

RELIABILITY TESTS ▪ STANDARD

Reference JIS C 5101-1, JIS C 5101-4 and JIS 60068-2

No.	Test	Test Specification	Test Standard	Sample Quantity	Test Criteria
1	Shelf life	Upper category temperature Duration: 1000h	JIS C 5101-4 No. 4.17 JIS C 5101-1 No. 4.25	10 pcs	1. $ \Delta C/C_R \leq 20\%$ of initial value ^[2] 2. $\tan\delta \leq 2$ times spec. limit ^[2] 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq 1.5$ times spec. limit 5. No visible damage 6. Marking legible
2	Temperature cycling	1. Lower category temperature: 30mins 2. Temperature change: 3mins 3. Upper category temperature: 30mins 4. Temperature change: 3mins Step 1 to 4 as a cycle Cycle: 10 cycles	JIS C 5101-4 No. 4.7 JIS C 5101-1 No. 4.16	10 pcs	1. $ \Delta C/C_R \leq 5\%$ of initial value 2. $\tan\delta \leq$ spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq$ spec. limit 5. No visible damage 6. Marking legible
3	Unbiased humidity	Temperature: $60^\circ\text{C} \pm 2^\circ\text{C}$ Humidity: 90 ~ 95%RH Duration: 1000h	JIS C 5101-4 No. 4.12 JIS C 5101-1 No. 4.22	10 pcs	1. $ \Delta C/C_R \leq 20\%$ of initial value 2. $\tan\delta \leq 1.5$ times of spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq$ spec. limit 5. No visible damage 6. Marking legible
4	Endurance (load Life)	Upper category temperature V_R applied Duration: specified or see detail specification	JIS C 5101-4 No. 4.13 JIS C 5101-1 No. 4.23	10 pcs	1. $ \Delta C/C_R \leq 20\%$ of initial value ^[2] 2. $\tan\delta \leq 1.5$ times spec. limit ^[2] 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq$ spec. limit 5. No visible damage 6. Marking legible
5	Endurance (Load ripple current life)	Upper category temperature I_R and V_R applied $AC + DC \approx V_R$ Duration: specified or see detail specification	JIS C 5101-4 No. 4.13 JIS C 5101-1 No. 4.23	10 pcs	1. $ \Delta C/C_R \leq 20\%$ of initial value ^[2] 2. $\tan\delta \leq 1.5$ times spec. limit ^[2] 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq$ spec. limit 5. No visible damage 6. Marking legible
6	Solvent resistance of marking	a. Solvent to be used: IPA b. Solvent temperature: $23^\circ\text{C} \pm 5^\circ\text{C}$ c. Conditioning: Method 1 (with rubbing) d. Rubbing material: Cotton wool e. Recovery time: Not applicable, unless otherwise stated in the detail specification	JIS C 5101-1 No. 4.32 JIS C 60068-2-45 3.1.2	5 pcs	See detail specification
7	Vibration	a. Frequency: 10 ~ 55 Hz b. Swing (single peak) and acceleration: 0.75mm or 98m/s^2 c. Test direction and duration: X, Y, Z each on for 2h	JIS C 5101-4 No. 4.8 JIS C 5101-1 No. 4.17	10 pcs	Taking from the vibration table static placed in the horizontal to test the box and carton appearance, test the electrical characteristics. 1. $ \Delta C/C_R \leq 5\%$ of initial value 2. $\tan\delta \leq$ spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. $ESR \leq$ spec. limit 5. No visible damage Marking legible

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No.	Test	Test Specification	Test Standard	Sample Quantity	Test Criteria
8	Resistance to solder heat	Max. temperature: 260°C (0~+3°C) Duration: 10s ± 1s	JIS C 5101-4 No. 4.5 JIS C 5101-1 No. 4.14	10 pcs	1. $ \Delta C/C_R \leq 5\%$ of initial value 2. $\tan\delta \leq$ spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. ESR \leq spec. limit 5. No visible damage 6. Marking legible
9	Solderability	Max. temperature: 245°C ± 5°C Duration: 2s ± 0.5s	JIS C 5101-4 No. 4.6 JIS C 5101-1 No. 4.15	10 pcs	The surface soldering attachment is greater than 95% soldering should brightness and equality, non-soldering needle hole, drop weld or concentrate at some point are not allowed
10	Characteristics at high and low temperature	The capacitors shall be measured at each temperature step Step 1: 20°C Capacitance tangent of loss angle Impedance (at the same frequency as step 2) Step 2: Lower category temperature ▪ Impedance Step 3: Upper category temperature ▪ Leakage current See detail specification	JIS C 5101-4 No. 4.19 JIS C 5101-1 No. 4.29	10 pcs	See detail specification
11	Terminal strength	Test method: Following model picture means: Put the samples solder on the glass epoxy resin board, profile added force is 17.7N (1.8kg), time within 60s ± 1s See detail specification	JIS C 5101-1 No. 4.13 JIS C 5104-1 No. 4.4	10 pcs	See detail specification
12	Surge voltage	a. Test temp.: Max. temp. for long life grade products ^[1] or Room temp. for general purpose grade products ^[1] b. Add surge voltage to the connections: 1.15·V _R when V _R ≤ 20V 1.10·V _R when V _R > 20V c. 6 min as a cycle (charge time 30s, discharge time 330s) d. Cycle: 1000 cycles	JIS C 5101-4 No. 4.14 JIS C 5101-1 No. 4.26	10 pcs	1. $ \Delta C/C_R \leq 10\%$ of initial value 2. $\tan\delta \leq$ spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. ESR \leq spec. limit 5. No visible damage 6. Marking legible
13	Storage at low temperature	Duration: 16h or 4h after thermal stability has been reached Temperature: -40°C	JIS C 5101-4 No. 4.18 JIS C 5101-1 No. 4.25	10 pcs	1. $ \Delta C/C_R \leq 10\%$ of initial value 2. $\tan\delta \leq$ spec. limit 3. $I_{LEAK} \leq$ spec. limit 4. ESR \leq spec. limit 5. No visible damage 6. Marking legible

Note:

 [1] General purpose grade: lifetime (V_R applied) ≤ 2000 hours.

 Long life grade: lifetime (V_R applied) > 2000 hours.

 [2] $\Delta C/C_R$ & $\tan\delta$ criterion, please refer to CapXon datasheet.