ERB Series Specifications and Test Method (1)

No.	Item		Specifications	Test Method
1	Operating Temperature Range		−55 to +125℃	Reference Temperature: 25°C
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, should be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities	Visual inspection
4	Dimensions		Within the specified dimension	Using calipers
5	Dielectric Strength		No defects or abnormalities	No failure should 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. (*) 300V: 250%, 500V: 200%
6	Insulation Resistance (I.R.)		1,000,000MΩ min. (C≦470pF) 100,000MΩ min. (C>470pF)	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25℃ and standard humidity and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance	The capacitance/Q should be measured at 25℃ at the frequency and voltage shown in the table.
8	Q		C≦ 220pF : Q≧10,000 220pF<C≦ 470pF : Q≧ 5,000 470pF<C≦1,000pF : Q≧ 3,000 C: Nominal Capacitance (pF)	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance (Table A-6)	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, the capacitance should 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 steps 1, 3 and 5 by the capacitance value in step 3.
		Temperature Coefficent	Within the specified tolerance (Table A-6)	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger)	
10	Adhesive Strength of Termination		No removal of the terminations or other defects should occur.	Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 1 using an eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.

Frequency	1±0.1MHz
Voltage	1±0.2Vrms

Step	Temperature (℃)
1	25±2
2	−55±3
3	25±2
4	125±3
5	25±2

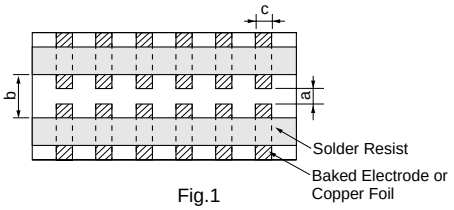

Fig.1

Type	a	b	c
ERB18	1.0	3.0	1.2
ERB21	1.2	4.0	1.65
ERB32	2.2	5.0	2.9

(in mm)
*5N (ERB188)

Continued on the following page.

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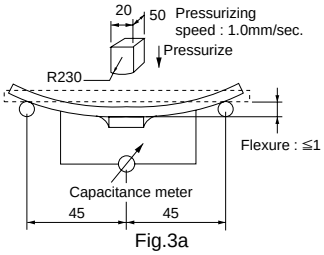
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No defects or abnormalities</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10).
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 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>Q</td><td>Satisfies the initial value.
C≦ 220pF : Q≧10,000
220pF<C≦ 470pF : Q≧ 5,000
470pF<C≦1,000pF : Q≧ 3,000
C: Nominal Capacitance (pF)</td></tr>
<tr><td rowspan="3">12</td><td rowspan="3">Deflection</td><td>Appearance</td><td>No marking defects</td><td rowspan="3">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. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.
<table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>ERB18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>ERB21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>ERB32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr></table>(in mm)</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF
(Whichever is larger)</td></tr>
<tr><td colspan="2"> 

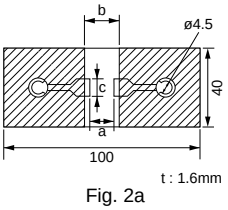
Fig.3a


Fig. 2a</td></tr>
<tr><td>13</td><td colspan="2">Solderability of Termination</td><td>95% of the terminations are to be soldered evenly and continuously.</td><td>Immerse the capacitor in a solution of isopropyl alcohol and rosin (25% rosin in weight proportion).
Preheat at 80 to 120℃ for 10 to 30 seconds.
After preheating, immerse in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution for 5±0.5 seconds at 245±5℃.</td></tr>
<tr><td>14</td><td colspan="2">Resistance to Soldering Heat</td><td>The measured and observed characteristics should satisfy the specifications in the following table.
<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF
(Whichever is larger)</td></tr><tr><td>Q</td><td>C≦ 220pF : Q≧10,000
220pF<C≦ 470pF : Q≧ 5,000
470pF<C≦1,000pF : Q≧ 3,000</td></tr><tr><td>Dielectric Strength</td><td>No failure</td></tr></table>C: Nominal Capacitance (pF)</td><td>Preheat according to the conditions listed in the table below. Immerse the capacitor in an eutectic solder or Sn-3.0Ag-0.5Cu solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours.
<table><tr><th>Chip Size</th><th>Preheat Condition</th></tr><tr><td>2.0×1.25mm max.</td><td>1minute at 120 to 150℃</td></tr><tr><td>3.2×2.5mm</td><td>Each 1 minute at 100 to 120℃ and then 170 to 200℃</td></tr></table></td></tr>
<tr><td>15</td><td colspan="2">Temperature Cycle</td><td>The measured and observed characteristics should satisfy the specifications in the following table.
<table><tr><th>Item</th><th>Specifications</th></tr><tr><td>Appearance</td><td>No marked defect</td></tr><tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF
(Whichever is larger)</td></tr><tr><td>Q</td><td>C≧30pF : Q≧350
10pF≦C<30pF : Q≧275+ $\frac{5}{2}$C
C<10pF : Q≧200+10C</td></tr><tr><td>I.R.</td><td>1,000MΩ min.</td></tr><tr><td>Dielectric Strength</td><td>No failure</td></tr></table>C: Nominal Capacitance (pF)</td><td>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.
<table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>Temp. (℃)</td><td>Min. Operating Temp. +0/−3</td><td>Room Temp.</td><td>Max. Operating Temp. +3/−0</td><td>Room Temp.</td></tr><tr><td>Time (min.)</td><td>30±3</td><td>5 max.</td><td>30±3</td><td>5 max.</td></tr></table></td></tr>
</table>

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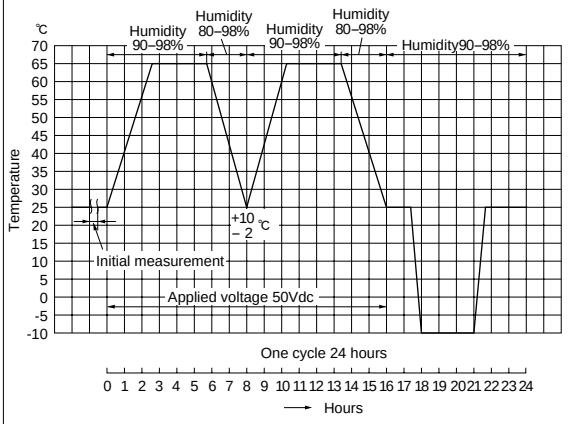
<table>
<tr><th>No.</th><th>Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr>
<td>16</td>
<td>Humidity</td>
<td>The measured and observed characteristics should satisfy the specifications in the following table.
<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Appearance</td><td>No marked defect</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>C≧30pF : Q≧350
10pF≦C<30pF : Q≧275+$\frac{5}{2}$C
C<10pF : Q≧200+10C</td></tr>
<tr><td>I.R.</td><td>1,000MΩ min.</td></tr>
</table>
C: Nominal Capacitance (pF)</td>
<td>Apply the 24-hour heat (−10 to +65℃) and humidity (80 to 100%) treatment shown below, 10 consecutive times. Remove, let sit for 24±2 hours at room temperature, and measure.


</td>
</tr>
<tr>
<td>17</td>
<td>High Temperature Load</td>
<td>The measured and observed characteristics should satisfy the specifications in the following table.
<table>
<tr><th>Item</th><th>Specifications</th></tr>
<tr><td>Appearance</td><td>No marked defect</td></tr>
<tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF (Whichever is larger)</td></tr>
<tr><td>Q</td><td>C≧30pF : Q≧350
10pF≦C<30pF : Q≧275+$\frac{5}{2}$C
C<10pF : Q≧200+10C</td></tr>
<tr><td>I.R.</td><td>1,000MΩ min.</td></tr>
</table>
C: Nominal Capacitance (pF)</td>
<td>Apply 200% (500V only 150%) of the rated voltage for 1,000±12 hours at 125±3℃.
Remove and let sit for 24±2 hours at room temperature, then measure.
The charge/discharge current is less than 50mA.</td>
</tr>
</table>

Table A-6

Char.	Nominal Values (ppm/℃) Note 1	Capacitance Change from 25℃ (%)					
		−55		−30		−10	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	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 5C)