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LED light source for micro display projection

微显示投影用 LED 光源

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LED light source for micro display projection

1 Scope

This standard specifies the terms and definitions, requirements, test methods, inspection rules, marking, packaging, transportation, storage of LED light sources for micro display projection.

This standard applies to LED light sources for micro display projection (hereinafter referred to as LED light sources), which is composed of LED light-emitting components, drive modules, heat dissipation systems.

This standard does not apply to the lighting system of micro display projection, projection optical system, LED light source for general lighting.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2423.1-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Tests A: Cold

GB/T 2423.2-2008 Environmental testing for electric and electronic products - Part 2: Test methods - Tests B: Dry heat

GB/T 2423.3-2006 Environmental testing for electric and electronic products - Part 2: Testing method - Test Cab: Damp heat, steady state

GB/T 2423.10-2008 Environmental testing - Part 2: Test methods - Test Fc: Vibration (sinusoidal)

GB/T 2829 Sampling procedures and tables for periodic inspection by attributes (apply to inspection of process stability)

GB/T 2900.65 Electrotechnical terminology - Lighting

GB/T 5465.2 Graphical symbols for use on electrical equipment - Part 2: Graphical symbols

GB 8898-2011 Audio, video and similar electronic apparatus - Safety requirements

GB 9254 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement

GB/T 17618 Information technology equipment - Immunity characteristics - Limits and methods of measurement

GB 17625.1 Electromagnetic compatibility - Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

GB/T 18313 Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment

SJ/T 11394-2009 Measure methods of semiconductor light emitting diodes

3 Terms and definitions

The terms and definitions as defined in GB/T 2900.65, as well as the following terms and definitions, apply to this document.

3.1

Micro display projection

Micro display projection (MD Projection) refers to rear projection and front projection systems based on micro display panel technology (such as DMD (digital mirror device), LCOS (liquid crystal on silicon), LCD micro display panel technology).

3.2

LED for micro display projection

The LEDs used for micro display projection are mainly red (R), green (G), blue (B) three-primary color LEDs. The micro display panel is illuminated by time modulation (single-chip structure) or spatial modulation (three-chip structure), and projected onto a screen (rear projection or front projection screen) to obtain a color image. Different micro display projection systems have different requirements for LED light sources.

3.3

Effective synthetic white luminous flux

The luminous flux of neutral color temperature synthetic white light as synthesized by RGB three-primary color LED light sources. The unit is lumen (lm). It is the size

display panel, enter the projection system.

3.8

Luminous brightness of LED light source

The luminous brightness of LED light source refers to the luminous flux of the LED light source per beam expansion, which is defined as the ratio of the effective synthetic white light luminous flux to its beam expansion. The unit is $\text{lm}/\text{mm}^2 \cdot \text{Sr}$.

3.9

Luminous efficiency of LED light source

The luminous efficiency of LED light source refers to the ratio -- of the luminous flux emitted by the LED light source TO the input electrical energy; the unit is lm/W . Together with the luminous flux, it specifies the power consumption of the LED light source.

3.10

Lumen maintenance rate

Lumen maintenance rate refers to the ratio -- of the luminous flux output by the LED light source at a specific moment TO the luminous flux at its initial moment, expressed as a percentage (%).

3.11

Average lifespan

When a batch of LED light sources work at the same time, and more than 50% of the light sources still have a lumen maintenance rate of 50%, the cumulative lighting time of the LED light source is the average lifespan of the LED, in hours (h).

3.12

Color coordinate drift

At a certain moment, the chromaticity coordinates of the LED light source deviate from the value of the initial chromaticity coordinates, which are described by the chromaticity coordinates (x, y) in the CIE 1931-XYZ colorimetric system.

4 Requirements

4.1 Power adaptability

4.4.4.1 Power

The power of the LED light source is directly related to the luminous flux required by the specific application system. See Table 3 for the light source power of different micro display projection systems.

4.4.4.2 Overload

The LED light source shall be able to withstand an overload test of 1.15 times the rated power; the temperature of the LED light source chip shall not exceed the temperature value specified in 4.4.6.

4.4.5 Average life

The average life of the LED light source is not less than 40000 hours.

4.4.6 Heat dissipation

The LED light source shall have good heat dissipation performance. The temperature of each part of the outer surface of the LED light source shall not exceed 60 °C, in an indoor working environment of 35 °C.

4.4.7 Noise

During normal operation, the noise shall not be higher than 36 dB at 1 m away from the LED light source.

4.5 Electrical safety

The insulation resistance and electrical strength shall meet the requirements of 10.3 in GB 8898-2011. The electrical clearance and creepage distance shall meet the requirements of Chapter 13 of GB 8898-2011; the pollution level shall be level 2.

4.6 Environmental adaptability

4.6.1 Low temperature

The LED light source shall be able to withstand a low temperature working test of -10 °C for 2 h.

4.6.2 High temperature

The LED light source shall be able to withstand a high temperature working test of 50 °C for 2 h.

4.6.3 Constant damp heat

The LED light source shall be able to withstand a constant damp heat working test of

5.4 Test of beam expansion and luminous brightness

According to the test device in Figure 7 of SJ/T 11394-2009, the luminous flux collected by the integrating sphere at different radiation angles is measured, by moving the LED light source to change the position with the standard detector, so as to obtain the relationship curve between the luminous flux and the radiation angle. Using the relationship between the luminous flux and the radiation angle obtained by the test, the light collection efficiency at different radiation angles can be obtained, so as to obtain the divergence angle of the light source according to the requirements of the light collection efficiency; the beam expansion and luminous brightness are calculated with the measured luminous area of the light source. The test results of the beam expansion shall meet the requirements of different micro display projection systems.

5.5 Measurement of color performance parameters

The measurement of the main wavelength and spectral line width of the LED light source shall be carried out, according to the test method specified in 5.3.5 of SJ/T 11394-2009.

5.6 Color coordinate drift

The color coordinate drift of the LED light source can be tested with a colorimeter. By setting the test mode of the colorimeter, it can directly read out the color temperature, color coordinates, color coordinates of the three primary colors of RGB of the synthetic white light. By using the color temperature and color coordinates obtained by test, through comparing them with the color coordinates at the initial moment, the color coordinate drift can be obtained.

5.7 Electrical performance test

5.7.1 Power test

The input power of the LED light source is tested using an electrical parameter tester.

5.7.2 Overload test

The input power of the LED light source is adjusted to 1.15 times the rated power by adjusting the input voltage, working for 15 minutes; the temperature of the LED light source chip is measured with a thermocouple.

5.8 Average life measurement

Batch size $N \geq 10$, under rated working conditions, the LED light sources of the batch are lit for 15 minutes, to measure the initial luminous flux of each light source. After that, the batch of light sources is turned off once after 12 hours of continuous operation, each time is not less than 1 hour. The off time is not included in the life.

When the lumen maintenance rate of $N/2$ (rounded to the nearest integer after the decimal point) LED light sources reaches 50%, the cumulative lighting time of the $N/2$ -th lamp in the detection order is the average life of the batch of LED light sources, expressed in hours.

5.9 Heat dissipation test

The temperature is measured by thermocouples at 35 °C indoor temperature environment, when the LED light source works for 30 minutes. Measure on the metal surface, plastic surface, fan exhaust respectively; make 3 measurements at each location and take the average value. Measure the temperature value of the LED light source 3 times and take the average value.

5.10 Noise test

After the LED light source is preheated for at least 30 minutes, measure according to the requirements of GB/T 18313.

5.11 Electrical safety test

The test method for insulation resistance and electrical strength shall be carried out in accordance with the test method specified in 10.3 of GB 8898-2011. The test method for electrical clearance and creepage distance shall be carried out in accordance with the test method specified in 13 of GB 8898-2011.

5.12 Environmental adaptability test

5.12.1 Lower limit test of working temperature

Performed in accordance with GB/T 2423.1-2008 "Test Ad". The test sample shall be initially tested. After the temperature reaches the specified value, it shall be powered on for 2 hours, to check whether the test sample is working normally. After 2 hours of recovery, the final testing shall be carried out.

5.12.2 Upper limit test of working temperature

Performed in accordance with GB/T 2423.2-2008 "Test Bd". The test sample shall be initially tested. After the temperature reaches the specified value, it shall be powered on for 2 hours, to check whether the test sample is working normally. After 2 hours of recovery, the final testing shall be carried out.

5.12.3 Constant damp heat test

Performed according to GB/T 2423.3-2006 "Test Cab". The test sample shall be initially tested. After the temperature and humidity reach the specified value, power on and work for 2 hours, to check whether the test sample is working normally. After 2 hours of recovery, the final testing is carried out. The sample shall still be able to work normally.

rejection quality level (RQL) is 65, the judgment array is $A_c = 1$, $R_e = 2$.

6.2.3 Samples of type inspection shall not be delivered to the ordering party as qualified products.

7 Marking, packaging, transportation, storage

7.1 Marking

The LED light source component shall have the following clear and firm markings: Product name, trademark, model and product number (batch number) and product barcode; nature of power supply, rated voltage, power frequency, power consumption and user warning signs to prevent electric shock; inspection certificate, production date, Chinese name of the manufacturer, address.

The packaging, storage, transportation graphic signs shall comply with the provisions of GB/T 191.

7.2 Packaging

7.2.1 Each packaging box shall be marked on the surface:

- a) Manufacturer's trademark and name, address, barcode;
- b) Product name, model;
- c) Standard number.

7.2.2 The outer packaging box of the product shall indicate:

- a) The name, address, trademark of the manufacturer;
- b) The name and model specifications of the product;
- c) Weight;
- d) External dimensions;
- e) Quantity;
- f) Production date.

7.3 Transportation

During transportation, the product shall avoid severe vibration, rain and snow, sun exposure, contact with corrosive gases, or mechanical damage.

7.4 Storage

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