Recommended Testing Method of Aluminum Electrolytic Capacitor

Aluminum Electrolytic Capacitor (for LED Products)

I. Endurance

1) Testing device: Ripple power tester, Thermostatic drier, LCR digital electric bridge and Leakage current tester

2) Testing conditions:
   ① Operating temperature range: $105\pm 3^\circ C$ (105°C Series) $130\pm 3^\circ C$ (130°C Series)
   ② Ripple Current: Follow the instruction of Ymin’s product catalogue.
   ③ DC Voltage: $U_d = U_{wv} - \sqrt{2}U_r$
   ④ Frequency: 50Hz, 120Hz, 40KHz and 100KHz (Follow the frequency conversion factor in Ymin’s product catalogue)

3) Testing procedure:
   ① Select 21 aluminum electrolytic capacitors from a batch of products and mark them. Select 20 of them to measure and record their capacitance, dissipation and leakage current before the test and the left one is for reservation.
   ② Connect the aluminum electrolytic capacitors with ripple power tester and set them into thermostatic drier with $105 \pm 3^\circ C$. The minimum distance between two aluminum electrolytic capacitors is 5mm.
   ③ According to the requirements of ripple current in Ymin’s product catalogue, applying ripple current to the panel of ripple power tester and calculate the DC voltage from the 3rd formula, starting the test.
   ④ All aluminum electrolytic capacitors collected from test period should be laid over 8 hours to test the data and then record the data on table. When the test finished, collect the aluminum electrolytic capacitors and leave them 16 hours for recovery. Check the appearance of aluminum electrolytic capacitors and measure their capacitance, dissipation and leakage current, then calculate capacitance change.

4) Feature requirements:
   ① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear.
   ② Leakage current I meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ③ Capacitance change meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ④ Dissipation factor meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ⑤ Test duration: follow the instruction of Ymin’s product catalogue.
   ⑥ Test period: record the data every 1000 hours.

5) Judgment: determining the test result of aluminum electrolytic capacitors according to
above requirements. The number of tested aluminum electrolytic capacitors is n=21 and the acceptance number is Ac=1.

II. High Temperature Accelerated Test
1) Testing device: Ripple power tester, Thermostatic drier, LCR digital electric bridge and Leakage current tester
2) Testing conditions:
   ① Operating temperature range: the 105℃ (≤ 100V) Series products in Ymin’s product catalogue can be tested under 115℃; the 105℃ (>100V) Series products in Ymin’s product catalogue can be tested under 125℃. The 130℃ Series products in Ymin’s product catalogue are not valid in high temperature accelerated test.
   ② Ripple Current: Follow the instruction of Ymin’s product catalogue.
   ③ DC Voltage: \( U_d = U_{wv} - \sqrt{2}U_r \)
   ④ Frequency: 50Hz, 120Hz, 40KHz and 100KHz (Follow the frequency conversion factor in Ymin’s product catalogue).
3) Testing procedure:
   ① Select 21 aluminum electrolytic capacitors from a batch of products and mark them. Select 20 of them to measure and record their capacitance, dissipation and leakage current before the test and the left one is for reservation.
   ② Connect the aluminum electrolytic capacitors with ripple power tester and set them into thermostatic drier with 105 ± 3℃. The minimum distance between two aluminum electrolytic capacitors is 5mm.
   ③ According to the requirements of ripple current in Ymin’s product catalogue, applying ripple current to the panel of ripple power tester and calculate the DC voltage from the 3rd formula, starting the test.
   ④ All aluminum electrolytic capacitors collected from test period should be laid over 8 hours to test the data and then record the data on table. When the test finished, collect the aluminum electrolytic capacitors and leave them 16 hours for recovery. Check the appearance of aluminum electrolytic capacitors and measure their capacitance, dissipation and leakage current, then calculate capacitance change.
4) Feature requirements:
   ① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear.
   ② Leakage current I meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ③ Capacitance change meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ④ Dissipation factor meets the tolerance of endurance requirement in Ymin’s product catalogue.
   ⑤ Test duration: when products tested under 115℃, the time should be half of the time required by Ymin’s product catalogue; when products tested under 125℃, the time
should be quarter of the time required by Ymin’s product catalogue.
⑥ Test period: record the data every 500 hours.

5) Judgement: Determining the test result of aluminum electrolytic capacitors according to above requirements. The number of tested aluminum electrolytic capacitors is \( n=21 \) and the acceptance number is \( Ac=1 \).

III. High Temperature Storage
1) Testing device: Thermostatic drier, LCR digital electric bridge and Leakage current tester
2) Testing conditions: maximum temperature ±3℃.
3) Testing procedure:
   ① Select 10 aluminum electrolytic capacitors from a batch of products and mark them. Measure and record their capacitance, dissipation and leakage current before the test.
   ② Mount the aluminum electrolytic capacitors on fixtures. Set them into thermostatic drier with the temperature of 105℃ ±3℃ and start the high temperature storage test.
   ③ According to the requirement of lasting time, collect the aluminum electrolytic capacitors from fixtures after the test. The aluminum electrolytic capacitors should be laid over 3 hour for recovery. Check their appearance and measure their capacitance, dissipation and leakage current, then calculate capacitance change.
4) Feature requirements:
   ① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear.
   ② Leakage current \( I \leq 2 \) times of the initial specified value.
   ③ Capacitance change meets the requirement of high temperature storage in Ymin’s product catalogue.
   ④ Dissipation factor meets the requirement of high temperature storage in Ymin’s product catalogue.
   ⑤ Test duration: follow the instruction of Ymin’s product catalogue.
   ⑥ Test period: record the data every 1000 hours.
5) Judgment: Determining the test result of aluminum electrolytic capacitors according to above requirements. The number of tested aluminum electrolytic capacitors is \( n=10 \) and the acceptance number is \( Ac=0 \).

IV. Surge Current Test
1) Testing device: surge current tester, DC stabilized power, LCR digital electric bridge and leakage current tester.
2) Testing conditions:
   ① Operating temperature range: 25℃ ±2℃
   ② Charging voltage: products of 160V-450V can be charged at the voltage of 50V + rated voltage; products of 10V-450V can be charged at the voltage of 1.25 times rated voltage.
   ③ Charging time: 30s
3) Testing procedure:
   ① Select 20 aluminum electrolytic capacitors from a batch of products and mark them. Check their appearance and measure their capacitance, dissipation and leakage current before the test.
   ② Mount the selected aluminum electrolytic capacitors on fixtures and leave them at normal temperature.
   ③ Open the DC power and connect anode and cathode respectively with the “V+” and “V-” of surge current tester. Charging it with surge current at rated voltage.
   ④ Set the surge current tester as initial status and start the test.
   ⑤ When the test finished, collect the aluminum electrolytic capacitors and leave them 16 hours for recovery. Check their appearance and measure their capacitance, dissipation and leakage current, then calculate capacitance change.

4) Feature requirements:
   ① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear.
   ② Leakage current I ≤ the initial specified value.
   ③ Capacitance change (120Hz 25℃±2℃) ≤ 10%
   ④ Dissipation factor tgδ (120Hz 25℃±2℃) is less than 1.5 times of the regulated value.
   ⑤ Testing period: record data every 1000 cycles

5) Judgment: Determining the test result of aluminum electrolytic capacitors according to above requirements. The number of tested aluminum electrolytic capacitors is n=20 and the acceptance number is Ac=0.

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Recommended Testing Method of Aluminum Electrolytic Capacitor

Lighting Test (for LED Products)

I. Test in 85°C twice (Applicable to all kinds of LED)

1) Testing device: Lamp bracket, Constant temperature and humidity machine, LCR digital electric bridge and Leakage current tester

2) Testing conditions: Operating temperature: 85°C±2°C; Humidity: 85±2%; Test duration: 3000 hours and 6000 hours.

3) Testing procedure:
   ① Matching aluminum electrolytic capacitors and LED lamp.
   ② Check the appearance of aluminum electrolytic capacitors and LED lamp and measure their capacitance, dissipation and leakage current with the condition of 120Hz 25°C ±2°C.
   ③ Check whether aluminum electrolytic capacitors weld to PCB with correct polarity. Check whether aluminum electrolytic capacitors and LED lamp meet the requirement. Adjust the temperature and humidity of constant temperature and humidity machine to testing conditions.
   ④ Adjust input voltage to 110V/220V. Light the LED lamp and record the time. The LED lamp should be turned off 15min after lighting 2.75 hours. Unpack the LED lamp every 3000 and 6000 hours (lighting hour can be longer for any special request) and test the record of LED lamp’s parameters (can light again if necessary) and electrolytic capacitors’ characteristics after 16 hours unpacking.

4) Feature requirements:
   ① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear after the test.
   ② Leakage current I ≤ the initial specified value.
   ③ Capacitance △C/C≤ ± 20%
   ④ Dissipation tgδ ≤ 2 times of the initial specified value.

5) Judgment: the aluminum electrolytic capacitors lighting longer than required time and the acceptance number is Ac=0.

II. Two parts lighting test

1) Testing device: Lamp bracket, Constant temperature and humidity machine, LCR digital electric bridge and Leakage current tester.

2) Testing conditions: a) Operating temperature: 100°C±2°C (applicable to split-type power lamp (above 15W)); Test duration: 3000 hours and 6000 hours.
   b) Operating temperature: 110°C±2°C (applicable to integrated bulb light, spotlight and tube light (below 15W)); Test duration: 1500 hours and 3000 hours.

3) Testing procedure:
   ① Matching aluminum electrolytic capacitors and LED lamp.
   ② Check the appearance of aluminum electrolytic capacitors and LED lamp and measure their capacitance, dissipation and leakage current with the condition of 120Hz 25°C ±2°C.
   ③ Check whether aluminum electrolytic capacitors weld to PCB with correct polarity and set the PCB into 100°C constant temperature machine. Install the light in normal temperature and connect it with the PCB. Check whether the property of the light meets the requirement.
   ④ Turn on the light with 250V and record the time. The light should be turned off 15min after lighting 2.75 hours. The lamp should light 3000 and 6000 hours with the
condition of 100°C±2°C and it also should light 1500 and 3000 hours with the condition of 110°C±2°C (lighting hour can be longer for any special request). When the test finished leave it for 16 hours and then test its parameters and test aluminum electrolytic capacitors’ characteristics.

4) Feature requirements:
① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear after the test.
② Leakage current I ≦ the initial specified value.
③ Capacitance △C/C≦ ±20%
④ Dissipation tgδ ≦ 2 times of the initial specified value.

5) Judgment: the aluminum electrolytic capacitors lighting longer than required time and the acceptance number is Ac=0.

III. High Temperature Lighting Test
1) Testing device: Lamp bracket, constant temperature machine, LCR digital electric bridge and leakage current tester.
2) Testing conditions: a) Operating temperature: 90°C±2°C (applicable to split-type power lamp (above 15W)); Test duration: 3000 hours and 6000 hours.
   b) Operating temperature: 100°C±2°C (applicable to integrated bulb light, spotlight and tube light (below 15W)); Test duration: 1500 hours and 3000 hours.
3) Testing procedure:
① Matching aluminum electrolytic capacitors and LED lamp.
② Check the appearance of aluminum electrolytic capacitors and LED lamp and measure their capacitance, dissipation and leakage current with the condition of 120Hz 25°C ±2°C.
③ Check whether aluminum electrolytic capacitors weld to PCB with correct polarity. Check whether aluminum electrolytic capacitors and LED lamp meet the requirement.
④ Adjust input voltage to 110V/220V. Light the LED lamp and record the time. The LED lamp should be turned off 15min after lighting 2.75 hours. The lamp should light 3000 and 6000 hours with the condition of 90°C±2°C and it also should light 1500 and 3000 hours with the condition of 100°C±2°C (lighting hour can be longer for any special request). When the test finished leaves the 16 hours and then test its parameters and test aluminum electrolytic capacitors’ characteristics.
4) Feature requirements:
① There is no visible damage and electrolyte leakage on the appearance of aluminum electrolytic capacitors and the sign is clear after the test.
② Leakage current I ≦ the initial specified value.
③ Capacitance △C/C≦ ±20%
④ Dissipation tgδ ≦ 2 times of the initial specified value.

5) Judgment: the aluminum electrolytic capacitors lighting longer than required time and the acceptance number is Ac=0.

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