

Cleaning of LEDs

Application Note



Valid for:
all OSRAM Opto Semiconductors LEDs

Abstract

This application note provides basic information on the cleaning of LEDs. The most important methods such as dry cleaning, wet cleaning and ultrasonic cleaning are described.

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A. General information

Typically, LEDs — such as 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 10,000 for the backend processes must be maintained. With respect to purity, this means that in 1 ft³, no more than 10,000 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.

Depending on the type and extent of the contamination, a combination of dry and wet cleaning may be required. Special LED type-specific notes for cleaning can also be found in the corresponding data sheets. The most important cleaning methods are described in the following.

B. Dry cleaning

For dusty or slightly dirty LEDs, 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 the board are blasted with clean air. If compressed air from a central supply is used, care should be taken that the air

is purified. If this is not the case, the opposite effect may be achieved, e.g. additional contaminants such as oils may be sprayed onto the components or the board.

The simplest method is cleaning the LEDs 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.

C. 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 above mentioned reasons.

Of the numerous cleansing solutions available, isopropyl alcohol (IPA) can be used for the cleaning of all LEDs which allow for wet cleaning in general. However, whether the residue of flux material, etc. can be removed depends on the flux material used. If other cleansing solutions are used, their appropriateness must be tested beforehand, especially as to whether or not they will damage the LED.

Note: For some of the LEDs from OSRAM Opto Semiconductors a wet cleaning process is not applicable e.g. due to not hermetically sealed packages. Please refer to the respective data sheets for further information.

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

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

D. 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.



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ABOUT OSRAM OPTO SEMICONDUCTORS

OSRAM, Munich, Germany is one of the two leading light manufacturers in the world. Its subsidiary, OSRAM Opto Semiconductors GmbH in Regensburg (Germany), offers its customers solutions based on semiconductor technology for lighting, sensor and visualization applications. OSRAM Opto Semiconductors has production sites in Regensburg (Germany), Penang (Malaysia) and Wuxi (China). Its headquarters for North America is in Sunnyvale (USA), and for Asia in Hong Kong. OSRAM Opto Semiconductors also has sales offices throughout the world. For more information go to www.osram-os.com.

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