PointLED® - It’s nice to be different

Application Note

Published by ams-OSRAM AG
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ams-osram.com
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PointLED® - It’s nice to be different

Application Note No. AN081

Valid for:
PointLED®

Abstract

This application note provides insight into the universally deployable and flexibly mountable light source of the PointLED® product family.

A fundamental overview of the LED construction as well as the optical and electrical characteristics and performance of the LED are presented. The unique and versatile mounting capability of the PointLED® is examined in detail.

Table of contents

1 PointLED® product family 3
1.1 Design and features 4
1.2 Product portfolio 5
2 Handling and processing 5
2.1 ESD stability 5
2.2 Manual handling 6
2.3 Automated handling 6
2.4 Pick-and-place nozzle design 7
2.5 Solder pad design 7
2.6 Reflow profile 8
3 Assembly of the PointLED® 9
3.1 Though-hole mounting 9
3.2 SMT mounting 10
4 Conclusion 11

1 PointLED® product family

At first glance, the PointLED® product family differs from other commercially available conventional SMT LEDs. Unlike customary SMT LEDs, the PointLED® does not have a rectangular package, but was developed and constructed as a round component (see Figure 1).

Figure 1: PointLED®

Compared to the rectangular component, the round package has the advantage that it exactly fits into a simple drill hole. In addition to being mounted in the normal manner on the surface (SMT), this permits a perfectly flat, "through-hole" mounting on the circuit board. As a result, the

package disappears within the circuit board rather than projecting outward from the surface. An even surface is formed, free of obstructions, so that the connection or mounting of additional components such as a light guide, a button or keyboard is possible.

The versatile PointLED® can be used in many different areas. For applications in which the available space is critical, it represents the ideal choice. Depending on the chip technology employed, the PointLED® can be used as a universal light source in the following areas:

- Backlighting (LCD, buttons, keyboards, advertising)
- Replacement for miniature lamps
- Indicator lighting (e.g. steps, emergency exits etc.)
- Signal and symbol illumination
- Coupled to light guides
- Optical indicators
- Effects lighting (mobile telephone, PC, etc.)

Furthermore, due to its high quality and reliability, it is also suitable for applications in the automotive area, such as:

- Interior lighting (e.g. instrument lighting etc.)
- Stop lights (CHMSL)

With its characteristics and extended mounting capability, the PointLED® is a flexible LED choice. It allows developers degrees of freedom that enable new application ways and options.

1.1 Design and features

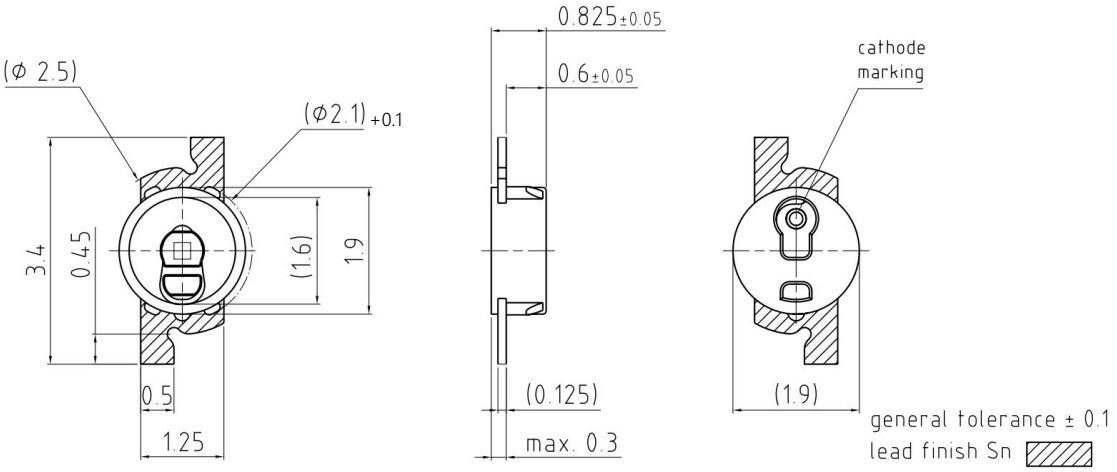
The construction of the PointLED® represents the perfect combination of packaging and chip technology. With its round, flat miniature package consisting of white plastic, lead frame and encapsulant, it is s small light source with a built-in reflector (Figure 2).

Specially developed for applications with small space requirements, the PointLED® has a diameter of only 2 mm and a total height of 0.775 mm. The reflector itself is only 0.5 mm in height and consequently can be ideally integrated in thin circuit boards.

In development of the package, particular attention was given to flexibility regarding mounting technology. Due to its design, the PointLED® is suited for both variants — for normal surface mount technology (SMT) and for through-hole mounting.

The PointLED® product family adheres to the RoHS guideline and contains no lead or other hazardous substances.

Figure 2: Dimensions of the PointLED®



A further significant advantage of the PointLED® product family is shown by the adaptable sealing concept. This permits the use of either a simple clear encapsulation or colored silicone for color conversion (with white LEDs). In combination with the various chip technologies, all colors can be produced and a higher LED lifetime can be achieved.

1.2 Product portfolio

The available product portfolio ranges from normal LED types with standard chip technology, various low-current LEDs for low power applications and highly efficient PointLED® variants with the latest thin film chip technology. An overview of the various versions with their type designation, color, wavelength and typical brightness for the respective grouping current can be found on the website.

2 Handling and processing

2.1 ESD stability

It should be noted that due to the miniature package, the LED does not contain an ESD protective diode. Depending on the chip technology employed, few PointLED® types are therefore sensitive to electrostatic discharge (ESD). It is recommended to use and adhere to the corresponding protective measures (e.g. grounding armband, grounding of equipment etc.).

Although there is no additional ESD protection included, the LED provides an ESD stability up to 2 kV. It is assigned to the "Class 2 HBM" category in accordance with ANSI / ESDA / JEDEC JS-001. With this class the LED can be considered as uncritical for processing and assembly by

state of the art SMT equipment aligned with ESD precautions. To achieve higher ESD protection on the system level, additional ESD protection must be applied.

Nevertheless, please be aware of ESD safety while handling LEDs. As a matter of principle, common ESD safety precautions must be observed during the handling, assembly and production of electronic devices (LEDs). For further information on ESD protection please refer to the application note "ESD protection while handling LEDs"

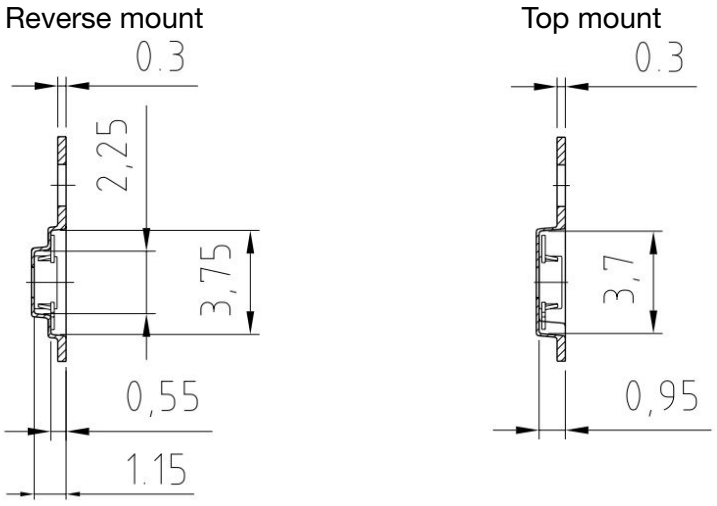
2.2 Manual handling

For variants with silicone encapsulation, it should be noted that direct mechanical stress on the silicone, e.g. with the ejector, pick-up needle etc., should be avoided. This can lead to damage to the LED (see application note "Handling of silicone resin LEDs").

2.3 Automated handling

The PointLED® is delivered on tape and reel. The tapes are adapted to the appropriate mounting technique, so that an individual tape is available for top or reverse mounting and the LEDs are correspondingly taken from the reel with the correct orientation (Figure 3).

Figure 3: Taping of the PointLED® corresponding to the individual mounting



Therefore the necessary taping should be already considered with order of the LED (Figure 4). In the designation system of the PointLED® the top mount technique is marked by the additional letter "F" (= Flipped). The reverse mounting — standard technology of the PointLED® group — is not marked in the designation additionally.

Figure 4: Individual designation of the PointLED® corresponding to the mounting

Ordering Information

Type	Luminous Intensity [1] I_F = 30 mA I_v	Mounting methode	Ordering Code
LY P47B-T2V1-26-1	355 ... 900 mcd	Reverse	Q65110A4726
LY P47B-T2V1-26-1-F	355 ... 900 mcd	Top	Q65110A4727

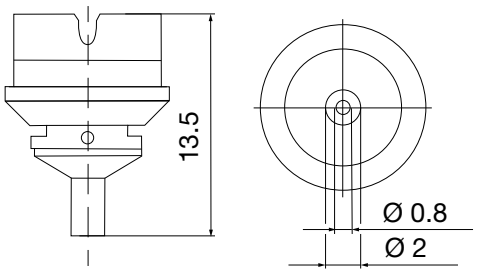
Flipped LED in tape for top mount

Each reel only contains a single brightness group and a single wavelength group. That is, from the brightness groups within the family, one tape contains only one of the groups.

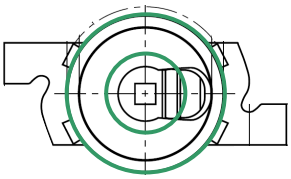
2.4 Pick-and-place nozzle design

When processing by means of automated placement machines, care should be taken that an appropriate pick-and-place tool is used and that the process parameters conform to the package characteristics. Figure 5 shows a nozzle recommendation for automated placement.

Figure 5: Recommended nozzle from ASM SIPLACE 3010529-01



Recommended nozzle pick-up area

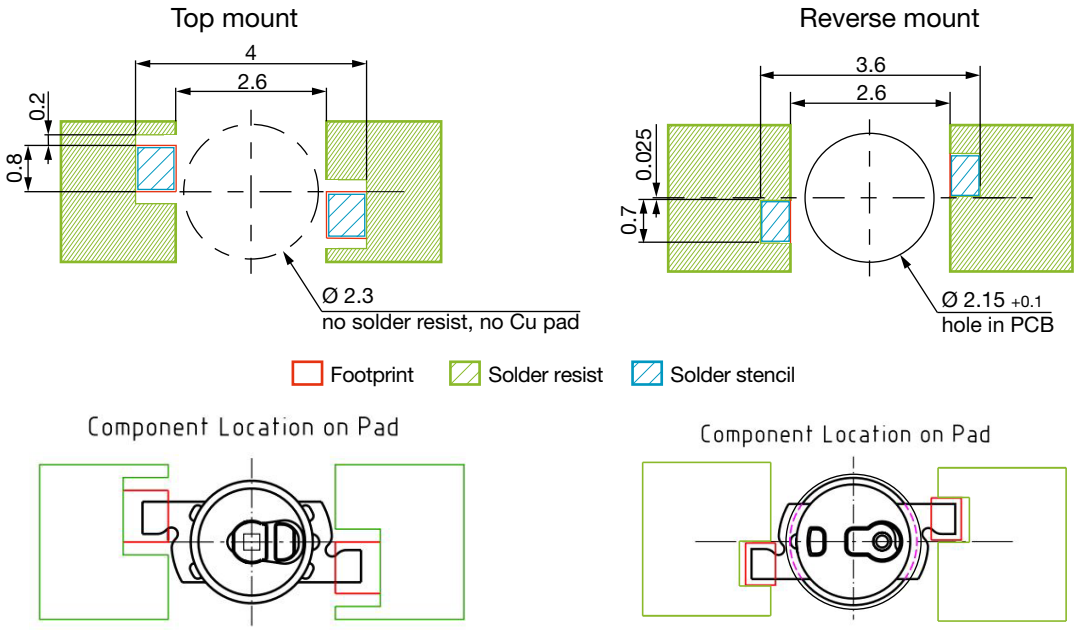


The use of a to small, round tool can cause damage (e.g. cracks, breaks) to the housing or to the entire component. With automatic processing, care should generally be taken that the forces acting upon the LED are kept as low as possible.

2.5 Solder pad design

For optimal mounting of the LED and therefore to guarantee the performance of the LED, it is usually advantageous to make use of the recommended solder pad layout. When designing the solder pads for the PointLED® product family, in addition to the characteristics of the LED, the thermal behavior and various mounting methods were also taken into consideration. The pad geometry was optimized with respect to an improved heat transfer. In Figure 6, the solder pads for the two individual mounting methods are shown.

Figure 6: Solder pads of the PointLED® for top — and reverse mounting

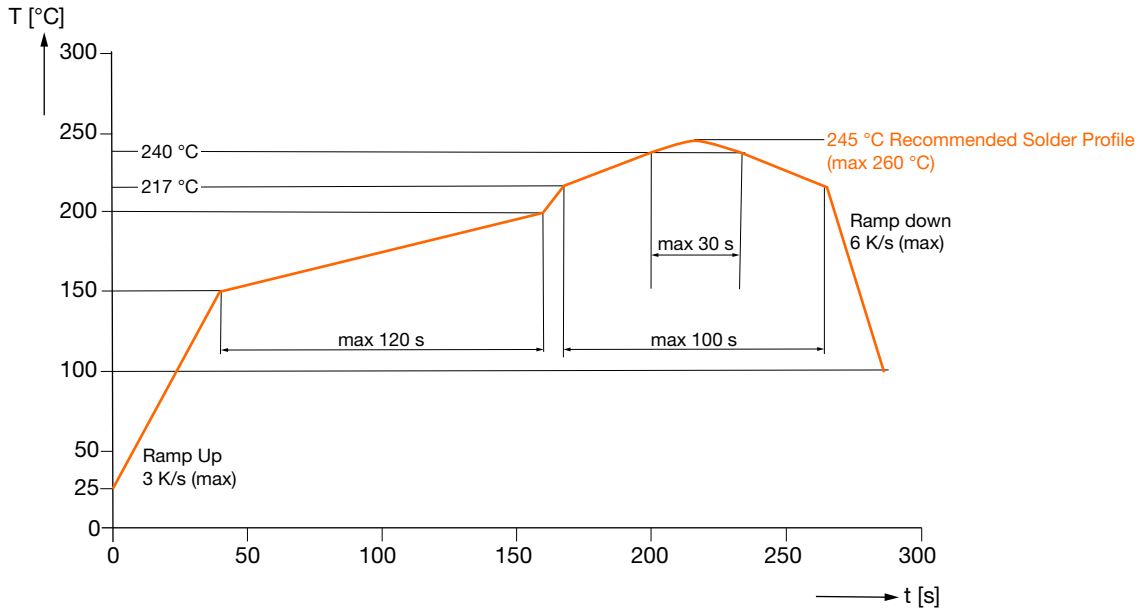


For top mounting, it should be noted that the circuit board area underneath the LED should be free of copper and solder resist. If this is not observed, it can happen that an insufficient solder connection between the solder pad and LED contact is formed, due to the larger gap. This can more readily be seen if only a thin layer of solder paste is applied.

2.6 Reflow profile

Generally, the PointLED® is compatible with the existing industrial SMT processing process, so that all prevalent population techniques can be used for the mounting process. For mounting the components, a standard reflow soldering procedure is recommended, in which a customary SnAgCu metal alloy solder is used. Figure 7 shows the soldering conditions and temperature curve for lead-free soldering of the PointLED® product family.

Figure 7: Reflow soldering profile for lead-free soldering



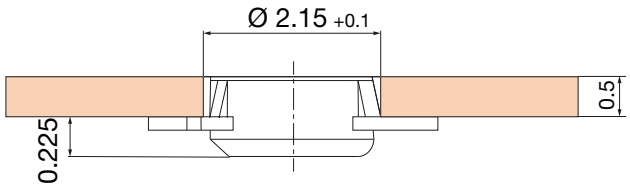
3 Assembly of the PointLED®

The most significant advantage of the PointLED® group is its unique and versatile mounting capability. Developed for extremely flat through-hole mounting by default, it can also be mounted on the circuit board such as a Toplooker LED, directly from above, as usual.

3.1 Though-hole mounting

With through-hole mounting, the LED is inserted from the reverse side of the circuit board and sunken in a drilled hole with a diameter of 2.15 mm (+0.1 mm). Connections to the PointLED® occur on the reverse side.

Figure 8: Through-hole mounting

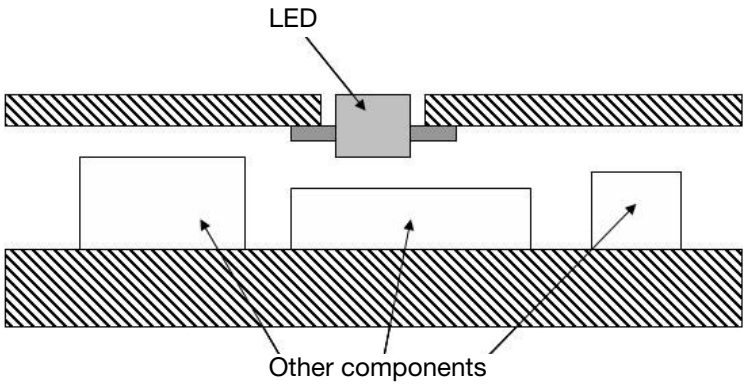


Embedded in a thin circuit board with a thickness of 0.5 mm, a single planar surface is created when the two surfaces are brought flush with each other. This area can be used for other

structures, mounting of other components or additional circuit traces. On the reverse side, the LED itself only extends 0.225 mm from the circuit board.

In a multilayer circuit board composite, this has the advantage that components on the following layers have not to be taken into consideration, since the minimum protruding portion of the PointLED® does not represent any interference, see Figure 9.

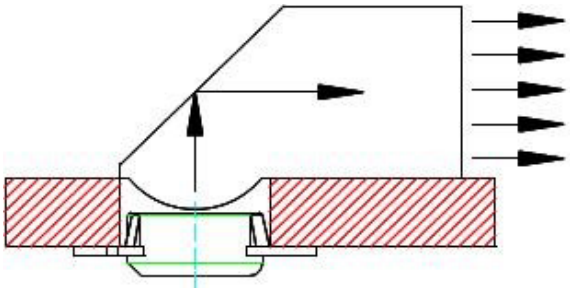
Figure 9: Location of PointLED® in a stack construction



With this use of thicker circuit boards (> 0.5 mm), The LED lies a bit below the surface. Depending on the thickness of the circuit board, this also leads to a narrowing of the radiation characteristics, similar to reverse-gullwing LEDs. In this case however, it is significantly less important.

As an example, Figure 10 shows a construction of the PointLED® with a 1 mm thick light guide.

Figure 10: PointLED® with light guide

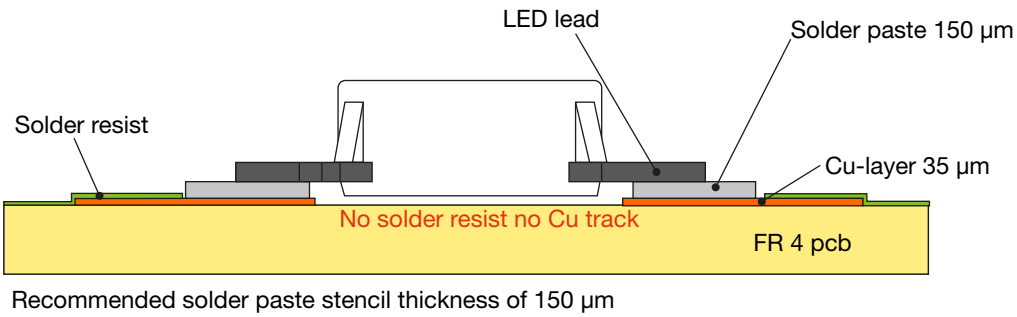


The goal here is to couple the radiated light into a light guide and divert the light by 90° by means of the end surface. The drilled hole serves both as an exact alignment and a coupling of the light guide to the LED.

3.2 SMT mounting

In consideration of its flat design the corresponding solder pad, the PointLED® is also suited for mounting from the top side (SMT). The LED is placed directly on the circuit board as normal (see Figure 11).

Figure 11: SMT mounting of the PointLED® on the surface of the PCB



Recommended solder paste stencil thickness of 150 µm

4 Conclusion

With its small dimensions and its versatile mounting ability, the PointLED® represents a universally deployable light source. In addition, though the possibility of a nearly full integration within the circuit board, it is ideal for applications in which the limited amount of available space plays a decisive role.

If the PointLED® is compared with other LEDs, it can be ascertained that through the combination of package and highly efficient chip technology, an equally high brightness and optical efficiency can be achieved.

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