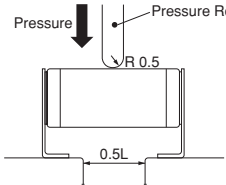
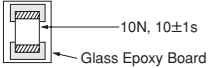



High Capacitance for General Use KRM Series Specifications and Test Methods

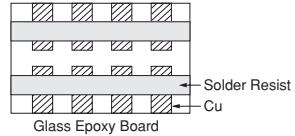
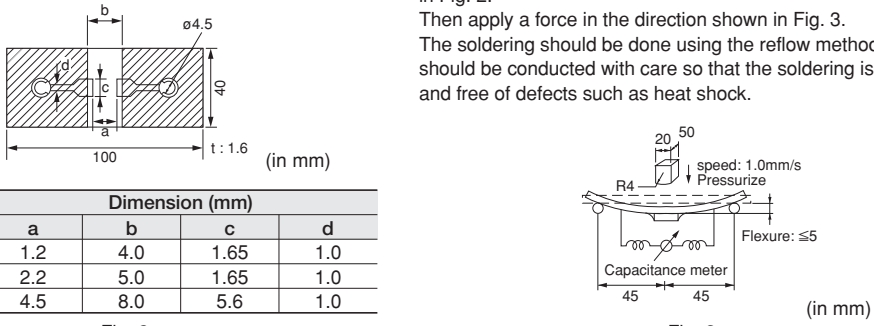
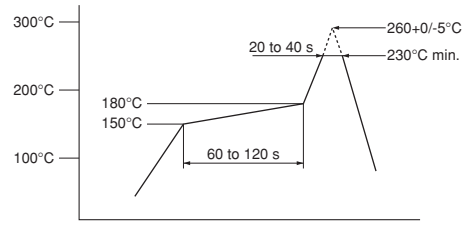
No.	Item	Specifications	Test Method												
1	Operating Temperature Range	X5R Char.: -55 to +85°C X6S Char.: -55 to +105°C X7R Char.: -55 to +125°C	Reference temperature: 25°C												
2	Appearance	No defects or abnormalities	Visual inspection												
3	Dimensions	Within the specified dimensions	Using calipers and micrometers												
4	Dielectric Strength	No defects or abnormalities	<p>No failure should be observed when voltage in the table is applied between the terminations for 1 to 5 sec., provided the charge/discharge current is less than 50mA.</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Test Voltage</th> </tr> </thead> <tbody> <tr> <td>DC16V, DC25V, DC35V, DC50V, DC63V</td> <td>250% of the reted voltage</td> </tr> <tr> <td>DC100V, DC250V</td> <td>200% of the reted voltage</td> </tr> <tr> <td>DC630V</td> <td>150% of the reted voltage</td> </tr> <tr> <td>DC1000V</td> <td>120% of the reted voltage</td> </tr> </tbody> </table>	Rated Voltage	Test Voltage	DC16V, DC25V, DC35V, DC50V, DC63V	250% of the reted voltage	DC100V, DC250V	200% of the reted voltage	DC630V	150% of the reted voltage	DC1000V	120% of the reted voltage		
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DC1000V	120% of the reted voltage														
5	Insulation Resistance (I.R.)	[KRM21, KRM31] W.V.: 16V/25V/35V : More than 50MΩ · μF W.V.: 50V/100V : More than 500MΩ · μF [KRM55] More than 100MΩ · μF	The insulation resistance should be measured with Rated Voltage and within 60±5 sec. of charging.												
6	Capacitance	Within the specified tolerance													
7	Dissipation Factor (D.F.)	[KRM21, KRM31] W.V.: 16V/25V/35V : 0.15 max. W.V.: 50V : 0.025 max. W.V.: 100V : 0.05 max. [KRM55] 0.025 max.	<p>The capacitance/D.F. should be measured at reference temperature at the meaning frequency and voltage shown in the table.</p> <table border="1"> <thead> <tr> <th>Nominal Capacitance</th> <th>Measuring Frequency</th> <th>Measuring Voltage</th> </tr> </thead> <tbody> <tr> <td>C>10μF</td> <td>120±24Hz</td> <td>AC0.5±0.1V(r.m.s.)</td> </tr> <tr> <td>C≤10μF</td> <td>1±0.2kHz</td> <td>AC1.0±0.2V(r.m.s.)</td> </tr> </tbody> </table>	Nominal Capacitance	Measuring Frequency	Measuring Voltage	C>10μF	120±24Hz	AC0.5±0.1V(r.m.s.)	C≤10μF	1±0.2kHz	AC1.0±0.2V(r.m.s.)			
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C≤10μF	1±0.2kHz	AC1.0±0.2V(r.m.s.)													
8	Capacitance Temperature Characteristics	X5R Char.: Within ±15% (Temp. Range: -55 to +85°C) X6S Char.: Within ±22% (Temp. Range: -55 to +105°C) X7R Char.: Within ±15% (Temp. Range: -55 to +125°C)	<p>The capacitance measurement should be made at each step specified in the Table.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25±2</td> </tr> <tr> <td>2</td> <td>Min. Operating Temp. ±3</td> </tr> <tr> <td>3</td> <td>25±2</td> </tr> <tr> <td>4</td> <td>Max. Operating Temp. ±2</td> </tr> <tr> <td>5</td> <td>25±2</td> </tr> </tbody> </table> <p>•Pretreatment Perform a heat treatment at 150+0/-10°C for 60±5 min. and then let sit for 24±2 hrs. at room condition. (*1)</p>	Step	Temperature (°C)	1	25±2	2	Min. Operating Temp. ±3	3	25±2	4	Max. Operating Temp. ±2	5	25±2
Step	Temperature (°C)														
1	25±2														
2	Min. Operating Temp. ±3														
3	25±2														
4	Max. Operating Temp. ±2														
5	25±2														
9	Strength of Metal Terminal	Termination not to be broken or loosened	<p>A static load of 10N using a pressure rod should be applied to the center in the direction of the arrow and held for 10 s.</p> 												
10	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.	<p>Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 1. Then apply 10N force in the direction of the arrow. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free defects such as heat shock.</p>  <p>Fig. 1</p>												

(*1) "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa


Continued on the following page. 

High Capacitance for General Use KRM Series Specifications and Test Methods

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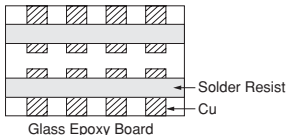
No.	Item	Specifications	Test Method																					
11	Appearance	No defects or abnormalities	Solder the capacitor to the test jig (glass epoxy board). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 min. This motion should be applied for a period of 2 hrs. in each of 3 mutually perpendicular directions (total of 6 hrs.). 																					
	Capacitance	Within the specified tolerance																						
	D.F.	In accordance with item No.7																						
12	Deflection	No marking defects	Solder the capacitor to the testing jig (glass epoxy board) shown in Fig. 2. Then apply a force in the direction shown in Fig. 3. The soldering should be done using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. 																					
		<table border="1"> <thead> <tr> <th rowspan="2">Type</th> <th colspan="4">Dimension (mm)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>KRM21</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> <td>1.0</td> </tr> <tr> <td>KRM31</td> <td>2.2</td> <td>5.0</td> <td>1.65</td> <td>1.0</td> </tr> <tr> <td>KRM55</td> <td>4.5</td> <td>8.0</td> <td>5.6</td> <td>1.0</td> </tr> </tbody> </table>		Type	Dimension (mm)				a	b	c	d	KRM21	1.2	4.0	1.65	1.0	KRM31	2.2	5.0	1.65	1.0	KRM55	4.5
Type	Dimension (mm)																							
	a	b	c	d																				
KRM21	1.2	4.0	1.65	1.0																				
KRM31	2.2	5.0	1.65	1.0																				
KRM55	4.5	8.0	5.6	1.0																				
13	Solderability of Termination	The metal surface is soldered well	Reflow Soldering: Peak 260+0/-5°C The area of soldering 230°C min., 20 to 40 s Let sit for 24±2 h at room condition,* then measure. •Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 min. and then let sit for 24±2 h at room condition. (*1) 																					
14	Appearance	No marking defects	•In case of Reflow Soldering See item 13 Solderability of termination •In case of Soldering Iron Temp. of solder: 350±10°C Solder time: 4+1/-0 s Let sit for 24±2 hrs.at room condition,* then measure Please refer to "Caution (Soldering and Mounting) Correction with a Soldering Iron"																					
	Resistance to Soldering Heat																							
	Capacitance Change	Within ±10%																						
	D.F.	In accordance with item No.7																						
	I.R.	In accordance with item No.5																						
	Dielectric Strength	In accordance with item No.4																						

(*1) "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Continued on the following page. 

High Capacitance for General Use KRM Series Specifications and Test Methods

Continued from the preceding page.

No.	Item	Specifications	Test Method															
15	Temperature Cycle	Appearance	No marking defects															
		Capacitance Change	Within $\pm 7.5\%$															
		D.F.	In accordance with item No.7															
		I.R.	In accordance with item No.5															
		Dielectric Strength	In accordance with item No.4															
			<p>Fix the capacitor to the supporting jig (glass epoxy board) shown in Fig. 4.</p> <p>Perform the 100 cycles according to the 4 heat treatments listed in the following table.</p> <p>Let sit for 24\pm2 hrs. at room condition,* then measure.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. Operating Temp. ± 3</td> <td>30\pm3</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> <tr> <td>3</td> <td>Max. Operating Temp. ± 2</td> <td>30\pm3</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>2 to 3</td> </tr> </tbody> </table> <p>•Pretreatment Perform a heat treatment at 150+0/-10°C for 60\pm5 min. and then let sit for 24\pm2 hrs. at room condition. (*1)</p>  <p style="text-align: center;">Fig. 4</p>	Step	Temperature (°C)	Time (min.)	1	Min. Operating Temp. ± 3	30 \pm 3	2	Room Temp.	2 to 3	3	Max. Operating Temp. ± 2	30 \pm 3	4	Room Temp.	2 to 3
Step	Temperature (°C)	Time (min.)																
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2	Room Temp.	2 to 3																
3	Max. Operating Temp. ± 2	30 \pm 3																
4	Room Temp.	2 to 3																
16	Humidity (Steady State)	Appearance	No marking defects															
		Capacitance Change	Within $\pm 15\%$															
		D.F.	[KRM21, KRM31] W.V.: 16V/25V/35V : 0.2 max. W.V.: 50V/100V : 0.05 max. [KRM55] 0.05 max.															
		I.R.	[KRM21, KRM31] W.V.: 16V/25V/35V : More than 12.5M Ω · μ F W.V.: 50V/100V : More than 50M Ω · μ F [KRM55] More than 10M Ω · μ F															
		Dielectric Strength	In accordance with item No.4															
			<p>Let the capacitor sit at 40\pm2°C and relative humidity of 90 to 95% for 500+24/-0 hrs.</p> <p>Remove and let sit for 24\pm2 hrs. at room condition,* then measure.</p> <p>•Pretreatment Perform a heat treatment at 150+0/-10°C for 60\pm5 min. and then let sit for 24\pm2 hrs. at room condition. (*1)</p>															
17	Life	Appearance	No marking defects															
		Capacitance Change	Within $\pm 15\%$ (Rated Voltage: DC16V to DC100V) Within $\pm 20\%$ (Rated Voltage: DC1000V)															
		D.F.	[KRM21, KRM31] W.V.: 16V/25V/35V : 0.2 max. W.V.: 50V/100V : 0.05 max. [KRM55] 0.05 max.															
		I.R.	[KRM21, KRM31] W.V.: 16V/25V/35V : More than 25M Ω · μ F W.V.: 50V/100V : More than 50M Ω · μ F [KRM55] More than 10M Ω · μ F															
		Dielectric Strength	In accordance with item No.4															
			<p>Apply voltage as in the Table for 1000+48/-0 hrs. at maximum operating temperature $\pm 3^\circ\text{C}$. Remove and let sit for 24\pm2 hrs. at room condition, (*1) then measure.</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Applied Voltage</th> </tr> </thead> <tbody> <tr> <td>DC16V, DC25V, DC35V, DC50V</td> <td>200% of rated voltage (*2)</td> </tr> <tr> <td>DC63V, DC100V, DC250V</td> <td>150% of rated voltage</td> </tr> <tr> <td>DC630V</td> <td>120% of rated voltage</td> </tr> <tr> <td>DC1000V</td> <td>110% of rated voltage</td> </tr> </tbody> </table> <p>The charge/discharge current is than 50mA.</p> <p>•Pretreatment Perform a heat treatment at 150+0/-10°C for 60\pm5 min. and then let sit for 24\pm2 hrs. at room condition. (*1)</p> <p>(*2) KRM21, KRM31: 150% of the rated voltage</p>	Rated Voltage	Applied Voltage	DC16V, DC25V, DC35V, DC50V	200% of rated voltage (*2)	DC63V, DC100V, DC250V	150% of rated voltage	DC630V	120% of rated voltage	DC1000V	110% of rated voltage					
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