High Brightness Through Hole LED Lamps With and Without Standoff

Application Note 5352

Introduction

Avago Technologies offers both standoff and non-standoff 5mm high brightness through hole (TH) LEDs to customers of Electronics Signs and Signals (ESS) applications. This application note provides detailed information about the features of both standoff and non-standoff LEDs.

Through Hole LED with Standoff

Advantages:

1) Flexibility. As the standoff holds the LED body at a distance above the PCB, the LED has the flexibility of being aligned or intentionally tilted slightly by using an alignment fixture or other controlled means prior to wave soldering (See Figure 1). Refer to application note AN-5334 for precautions of alignment fixture designs and handling.

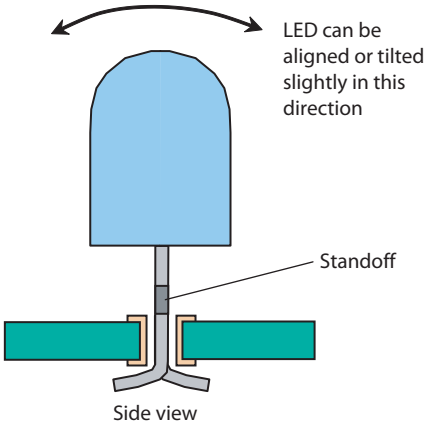


Figure 1. LED with standoff normally can be aligned or tilted slightly

2) Less heat absorption during the wave soldering process.
   i. As the LED body is further above the wave solder contact point, the heat transfer from the solder bath to the LED body is less.
   ii. Larger gap between the LED body and the PCB allow faster cooling after wave soldering.
3) Absorption of mechanical stress. During the auto-insertion process, the leads protruding from the bottom of the PCB will be cut and clinched. The plated through hole (PTH) will act as the pivot point in this action. Since the LED has not been soldered, the mechanical stress during auto-insertion can still be transferred to the LED package. Standoff LEDs can help to absorb mechanical stress during auto-insertion, keeping the LED body further away from the pivot point.
4) Blow hole elimination. With the LED body being lifted off from the PCB, the blow hole issue that is caused by the LED body blocking the top of the PTH, can be eliminated.

Disadvantages:

1) Potting material. For outdoor sign applications, potting material on the outer side of the PCB is necessary to protect the electronic components. As the standoff lifts the LED body, more potting material is required, compared to LEDs without standoff as shown in Figure 2.
2) The LED may be bended or twisted during the assembly process if not controlled well.

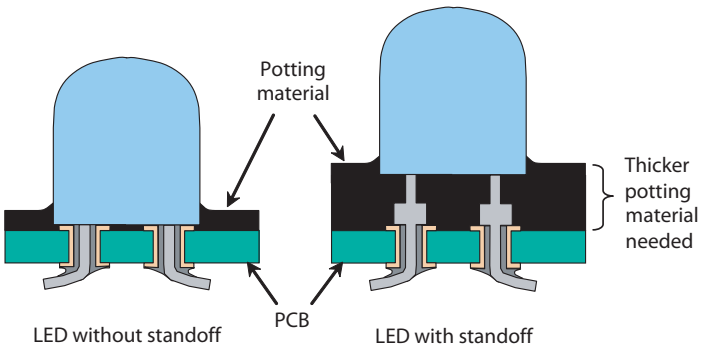
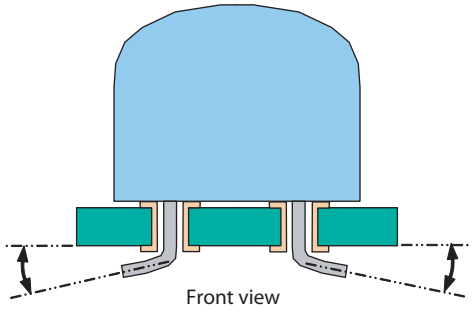


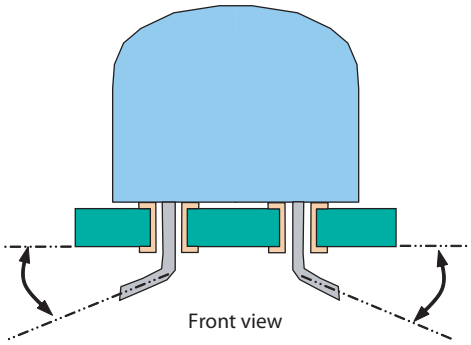
Figure 2. Thicker potting material may be needed for LEDs with standoff

Through Hole LED without Standoff

An LED without standoff will sit flat on the PCB after insertion. This gives some advantages and disadvantages. Users are urged to take extra precautions when using LEDs without standoff.



More clinching on LED's leads



Less clinching on LED's leads

Figure 3. Less clinching can helps to reduce mechanical stress experienced by the LED

Advantages:

1) Alignment reduction. After insertion, the LED sits flat on the PCB tightly. Being supported by the LED body, it has a lower risk to bending during the assembly process. The need for alignment fixture during wave soldering is reduced.
2) Less potting material. As shown in Figure 2, there is less usage of potting material needed to protect the electrical connections and components.

Disadvantages and precautions:

1) Higher thermal stress. The LED will experience higher thermal stress as the heat path into the LED package is shorter. It is important to control the wave soldering temperature as low as possible in order not to overstress the LED; preferably less than 235°C peak temperature.
2) Blow hole issue. TheLED without standoff is more susceptible to the blow hole issue as the LED body might block the PTH when it sits flush to the board. This affects the out-gassing escape path during wave soldering. Refer to Avago's application note AN-5334 for details.
3) Mechanical stress experienced by the epoxy during the lead clinching process is higher as the LED body is closer to the PCB. Clinching should be minimized to reduce the stress as shown in Figure 3.

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