

Cleaning of LEDs

Application Note

Introduction

Typically, LEDs, like other microelectronic components, are produced under controlled, dust-free and clean conditions, in so-called clean rooms.

During LED production a clean room classification of 10000 for the backend processes must be maintained.

With respect to purity, this means that in 1 ft³, no more than 10000 particles larger than 0.5 µm in size, or in relation to 1 m³, no more than 352,000 particles are permitted.

Since packaging of the LEDs is also governed by the corresponding conditions (vacuum-packed, ESD-secure, and moisture-resistant), for the most part, the LEDs can be considered to be 100% clean at the time of delivery.

Contamination can therefore only be assumed to occur after unpacking, during ongoing processing, uncovered temporary storage of products or possibly from use.

In general, it can be determined that LEDs with a normal standard epoxy encapsulant are less susceptible to contamination than those with a silicone encapsulant.

The reason is that the surface of the silicone exhibits a slight residual stickiness after hardening, allowing dust and contaminants to more easily remain attached to the surface.

This characteristic should always be taken into consideration when cleaning.

Various cleaning methods are described in the following.

Dry Cleaning

For dusty or slightly dirty LEDs, a simple dry cleaning is usually sufficient.

Ideally, cleaning by means of compressed air (e.g. central supply or spray can) is recommended here. The LEDs and/or board are simply blasted with clean air.

With the use of compressed air from a central supply, care should also be taken that the air is purified.

If not, the opposite effect is achieved. Additional contaminants (e.g. oil) are sprayed onto the components or board.

The simplest method is cleaning with a clean, soft, lint-free, dry cloth (cellulose or linen) or a clean brush.

Dry cleaning of LED devices encapsulated with silicone is not recommended, since the silicone is softer and therefore more sensitive to pressure, and dust is more likely to adhere to the slightly sticky surface of the silicone.

The probability that dry cleaning cannot achieve the intended effect is quite high. This can possibly lead to additional contamination or in the worst case, damage to the component due to mechanical stress to the silicone.

Wet Cleaning

Cleaning with a cleansing solution is most often required if the LEDs are dirtier or with more strongly adhering contamination such as residue from the soldering process (flux material, etc.).

For LEDs with a silicone encapsulant, cleaning with a cleansing solution is also recommended, due to the abovementioned reasons.

Of the numerous cleansing solutions available, isopropyl alcohol can generally be used for the cleaning in all cases.

Whether the residue of flux material can also be removed depends on the flux material used, however.

If other cleansing solutions are used, their appropriateness must be tested beforehand, especially as to whether or not they will damage the LED.

Generally, due to health and environmental issues as well as the worldwide regulations, cleansing solutions with CFCs (chlorofluorocarbons) should not be used.

As a matter of principle, LEDs must be cleaned in an unpowered state when wet cleaning is used.

Ultrasonic Cleaning

Cleaning of LEDs in an ultrasonic bath is generally not recommended.

The reason is that the influence of the ultrasound on the component is essentially dependent on the power of the ultrasonic bath, the temperature, the treatment time and the cleansing solution used. Possible ramifications or long-term consequences therefore cannot be foreseen or calculated.

If an ultrasonic cleaning cannot be avoided, tests must be carried out beforehand as to whether or not the LED will be damaged. In principle, this type of cleaning is carried out at one's own risk.

Summary

Generally, isopropyl alcohol can be used for cleaning, since this has been approved by OSRAM OS as suitable for all types of LEDs.

If other cleansing materials are used, their suitability must be tested beforehand, particularly as to whether or not damage is associated with the LED.

Due to worldwide regulations, cleansing solutions containing CFCs (chlorofluorocarbons) should not be used.

Ultrasonic cleaning of LEDs is not recommended.

In case an ultrasonic cleaning cannot be avoided, it should be determined beforehand whether or not the LEDs will be damaged.

For dry cleaning, in addition to purified compressed air, a clean, soft, lint-free cloth can be used, especially for LEDs with an epoxy encapsulant.

Dry cleaning of LED devices encapsulated with silicone is not recommended.

A combination of dry and wet cleaning may be required, depending on the type and extent of the contamination.

Special LED type-specific notes for cleaning can be found in the corresponding data sheets.

Appendix



Don't forget: LED Light for you is your place to be whenever you are looking for information or worldwide partners for your LED Lighting project.

www.ledlightforyou.com

Author: Andreas Stich

About Osram Opto Semiconductors

Osram Opto Semiconductors GmbH, Regensburg, is a wholly owned subsidiary of Osram GmbH, one of the world's three largest lamp manufacturers, and offers its customers a range of solutions based on semiconductor technology for lighting, sensor and visualisation applications. The company operates facilities in Regensburg (Germany), San José (USA) and Penang (Malaysia). Further information is available at www.osram-os.com.

All information contained in this document has been checked with the greatest care. OSRAM Opto Semiconductors GmbH can however, not be made liable for any damage that occurs in connection with the use of these contents.