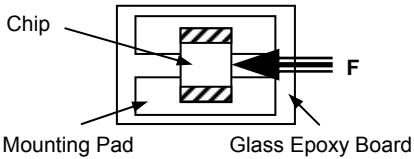
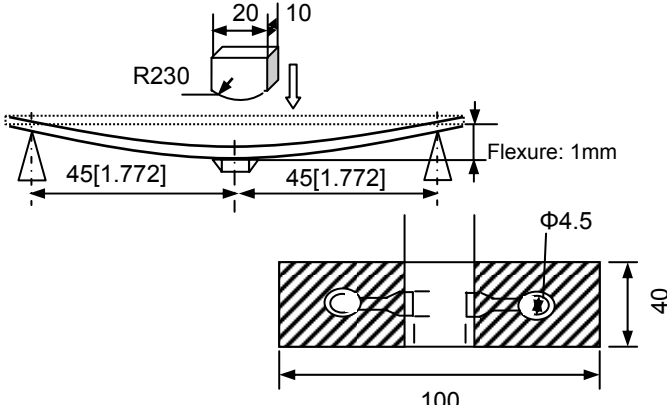
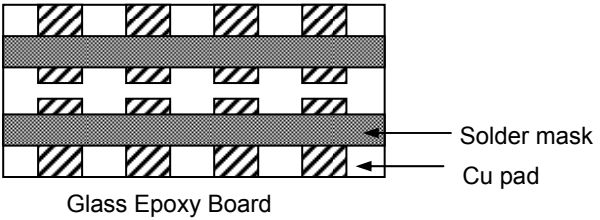


RELIABILITY AND TEST CONDITIONS

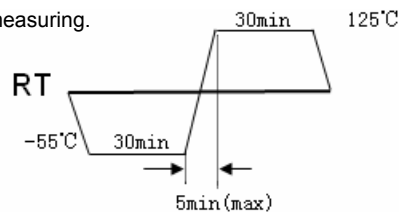
Solid Tantalum Chip Capacitors (TC211&212 Series)

Items	Requirements	Test Methods and Remarks
1. Operating Temperature Range		-55°C to +125°C
2. Storage Temperature Range		-55°C to +125°C
3. Terminal Strength	No removal or split of the termination or other defects shall occur.	<ol style="list-style-type: none"> Solder the capacitor inductor to the testing jig (glass epoxy board shown as the left figure) using eutectic solder. Then apply a force in the direction of the arrow. 5N force Keep time: 10±1s Speed: 1.0mm/s 
4. Resistance to Flexure	No visible mechanical damage.	<ol style="list-style-type: none"> Solder the capacitor to the test jig (glass epoxy board) Using a eutectic solder. Then apply a force in the direction shown as the following figure. Flexure:1 mm; Pressurizing Speed: 0.5mm/sec. Keep time: 10 sec. <p>Unit: mm [inch]</p> 
5. Vibration	No visible mechanical damage.	<ol style="list-style-type: none"> Solder the capacitor to the testing jig (glass epoxy board shown as the following figure) using eutectic solder. The capacitor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. The frequency range from 10 to 55 Hz and return to 10 Hz 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). 

RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC211&212 Series)

Items	Requirements	Test Methods and Remarks
6. Solderability	① No visible mechanical damage. ② Wetting shall be exceeded 95% coverage.	① Solder temperature: $240\pm 2^{\circ}\text{C}$ ② Duration: 3 sec ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight
7. Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Capacitance change: within $\pm 5\%$. ④ $\tan\delta$ shall not exceed 150% of the initial requirement. ⑤ I_0 change shall not exceed the initial I_0	① Solder temperature: $260\pm 3^{\circ}\text{C}$ ② Duration: 5 sec ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
8. Temperature	A. At -55°C ① No visible mechanical damage. ② Capacitance change: within -10% . ③ $\tan\delta$ shall not exceed 150% of the initial requirement.	① Drying 30^{+4} min at 125°C ② The chip shall be stabilized at normal condition for 1~2 hours after drying, and measured at 25°C as initial data. ③ The chip shall be measured at -55°C
	B. At 85°C ① No visible mechanical damage. ② Capacitance change: $<10\%$ ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ④ I_0 shall not exceed $10 I_0$	① After Step A, the chip shall cool to room temperature. ② Measure at 85°C .
	C. At 125°C ① No visible mechanical damage. ② Capacitance change: $<12\%$. ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ④ I_0 shall not exceed $12.5 I_0$	① After Step B, the chip shall be measured at 125°C .
9. Thermal Shock	① Capacitance change: within $\pm 5\%$. ② $\tan\delta$ shall not exceed the initial requirement. ③ I_0 shall not exceed the initial I_0 .	① Temperature, Time (See the following figure) ② -55°C , 30 ± 3 min \rightarrow 125°C , 30 ± 3 min. ③ Transforming interval: Max. 5min. ④ Tested cycle: 5 cycles. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.



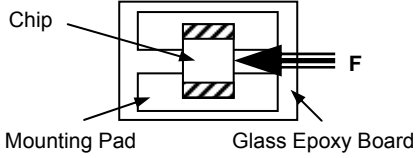
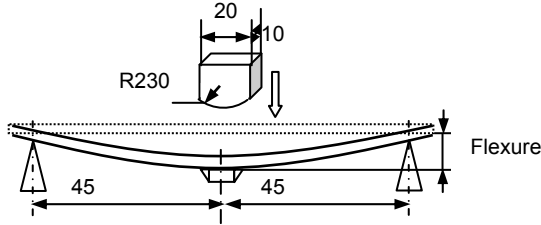
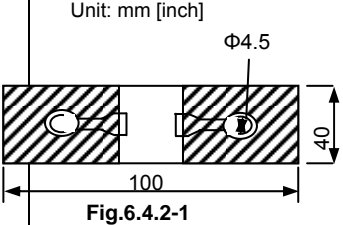
RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC211&212 Series)

Items	Requirements	Test Methods and Remarks
10. Moisture Resistance	<ul style="list-style-type: none">① No visible mechanical damage.② Capacitance change: within $\pm 10\%$.③ $\tan\delta$ shall not exceed 150% of the initial requirement.④ I_0 shall not exceed $2I_0$.	<ul style="list-style-type: none">① Temperature: $40\pm 2^\circ\text{C}$.② Relative Humidity: 90%~95%RH.③ Duration: 500^{+24} hours.④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
11. Life Test	<ul style="list-style-type: none">① No visible mechanical damage.② Capacitance change: within $\pm 10\%$.③ $\tan\delta$ shall not exceed the initial requirement.④ I_0 shall not exceed $1.25 I_0$.	<ul style="list-style-type: none">① Temperature: $85\pm 2^\circ\text{C}$; Rated Voltage② Duration: 2000^{+24} hours③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC311 Series)

Items	Requirements	Test Methods and Remarks															
1. Operating Temperature Range		-55°C to +105°C															
2. Storage Temperature Range		-55°C to +105°C															
3. Terminal Strength	No removal or split of the termination or other defects shall occur.	<p>① Solder the capacitor inductor to the testing jig (glass epoxy board shown as the left figure) using eutectic solder. Then apply a force in the direction of the arrow.</p> <p>② Case code and shear:</p> <table border="1"> <thead> <tr> <th>Case code</th> <th>Size</th> <th>Max. Shear (Kg)</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>3528-21</td> <td>3.6</td> </tr> <tr> <td>D</td> <td>7343-31</td> <td>5.0</td> </tr> <tr> <td>V</td> <td>7343-19</td> <td>5.0</td> </tr> <tr> <td>E</td> <td>7343-43</td> <td>5.0</td> </tr> </tbody> </table> <p>③ Keep time: 10±1s ④ Speed: 1.0mm/s</p> 	Case code	Size	Max. Shear (Kg)	B	3528-21	3.6	D	7343-31	5.0	V	7343-19	5.0	E	7343-43	5.0
Case code	Size	Max. Shear (Kg)															
B	3528-21	3.6															
D	7343-31	5.0															
V	7343-19	5.0															
E	7343-43	5.0															
4. Resistance to Flexure	No visible mechanical damage.	<p>① Solder the capacitor to the test jig (glass epoxy board) Using a eutectic solder. Then apply a force in the direction shown as the following figure.</p> <p>② Flexure: 1 mm; ③ Pressurizing Speed: 0.5mm/sec. ④ Keep time: 10 sec.</p> 															
5. Vibration	No visible mechanical damage.	<p>① Solder the capacitor to the testing jig (glass epoxy board shown as the following figure) using eutectic solder.</p> <p>② The capacitor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz.</p> <p>③ The frequency range from 10 to 55 Hz and return to 10 Hz 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).</p> 															

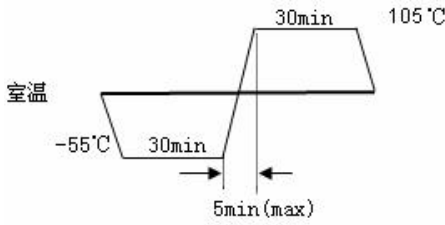
RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC311 Series)

Items	Requirements	Test Methods and Remarks
6. Solderability	<ul style="list-style-type: none"> ① No visible mechanical damage. ② Wetting shall be exceeded 95% coverage. ③ The less 5% of area is permitted to contain a few defect , such as pinholes、holes、un-soaking or poor soaking area which do not gather together. 	<ul style="list-style-type: none"> ① Solder temperature: 235±2℃ ② Duration: 3 sec ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight
7. Resistance to Soldering Heat	<ul style="list-style-type: none"> ① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Capacitance change: within ±10%. ④ $\tan\delta$ shall not exceed 150% of the initial requirement. ⑤ I_0 change shall not exceed the initial I_0 	<ul style="list-style-type: none"> ① Solder temperature: 260±3℃ ② Duration: 5 sec ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight ⑤ The chip shall be stabilized at normal condition for 2 hours before measuring.
8. Temperature	<p>A. At -55℃</p> <ul style="list-style-type: none"> ① No visible mechanical damage. ② Capacitance change: within ±20%. ③ $\tan\delta$ shall not exceed the initial requirement. 	<ul style="list-style-type: none"> ① Drying 30⁺⁴ min at 105℃ ② The chip shall be stabilized at normal condition for 2 hours after drying, and measured at 25℃ as initial data. ③ The chip shall be measured at -55℃
	<p>B. At 25℃</p> <ul style="list-style-type: none"> ① No visible mechanical damage. ② Capacitance change: within ±10% ③ $\tan\delta$ shall not exceed the initial requirement. ④ I_0 shall not exceed I_0 	<ul style="list-style-type: none"> ① After Step A, the chip shall be cooled to 85℃ and measured.
	<p>C. At 85℃</p> <ul style="list-style-type: none"> ① No visible mechanical damage. ② Capacitance change: within ±20% ③ $\tan\delta$ shall not exceed 120% of the initial requirement. ④ I_0 shall not exceed 10 I_0. 	<ul style="list-style-type: none"> ① After Step B, the chip shall be measured at 85℃.
	<p>D. At 105℃</p> <ul style="list-style-type: none"> ① No visible mechanical damage. ② Capacitance change: within ±30%. ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ⑤ I_0 shall not exceed 10 I_0. 	<ul style="list-style-type: none"> ① After Step C, the chip shall be measured at 105℃.

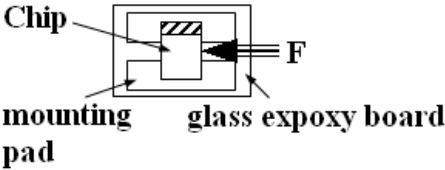
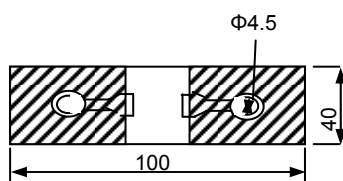
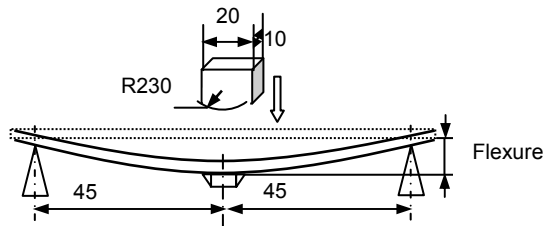
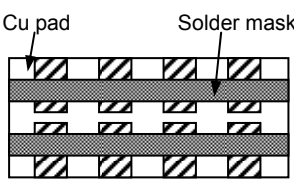
RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC311 Series)

Items	Requirements	Test Methods and Remarks
8. Temperature	E. At 25°C ① No visible mechanical damage. ② Capacitance change: within ±10% ③ tanδ shall not exceed the initial requirement. ④ Leakage current shall not exceed I ₀ .	① After Step D, the chip shall be cooled to 25°C and measured.
9. Thermal Shock	① Capacitance change: within -20%~+10%. ② tanδ shall not exceed the initial requirement. ③ Leakage current shall not exceed the initial I ₀ . ④ ESR shall not exceed 200% of the initial requirement.	① Temperature, Time (See Fig.6.4.7) ② -55°C, 30±3 min→105°C, 30±3min. ③ Transforming interval: Max.5min. ④ Tested cycle: 500cycles. ⑤ The chip shall be stabilized at normal condition for 2 hours before measuring.  Fig.6.4.7
10. Moisture Resistance	① No visible mechanical damage. ② Capacitance change: -5%~+35%. ③ tanδ shall not exceed of the initial requirement. ④ I ₀ shall not exceed 5I ₀ . ⑤ ESR shall not exceed 200% of the initial requirement.	① Temperature: 60±2°C. ② Relative Humidity: 90%~95%RH. ③ Duration: 500 ⁺²⁴ hours. ④ The chip shall be stabilized at normal condition for 2 hours before measuring.
11. Life Test	① No visible mechanical damage. ② Capacitance change: -20%~+10%. ③ tanδ shall not exceed the initial requirement. ④ I ₀ shall not exceed I ₀ . ⑤ ESR shall not exceed the initial requirement.	① Temperature: 85±2°C; Rated Voltage ② Duration: 2000 ⁺²⁴ hours ③ The chip shall be stabilized at normal condition for 2 hours before measuring.
12. Surge Voltage	① No visible mechanical damage. ② Capacitance change: -20%~+10%. ③ tanδ shall not exceed the initial requirement. ④ Leakage current shall not exceed I ₀ . ⑤ ESR shall not exceed the initial requirement.	① Temperature: 105±2°C; ② 33ΩResistance, 1.32Rated Voltage; ③ 1000cycles.

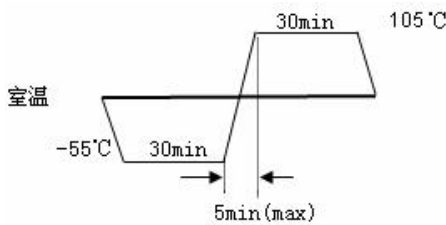
RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC312 Series)

Item	Requirements	Test Methods and Remarks																		
6.4.1 Terminal Strength	1、shear  Fig.6.4.1-1	1、shear ① Solder the capacitor to the test board(glass epoxy board shown in Fig. 6.4.1-1) , then apply a force in the direction as Fig. 6.4.1-1 ; ② Case code and shear: <table border="1" data-bbox="821 414 1420 649"> <thead> <tr> <th>Case code</th> <th>Size</th> <th>Max. Shear (Kg)</th> </tr> </thead> <tbody> <tr> <td>B</td> <td>3528-21</td> <td>3.6</td> </tr> <tr> <td>C</td> <td>6032-28</td> <td>4.5</td> </tr> <tr> <td>D</td> <td>7343-31</td> <td>5.0</td> </tr> <tr> <td>V</td> <td>7343-19</td> <td>5.0</td> </tr> <tr> <td>E</td> <td>7343-43</td> <td>5.0</td> </tr> </tbody> </table> ③ Keep time: 10±1sec; ④ speed: 1.0mm/sec.	Case code	Size	Max. Shear (Kg)	B	3528-21	3.6	C	6032-28	4.5	D	7343-31	5.0	V	7343-19	5.0	E	7343-43	5.0
Case code	Size	Max. Shear (Kg)																		
B	3528-21	3.6																		
C	6032-28	4.5																		
D	7343-31	5.0																		
V	7343-19	5.0																		
E	7343-43	5.0																		
6.4.2 Resistance to Flexure	No visible mechanical damage. unit: mm  Fig.6.4.2-1	① Solder the capacitor to the test jig (glass epoxy board shown in Tab. 5-1) Using a eutectic solder. Then apply a force in the direction shown in Fig. 6.4.2-1~Fig. 6.4.2-2 ② Flexure:1 mm; ③ Pressurizing Speed: 0.5mm/sec. ④ Keep time: 10 sec.  Fig.6.4.2-2																		
6.4.3 Vibration	No visible mechanical damage.  Fig.6.4.3-1	① Solder the capacitor to the testing jig (glass epoxy board shown in Fig.6.4.3-1) using eutectic solder. ② The capacitor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ The frequency range from 10 to 55 Hz and return to 10 Hz 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).																		
6.4.4 Solderability	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ The less 5% of area is permitted to contain a few defect , such as pinholes、 holes、 un-soaking or poor soaking area which do not gather together.	① Solder temperature: 235±2℃ ② Duration: 3 sec. ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight.																		
6.4.5 Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Capacitance change: within ±10%. ④ tanδ shall not exceed 150% of the initial requirement. ⑤ Leakage current change shall not exceed the initial I ₀ .	① Solder temperature: 260±3℃ ② Duration: 5 sec. ③ Solder: Sn/3.0Ag/0.5Cu ④ Flux: 25% Resin and 75% ethanol in weight. ⑤ The chip shall be stabilized at normal condition for 2 hours before measuring.																		

RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC312 Series)

Item	Requirements	Test Methods and Remarks
6.4.6 Temperature properties	A. At -55°C ① No visible mechanical damage. ② Capacitance change: within ±20%. ③ $\tan\delta$ shall not exceed the initial requirement.	① Drying 30 ⁺⁴ min at 105°C ② The chip shall be stabilized at normal condition for 2 hours after drying, and measured at 25°C as initial data. ③ The chip shall be measured at -55°C.
	B. At 25°C ① No visible mechanical damage. ② Capacitance change: within ±10% ③ $\tan\delta$ shall not exceed the initial requirement. ④ Leakage current shall not exceed I_0 .	① After Step A, the chip shall be cooled to 25°C and measured.
	C. At 85°C ① No visible mechanical damage. ② Capacitance change: within ±20% ③ $\tan\delta$ shall not exceed 120% of the initial requirement. ④ Leakage current shall not exceed 10 I_0 .	① After Step B, the chip shall be measured at 85°C.
	D. At 105°C ① No visible mechanical damage. ② Capacitance change: within ±30%. ③ $\tan\delta$ shall not exceed 150% of the initial requirement. ④ Leakage current shall not exceed 10 I_0 .	① After Step C, the chip shall be measured at 105°C.
	E. At 25°C ① No visible mechanical damage. ② Capacitance change: within ±10% ③ $\tan\delta$ shall not exceed the initial requirement. ④ Leakage current shall not exceed I_0 .	① After Step D, the chip shall be cooled to 25°C and measured.
6.4.7 Thermal Shock	① Capacitance change: within -20%~+10%. ② $\tan\delta$ shall not exceed the initial requirement. ③ Leakage current shall not exceed the initial I_0 . ④ ESR shall not exceed 200% of the initial requirement.	① Temperature, Time (See Fig.6.4.7) ② -55°C, 30±3 min→105°C, 30±3min. ③ Transforming interval: Max.5min. ④ Tested cycle: 500cycles. ⑤ The chip shall be stabilized at normal condition for 2 hours before measuring. 
6.4.8 Moisture Resistance	① No visible mechanical damage. ② Capacitance change: -5%~+35%. ③ $\tan\delta$ shall not exceed of the initial requirement. ④ Leakage current shall not exceed 5 I_0 . ⑤ ESR shall not exceed 200% of the initial requirement.	① Temperature: 60±2°C. ② Relative Humidity: 90%~95%RH. ③ Duration: 500 ⁺²⁴ hours. ④ The chip shall be stabilized at normal condition for 2 hours before measuring.

RELIABILITY AND TEST CONDITIONS

Solid Tantalum Chip Capacitors (TC312 Series)

Item	Requirements	Test Methods and Remarks
6.4.9 Life Test	<ul style="list-style-type: none">① No visible mechanical damage.② Capacitance change: -20%~+10%.③ $\tan\delta$ shall not exceed the initial requirement.④ Leakage current shall not exceed I_0.⑤ ESR shall not exceed the initial requirement.	<ul style="list-style-type: none">① Temperature: $85\pm 2^\circ\text{C}$; Rated Voltage② Duration: 2000⁺²⁴ hours③ The chip shall be stabilized at normal condition for 2 hours before measuring.
6.4.10 Surge Voltage	<ul style="list-style-type: none">① No visible mechanical damage.② Capacitance change: -20%~+10%.③ $\tan\delta$ shall not exceed the initial requirement.④ Leakage current shall not exceed I_0.⑤ ESR shall not exceed the initial requirement.	<ul style="list-style-type: none">① Temperature: $105\pm 2^\circ\text{C}$;② 33ΩResistance, 1.32Rated Voltage;③ 1000cycles.