Chip Monolithic Ceramic Capacitors

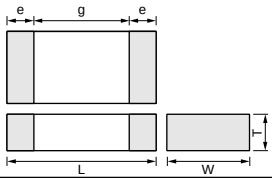
for Smoothing

■ Features

1. Heat generation is low at high frequency because of low dielectric loss.
2. Compared with aluminum electrolytic capacitors, capacitance can be lower to obtain the same smoothing performance.
3. Ceramic capacitor has no polarity and ensures long life time.

■ Applications

• DC-DC converter
• Noise elimination LCD bias circuit
(Use for only alumina, paper or glass epoxy board)



Part Number	Dimensions (mm)				
	L	W	T	e min.	g min.
GJ221B	2.0 ±0.1	1.25 ±0.1	1.25 ±0.1	0.2 to 0.7	0.7
GJ231M	3.2 ±0.15	1.6 ±0.15	1.15 ±0.1	0.3 to 0.8	1.5
GJ232N	3.2 ±0.3	2.5 ±0.2	1.35 ±0.15	0.3	1.0
GJ232C			1.6 ±0.15		
GJ232R			1.8 ±0.2		
GJ243R	4.5 ±0.4	3.2 ±0.3	1.8 ±0.2	0.3	2.0
GJ243X			2.2 ±0.3		

Part Number	TC	Rated Voltage (Vdc)	Capacitance (μF)	Length L (mm)	Width W (mm)	Thickness T (mm)
GJ221BF50J106ZD01	Y5V	6.3	10 +80.-20%	2.00	1.25	1.25
GJ231MF50J226ZD01	Y5V	6.3	22 +80.-20%	3.20	1.60	1.15
GJ232CF50J476ZD01	Y5V	6.3	47 +80.-20%	3.20	2.50	1.60
GJ243RF50J107ZD11	Y5V	6.3	100 +80.-20%	4.50	3.20	1.80
GJ232NF51A226ZD01	Y5V	10	22 +80.-20%	3.20	2.50	1.35
GJ232RF51H475ZD01	Y5V	50	4.7 +80.-20%	3.20	2.50	1.80
GJ243XF51H106ZD12	Y5V	50	10 +80.-20%	4.50	3.20	2.20
GJ232RF52A105ZD01	Y5V	100	1 +80.-20%	3.20	2.50	1.8

Specifications and Test Methods

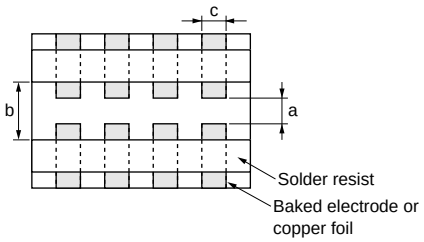
<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operating Temperature Range</td><td>F5 : −30°C to 85°C</td><td></td></tr>
<tr><td>2</td><td>Rated Voltage</td><td>See the previous pages.</td><td>The rated voltage is defined as the maximum voltage 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.</td></tr>
<tr><td>3</td><td>Appearance</td><td>No defects or abnormalities.</td><td>Visual inspection.</td></tr>
<tr><td>4</td><td>Dimensions</td><td>Within the specified dimension.</td><td>Using calipers.</td></tr>
<tr><td>5</td><td>Dielectric Strength</td><td>No defects or abnormalities.</td><td>No failure shall be observed when 250% of the rated voltage is applied between the both terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.</td></tr>
<tr><td>6</td><td>Insulation Resistance</td><td>More than 10,000MΩ or 500Ω · F.
(Whichever is smaller)</td><td>The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 2 minutes* of charging.
*5minutes for c>47µF.</td></tr>
<tr><td>7</td><td>Capacitance</td><td>Within the specified tolerance.</td><td rowspan="2">The capacitance/D.F. shall be measured at 25°C at the frequency and voltage shown in the table.
<table><tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr><tr><td>C≦10µF</td><td>1±0.1kHz</td><td>1±0.2Vrms</td></tr><tr><td>C>10µF</td><td>120±24Hz</td><td>0.5±0.1Vrms</td></tr></table></td></tr>
<tr><td>8</td><td>Dissipation Factor (D.F.)</td><td>0.07 max. (50/100V)
0.09 max. (10/16/25V)
0.15 max. (6.3V)</td></tr>
<tr><td>9</td><td>Capacitance Temperature Characteristics</td><td><table><tr><th>Char.</th><th>Temp. Range</th><th>Reference Temp.</th><th>Cap. Change Rate</th></tr><tr><td>F5</td><td>-30 to +85°C</td><td>25°C</td><td>Within $^{+22}_{-82}$%</td></tr></table></td><td>The capacitance change shall be measured after 5 min. at each specified temperature stage.
The ranges of capacitance change compared to 25°C with the temperature ranges shown in the table shall be within the specified ranges.</td></tr>
<tr><td>10</td><td>Adhesive Strength of Termination</td><td>No removal of the terminations or other defects shall occur.
 

Fig.1</td><td>Solder the capacitor on the testing jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 5N force in parallel with the test jig for 10±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 defect such as heat shock.
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GJ218</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GJ221</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GJ231</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GJ232</td><td>2.2</td><td>5.0</td><td>2.9</td></tr><tr><td>GJ243</td><td>3.5</td><td>7.0</td><td>3.7</td></tr></table>(in mm)</td></tr>
<tr><td>11</td><td>Vibration Resistance</td><td><table><tr><td>Item</td><td colspan="3">Frequency</td></tr><tr><td>Appearance</td><td colspan="3">No defects or abnormalities.</td></tr><tr><td>Capacitance Change</td><td colspan="3">Within the specified tolerance.</td></tr><tr><td>D.F.</td><td>50, 100V
0.07 max.</td><td>10, 16, 25V
0.09 max.</td><td>6.3V
0.15 max.</td></tr><tr><td>Dielectric Strength</td><td colspan="3">No failure</td></tr></table></td><td>Solder the capacitor on the testing jig (glass epoxy board) in the same manner and under the same conditions as (10).
The capacitor shall be subjected to 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).</td></tr>
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Specifications and Test Methods

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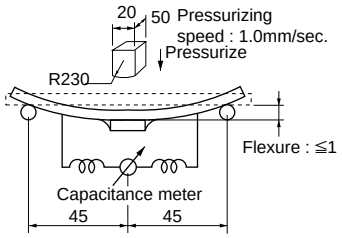
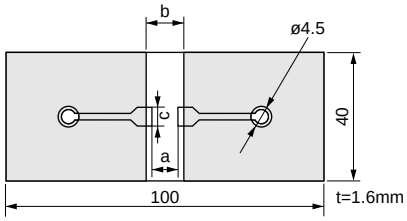
No.	Item	Specification	Test Method
12	Deflection	No cracks or marking defects shall occur.  Fig.3	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig.3 for 5±1 sec. The soldering shall be done either with an 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.  Fig.2 Type / a / b / c **GJ218** 1.0 / 3.0 / 1.2 **GJ221** 1.2 / 4.0 / 1.65 **GJ231** 2.2 / 5.0 / 2.0 **GJ232** 2.2 / 5.0 / 2.9 **GJ243** 3.5 / 7.0 / 3.7 (in mm)
13	Solderability of Termination	75% of the terminations is to be soldered evenly and continuously.	Immerse the capacitor first ethanol (JIS-K-8101)a solution of rosin (JIS-K-5902) (25% rosin in weight proportion), then in an eutectic solder solution for 2±0.5 seconds at 230±5°C after preheating in the following table. then set it for 48±4 hours at room temperature and measure.
14	Resistance to Soldering Heat	The measured values shall satisfy the values in the following table. Item: Specification Appearance: No marked defect Capacitance Change: Within ±20% I. R.: More than 10,000MΩ or 500Ω · F (Whichever is smaller) D.F.: 50, 100V: 0.07 max. / 10, 16, 25V: 0.09 max. / 6.3V: 0.15 max. Dielectric Strength: No failure	The capacitor shall be set for 48±4 hours at room temperature after one hour heat of treatment at 150^{+0}_{-10} °C. Immerse the capacitor in a eutectic solder solution at 270± 5°C for 10±0.5 seconds after preheating in the flowing table. Then set it for 48T4 hours at room temperature and measure.
15	Temperature Cycle	No marking defects. Item: Specification Appearance: No marked defect Capacitance Change: Within ±20% I. R.: More than 10,000MΩ or 500Ω · F (Whichever is smaller) D.F.: 50, 100V: 0.07 max. / 10, 16, 25V: 0.09 max. / 6.3V: 0.15 max. Dielectric Strength: No failure	The capacitor shall be set for 48±4 hours at room temperature after one hour heat of treatment at 150^{+0}_{-10} °C. Then measure for the initial measurement. Fix capacitor to the supporting jig in the same manner and under the same conditions as in (10) and conduct the five cycles according to the temperature and time shown in the following table. Set it for 48±4 hours at room temperature, then measure. Step / 1 / 2 / 3 / 4 Temp. (ºC): Min. Operating Temp. $^{+3}_{-0}$ / Room Temp. / Max. Operating Temp. $^{+3}_{-0}$ / Room Temp. Time (min.): 30±3 / 2 to 3 / 30±3 / 2 to 3
16	Humidity Steady State	No marking defects. Item: Specification Appearance: No marked defect Capacitance Change: Within ±30% I. R.: More than 1,000MΩ or 50Ω · F (Whichever is smaller) D.F.: 50, 100V: 0.1 max. / 10, 16, 25V: 0.125 max. / 6.3V: 0.2 max. Dielectric Strength: No failure	Set the capacitor for 500±12 hours at 40±2°C and 90 to 95% humidity. Take it out and set it for 48T4 hours at room temperature, then measure.
17	Humidity Load	No marking defects. Item: Specification Appearance: No marked defect Capacitance Change: Within ±30% I. R.: More than 500MΩ or 25Ω · F (Whichever is smaller) D.F.: 50, 100V: 0.1 max. / 10, 16, 25V: 0.125 max. / 6.3V: 0.2 max. Dielectric Strength: No failure	Apply the rated voltage for 500±12 hours at 40±2°C and 90 to 95% humidity and set it for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA.

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Specifications and Test Methods

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<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>18</td><td>High Temperature Load</td><td>No marked defect.
<table>
<tr><td>Item</td><td colspan="3">Specification</td></tr>
<tr><td>Appearance</td><td colspan="3">No marked defect</td></tr>
<tr><td>Capacitance Change</td><td colspan="3">Within ±30%</td></tr>
<tr><td>I. R.</td><td colspan="3">More than 1,000MΩ or 50Ω · F
(Whichever is smaller)</td></tr>
<tr><td>D.F.</td><td>50, 100V
0.1 max.</td><td>10, 16, 25V
0.125 max.</td><td>6.3V
0.2 max.</td></tr>
<tr><td>Dielectric Strength</td><td colspan="3">No failure</td></tr>
</table></td><td>The voltage treatment shall be given to the capacitor, in which a DC voltage of 200%* the rated voltage is applied for one hour at the maximum operating temperature ±3°C then it shall be set for 48±4 hours at room temperature and the measurement shall be conducted. Then apply the above mentioned voltage continuously for 1000±12 hours at the same temperature, remove it from the bath, and set it for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
*150% for C>10µF</td></tr>
</table>

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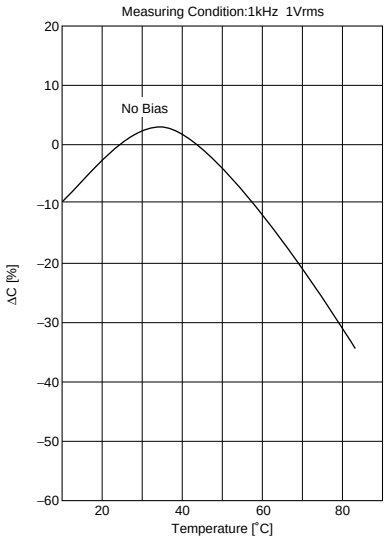
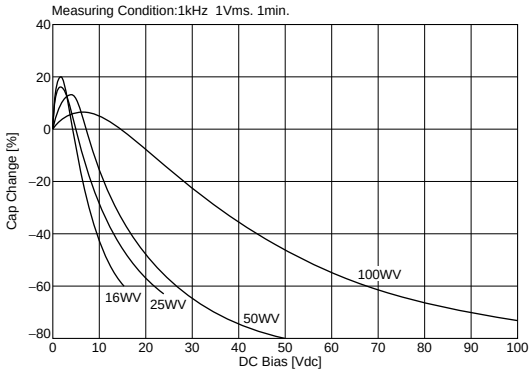
Characteristics Data

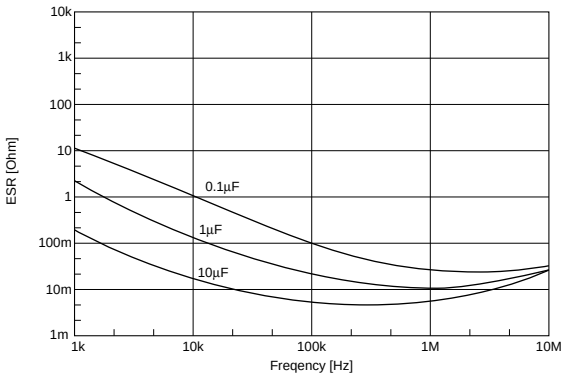
■ Capacitance-Temperature Characteristics



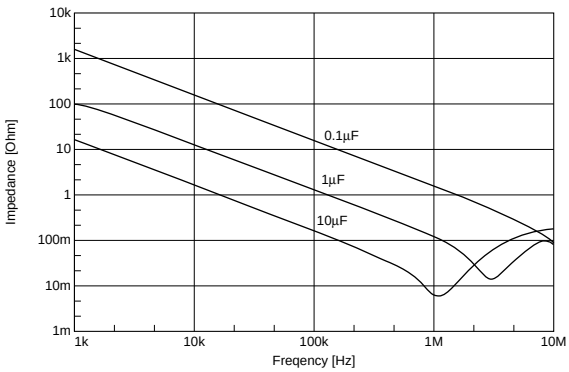
■ Capcitance-DC Voltage Characteristics



■ Capcitance-AC Voltage Characteristics



■ Impedance-Frequency Characteristics



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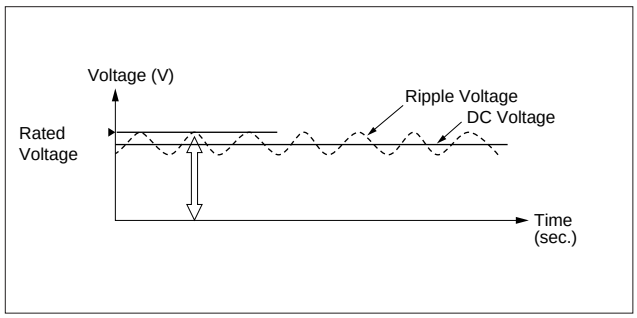
Reference Data

■ Allowable Ripple Current

Ripple current should be less than "Allowable ripple current value" shown in the following table.
And temperature rise of the chip surface (ΔT) should be below 20°C. When AC and DC voltage are superimposed, keep the peak value of the voltage within the rated voltage.



Allowable ripple current value

Series	Rated Voltage	Allowable ripple current value (r.m.s.)		
		100kHz≦ f <300kHz	300kHz≦ f <500kHz	500kHz≦ f <1MHz
GJ221	4V / 6.3V	1.4Ar.m.s.	1.5Ar.m.s.	1.6Ar.m.s.
GJ231		1.5Ar.m.s.	1.6Ar.m.s.	1.6Ar.m.s.
GJ232		1.7Ar.m.s.	1.8Ar.m.s.	2.0Ar.m.s.
GJ243		1.4Ar.m.s.	1.3Ar.m.s.	1.2Ar.m.s.
GJ218	10V	1.4Ar.m.s.	1.5Ar.m.s.	1.6Ar.m.s.
GJ231		1.5Ar.m.s.	1.6Ar.m.s.	1.6Ar.m.s.
GJ232		1.7Ar.m.s.	1.8Ar.m.s.	2.0Ar.m.s.
GJ243		1.4Ar.m.s.	1.3Ar.m.s.	1.2Ar.m.s.
GJ231	16V	1.5Ar.m.s.	1.6Ar.m.s.	1.6Ar.m.s.
GJ232		1.7Ar.m.s.	1.8Ar.m.s.	2.0Ar.m.s.
GJ232	25V / 35V / 50V	2.0Ar.m.s.	2.2Ar.m.s.	2.2Ar.m.s.
GJ243		2.0Ar.m.s.	2.2Ar.m.s.	2.2Ar.m.s.
GJ232	100V	1.6Ar.m.s.	1.7Ar.m.s.	1.8Ar.m.s.