

Customer complaint management — Details on return shipments for failure analysis request (FAR)

Application Note



Valid for:

all OSRAM Opto Semiconductors products

Abstract

This application note gives guidance on how parts meant for failure analysis are to be returned to OSRAM Opto Semiconductors to ensure a fast and reliable analysis.

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A. General information

Despite their reliability and robustness, LEDs can experience faults and failures caused for example by various manufacturing processes, by design or system factors when in use or as a result of interaction with other system components.

For almost every root cause analysis it is therefore essential to perform a detailed and thorough failure analysis based on which the right conclusion can be drawn. This is independent on who is actually responsible for the failures.

By constantly striving for highest quality, OSRAM Opto Semiconductors increases customer satisfaction and improves its competitive position. This simple equation is the driving force behind our quality policy.

OSRAM Opto Semiconductors' reliability engineering & research group, supported by in-house reliability laboratories, continuously achieve enhancement of experience and know-how in opto semiconductor quality and reliability.

B. Analysis methods

In the event of quality issues or as part of development evaluations, OSRAM Opto Semiconductors offers a step-by-step analysis process for LED components in our in-house analysis laboratory.

Analysis methods available at OSRAM Opto Semiconductors include:

- Electrical & optical characterization
- Light microscopy
- IR microscopy
- Photoemission microscopy (PEM)
- Energy dispersive X-ray analysis (EDX)
- Focused ion beam preparation (FIB)
- X-Ray photoelectron spectroscopy (XPS)
- Solderability testing
- X-ray & X-ray CT imaging

C. Communication of necessary information

For OSRAM Opto Semiconductors as supplier it is essential to have sufficient information available when a complaint is started. The information provided before shipping a part, can be helpful to speed up the root cause investigation, set-up robust containment actions and check production history in advance to have a conclusive and complete analysis.

- Product data (e.g. LED type) *
- Failure location (incoming inspection, production, qualification, 0-km, field incl. km/hours) *
- Clear failure/symptom description (optical, electrical, mechanical, etc.)
- Quantity (how many failures occurred) *
- Application *
- Date of occurrence *
- Delivery note *
- Operating conditions *
- Application/ambient conditions
- Label Information
- Laser code (in case available for LED type)
- Purchase Order No.
- Pictures of affected LED/application
- Failure rate

*Essential information

To gather this information in advance, OSRAM Opto Semiconductors provides a form (customer information sheet, CIS) which is available at regional sales and customer service departments. The contents of the CIS are essential for a fast and reliable failure analysis and will help us to handle your complaint fast and without time-consuming question and answer. Please always provide a filled out CIS when starting a complaint.

D. How to return parts for analysis

Ideally, LEDs should be provided for failure analysis in the actual failure condition, i.e. in the condition they were in when the fault or failure occurred.

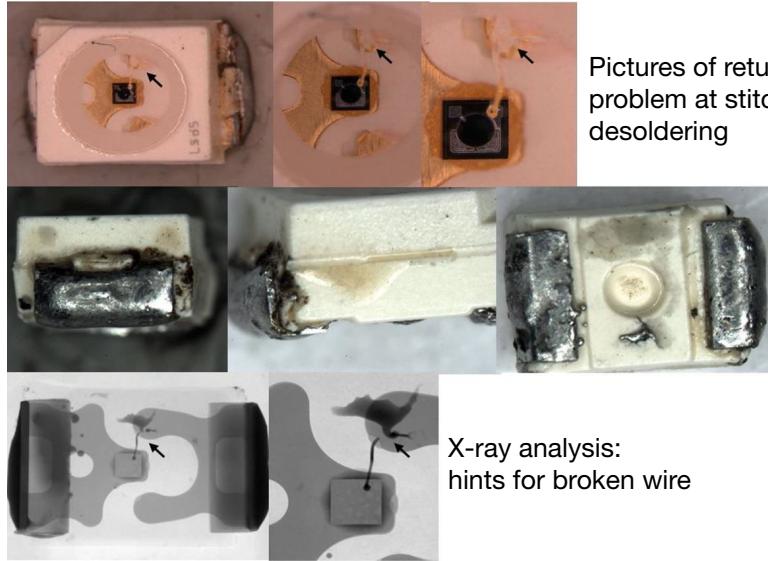
The LEDs will most likely be mounted on a customer-specific circuit board when the fault occurs and it is best to submit the complete board for analysis.

As a general rule, LEDs should not be detached or desoldered from the circuit board. This avoids any further damage or degradation to the LED, which may mask or even eliminate the original fault (Figure 1).

Additionally, a potential influence of the circuit or other design factors can also be investigated and possibly excluded.

Handling in accordance with ESD protection guidelines is also essential for packing and shipping to avoid any further impact on the electronic assembly.

Figure 1: Problem with desoldered devices: impact on device may mask or eliminate original failure



Pictures of returned unit/ internal assembly: problem at stitch probably caused during desoldering

Side view of package: thermal damage of package material due to desoldering

X-ray analysis: hints for broken wire

LEDs having a silicone resin or lens are sensitive to dust and volatiles due to the properties of the silicone materials. Therefore, packaging should also be dust-free and residue-free.

Any kind of mechanical stress on the LEDs has to be avoided.

Further damage (scratching, shearing off of the lens, distortion of the bond wire, etc.) can conceal the original damage (lens defect, bond wire defect, etc.).

Table 1 gives an overview of typical Dos and Don'ts.

Table 1: Dos and Don'ts

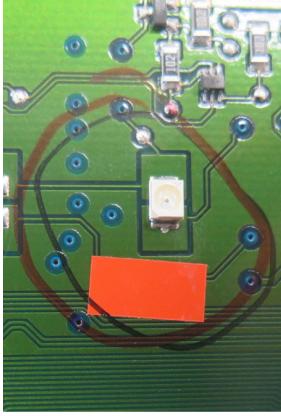
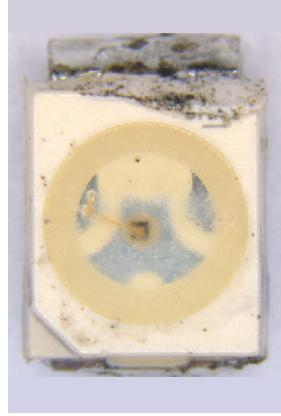
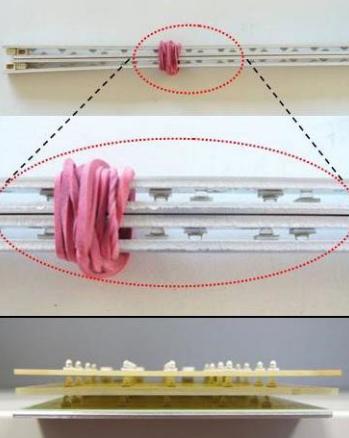
Topic	Dos	Don'ts
Return conditions	 <p>Return parts clearly marked in actual failure condition of PCB</p>	 <p>Desolder parts and apply different types of stress</p>
Laser code	 <p>Provide clear picture with readable laser code</p>	 <p>Provide insufficient picture of affected part with no readable laser code</p>
ESD protection	 <p>Send PCB in sealed ESD conformal bag</p>	 <p>Use standard bag and return single LEDs</p>

Table 1: Dos and Don'ts

Topic	Dos	Don'ts
Packaging	 <p>ESD cardboard box with foam inside to protect parts against electrical and mechanical stress</p>	 <p>Insufficient protection of affected parts against electrical and mechanical stress</p>

E. Conclusion

Failure analysis concerning the allocation of cause and effect can be a sensitive issue. In some cases it can even be controversial. Therefore, an accurate and well-structured proceeding is essential to prevent avoidable issues.

Inside a concerted environment and on the basis of mutual trust, failure analysis provides a better understanding of the needs and expectations of both partners. Furthermore, a traceable and exact failure analysis initiates continuous learning and improvement of technologies, products, processes and services.

In any case, failure analysis is of mutual benefit and is a critical factor for success in terms of product quality and reliability.



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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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