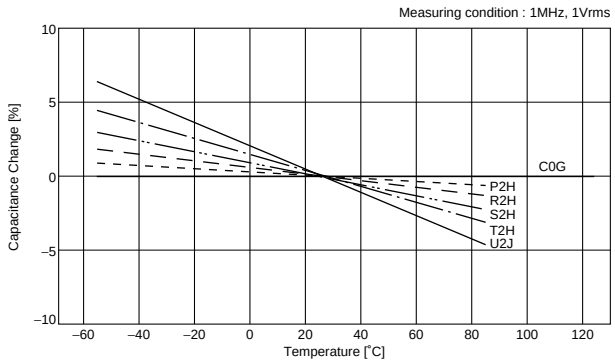
Table A

Char.	Temp. Coeff. (ppm/℃) Note 1	Capacitance Change from 25℃ Value (%)					
		−55℃		−30℃		−10℃	
		Max.	Min.	Max.	Min.	Max.	Min.
C0G	0±30	0.58	−0.24	0.40	−0.17	0.25	−0.11

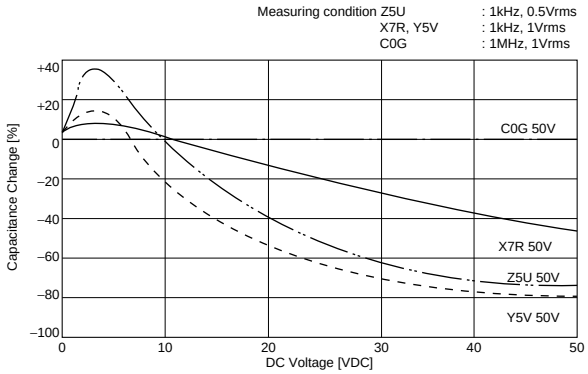
Note 1 : Nominal values denote the temperature coefficient within a range of 25 to 125℃.(for C0Δ)

GRM Series Data

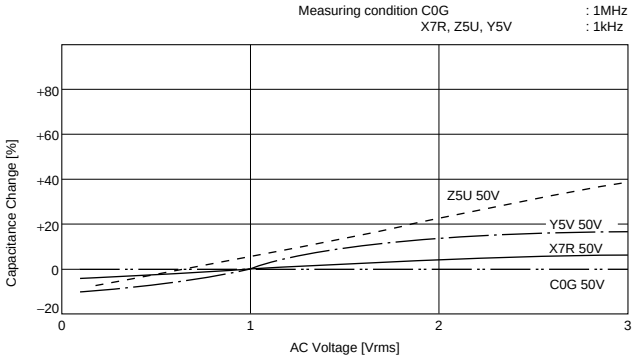
■ Capacitance-Temperature Characterstics



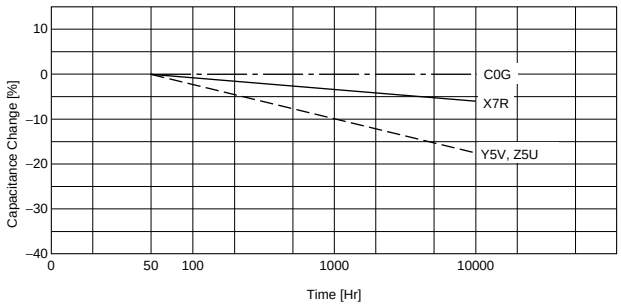
■ Capcitance-DC Voltage Characteristics



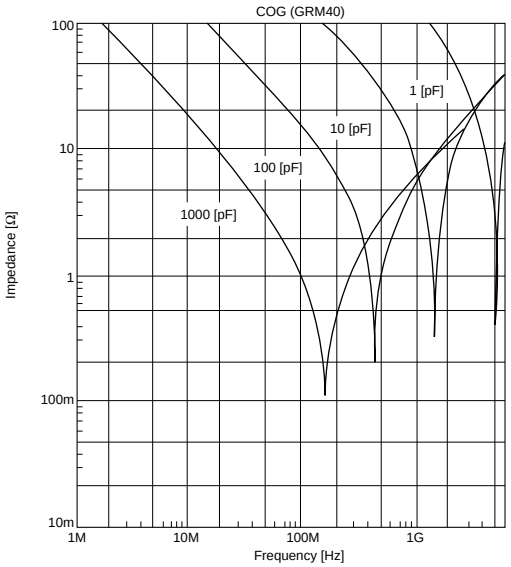
■ Capcitance-AC Voltage Characteristics



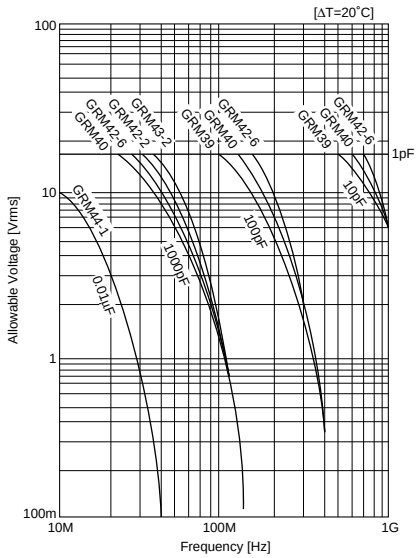
■ Capacitance Change-Aging



■ Impedance-Frequency Characteristics



■ Allowable Voltage-Frequency



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GRM Series Data

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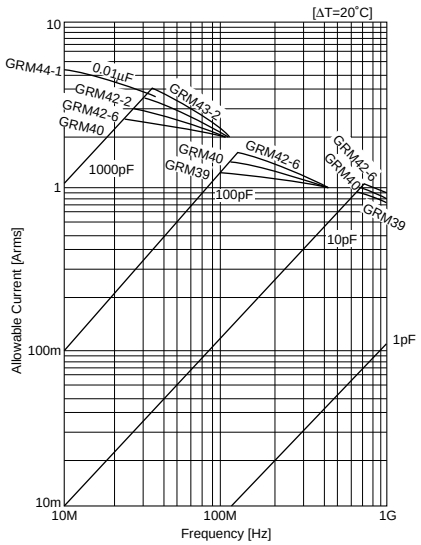
■ Allowable Current-Frequency



■ Allowable Appearant Power