

Application Note 5333

Introduction

This series of top mount PCB PolyLED is designed with smaller footprint to achieve high density of components on board. They have the industry standard footprint of 3.2mm x 2.4mm and a dome height of 2.4mm. This makes them very suitable for backlighting and indication application where space is a constraint.



Figure 1 . Avago's PCB PolyLEDs

The main benefits of these PCB PolyLEDs are:

- Small foot print
- Available in four colors
- Non-diffused dome for high brightness
- Supreme product quality and reliability
- Operating temperature range of -40°C to +85°C
- Package in 8mm tape on 7" diameter reels
- Compatible with automated placement equipment
- Compatible with infrared and vapor phase reflow soldering process

Contents

- Package Construction
- Tape and Reel Packaging
- Moisture Sensitivity
- Automatic Placement Equipment Considerations
- Land Pattern Design Recommendation
- SMT Reflow Soldering Profile

Package Construction

The design of the ASMT-Bx20 package is very unique to facilitate its top-firing option in with consisting with a dome len. The LED is constructed of the LED die attached to the PCB substrate using the silver epoxy and encapsulated by epoxy resin. The gold wire completes the electrical connection to the two terminals.

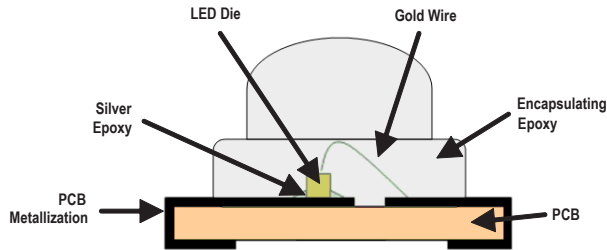


Figure 2. PCB PolyLED Package Construction

Tape and Reel Packaging

The LEDs are packaged in tape and reel form in accordance with the EIA-481-1-A-1994 Standard, Taping of Surface Mount Components for Automatic Placement. Figure below shows the packaging specifications.

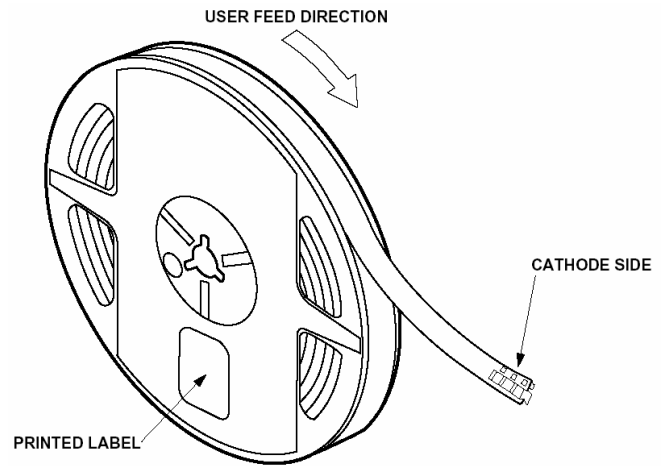


Figure 3. Reeling Orientation

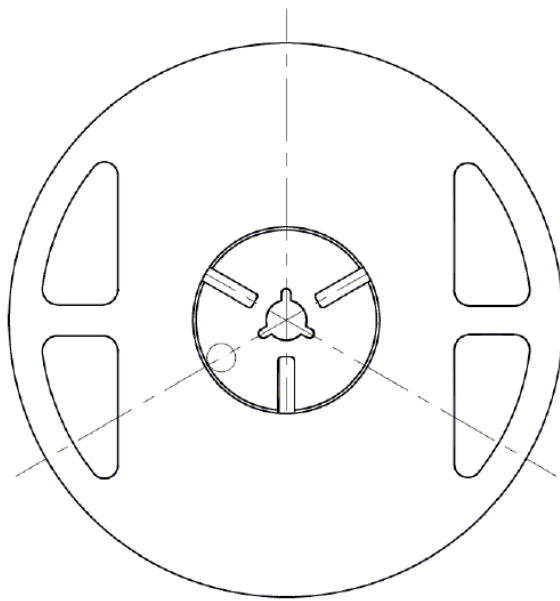
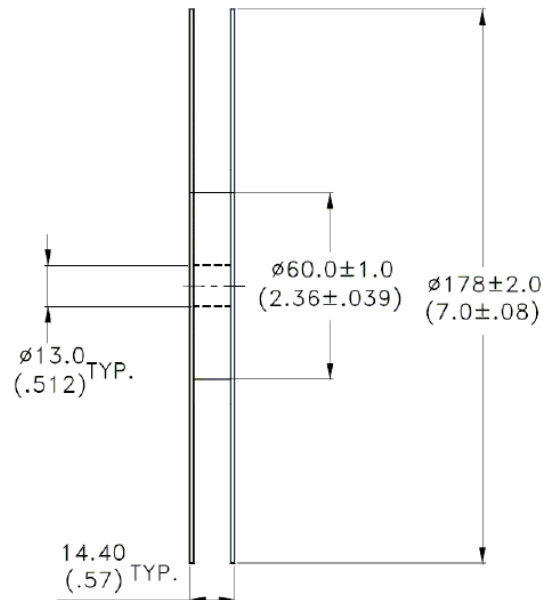


Figure 4. Reel Dimensions



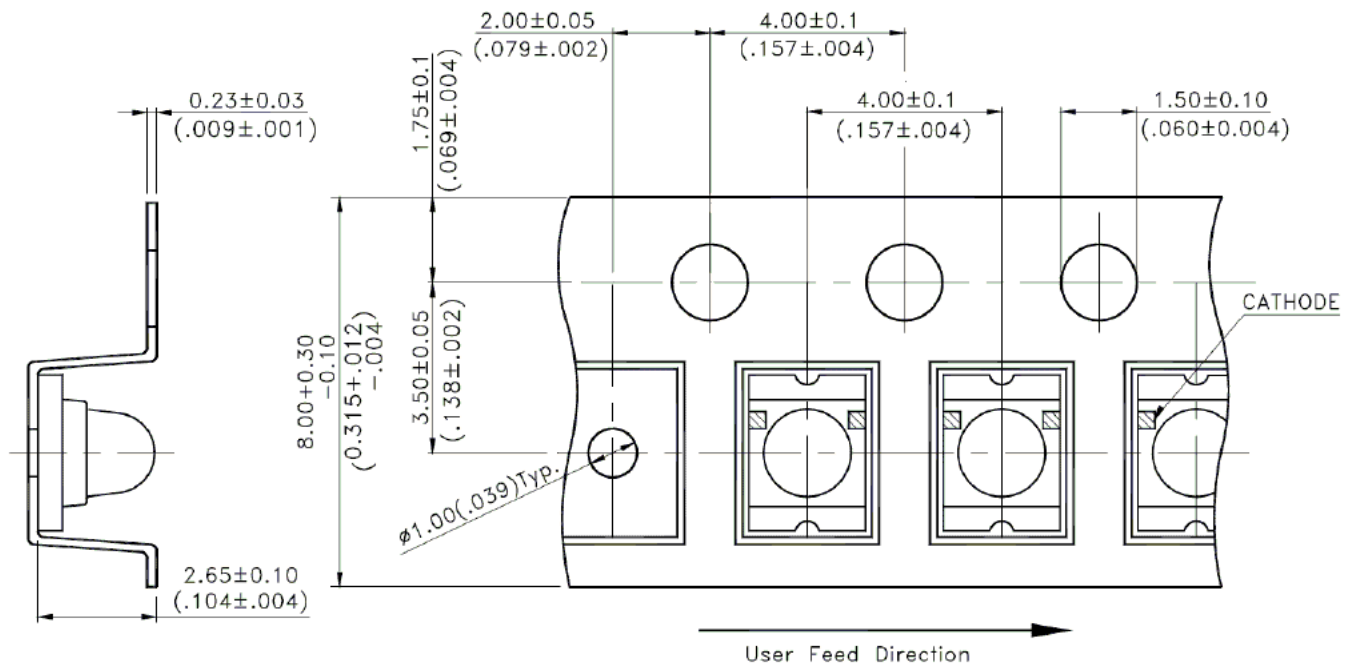


Figure 5. Tape Dimensions

	DIM. A	DIM. B	DIM. C
Part Number	± 8.00 (00315)	± 4.00 (0.157)	± 2.65 (0.104)
ASMT-Bx20	L = 3.2 (0.126)	W = 2.4 (0.094)	H = 2.4 90.094)

Dimensions in millimeters (inch)

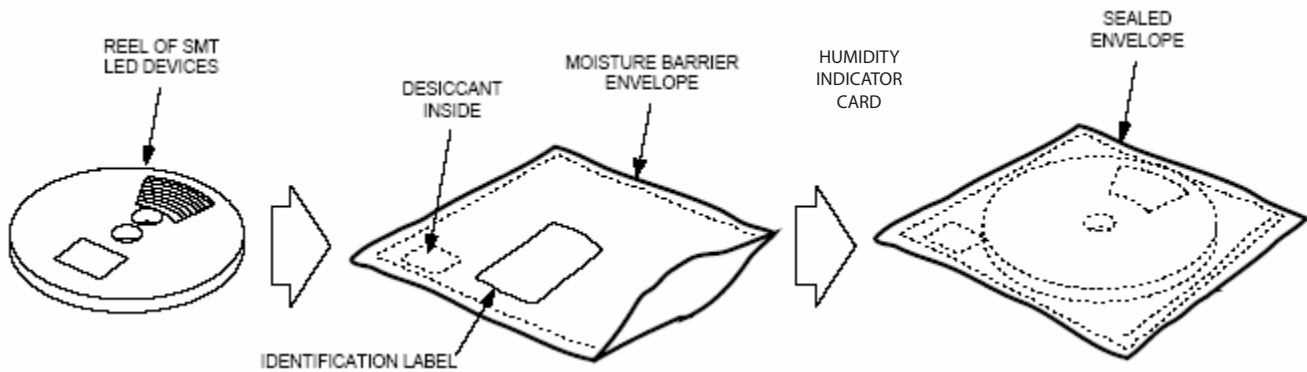


Figure 6. Moisture Barrier Bag Packaging for SMT LED components

Moisture Sensitivity

The optical grade materials used in SMT LED components absorb moisture directly out of the air. Absorbed moisture in SMT LED components that have been reflow soldered to a pc board is typically of minor concern. However, moisture absorption in SMT LED components prior to reflow soldering is of serious concern.

If moisture is absorbed by SMT LED components prior to soldering, the entrapped moisture turns into superheated steam during the solder process. The pressure of this superheated steam fractures the packages of the components causing catastrophic failure. Therefore, it is of vital importance to protect SMT LED components from absorbing moisture prior to soldering.

To protect the SMT LED components from moisture absorption during shipping and handling, reels for SMT LED components are packaged in moisture barrier bags (Figure 9). Each bag contains a humidity indicator card (HIC) which is a card on which a moisture-sensitive chemical is applied such that it will make a significant, perceptible change in color (hue), typically from blue (dry) to pink (wet) when the indicated relative humidity is exceeded. The HIC have 3 color spots with sensitivity values of 5%RH, 10%RH and 60%RH.

E.g. The parts are to be baked before mounting if the 10% is NOT Blue (PolyLED products are MSL Level 2a).

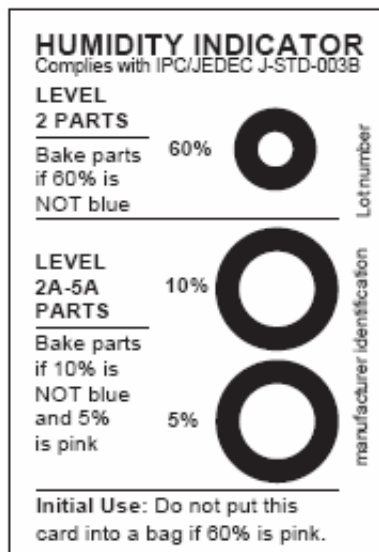


Figure 7. Example of Humidity Indicator Card

Once the MBB bag is opened, SMT LED components should be handled in accordance with the recommendations for their appropriate moisture sensitivity classification. The Joint Industry Standard IPC/JEDEC J-STD-020 Moisture / Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices establishes the necessary handling recommendations for each moisture sensitivity classification.

Table 5-1 Moisture Classification Level and Floor Life

Level	Floor Life (out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated
1	Unlimited at $\leq 30^{\circ}\text{C}/85\% \text{ RH}$
2	1 year
2a	4 weeks
3	168 hours
4	72 hours
5	48 hours
5a	24 hours
6	Mandatory bake before use. After bake, must be reflowed within the time limit specified on the label.

Figure 8. Moisture Classification Level and Floor Life



	Caution This bag contains MOISTURE-SENSITIVE DEVICES	LEVEL  <small>If blank, see adjacent bar code label</small>
	<ol style="list-style-type: none"> Calculated shelf life in sealed bag: 12 months at <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH) Peak package body temperature: _____ $^{\circ}\text{C}$ <small>If blank, see adjacent bar code label</small> After bag is opened, devices that will be subjected to reflow solder or other high temperature process must <ol style="list-style-type: none"> Mounted within: _____ hours of factory conditions <small>If blank, see adjacent bar code label</small> <math><30^{\circ}\text{C}/60\%</math> RH, OR Stored at <math><10\%</math> RH Devices require bake, before mounting, if: <ol style="list-style-type: none"> Humidity Indicator Card is >10% when read at <math>23 5^{\circ}\text{c}<="" \pm="" li="" math><=""> 3a or 3b not met </math>23> If baking is required, devices may be baked for 48 hours at <math>125 5^{\circ}\text{c}<="" \pm="" math><br=""></math>125> <small>Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure</small> 	
Bag Seal Date: _____ <small>If blank, see adjacent bar code label</small>		
<small>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</small>		

Figure 9. MBB Identification Label

Avago PCB PolyLED products are MSL Level 2a which has a floor life of 4 weeks or 672 hours at factory conditions of 30°C/60%RH or stored at <math><10\%</math>RH. Baking is required if the HIC is >10% when read at

Automatic Placement Equipment Considerations

In the placement process, the LED components are placed onto solder paste or adhesive on the PCBs. There are many factors to consider during this process, i.e. placement equipment, feeders, placement program and data, nozzles, PCB support, components, PCB, solder paste, environment, operator and many more.

In order to facilitate its top-firing light emitting direction, the LED must be designed in such a way where the LED is positioned to the PCB land pattern design (See Figure 13 below).

To ensure the quality and accuracy of the placement, it is important that all data are set correctly and precisely. Most continuous placement failures are caused by faulty data. The component data and package dimension can be obtained from the product datasheet.

The placement of the LED needs to be on the two soldering pads as illustrated in Figure 10.

The recommended nozzle sizes are summarized as table below to avoid high fallout unit rate during pick and place process.

Description	Nozzle Selection	
Nozzle Sizes	Outer Dia = 1.5mm,- Inner Dia = 1.0mm	Outer Dia = 3.5mm,- Inner Dia = 1.7mm,- (RubberTips)
Observation	nozzle selected based on the LED dimension	-
Summary	High units fallout due to insufficient vacuum to hold LED by inner diameter hole	Excellent pick up response, LED dome can be properly vacuum by the nozzle tip
Recommendation	√	

The recommended nozzle size should be sufficient to cover up the dome lens of the LED as figure below :

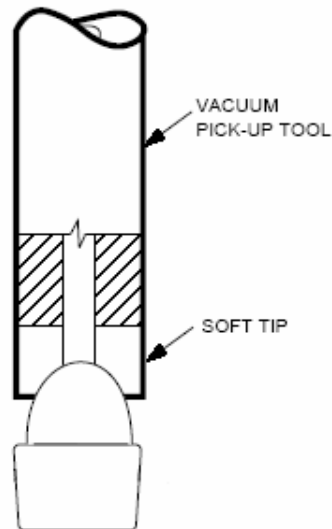


Figure 10. Recommended nozzle size

Land Pattern Design Recommendations

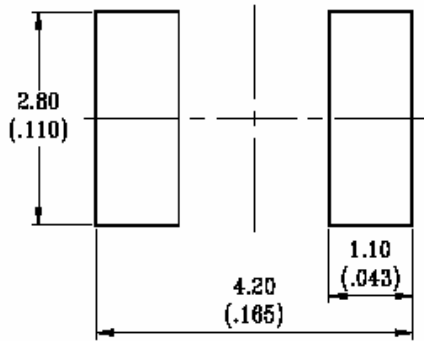


Figure 11. PCB PolyLED Land pattern design

SMT Reflow Soldering Profile

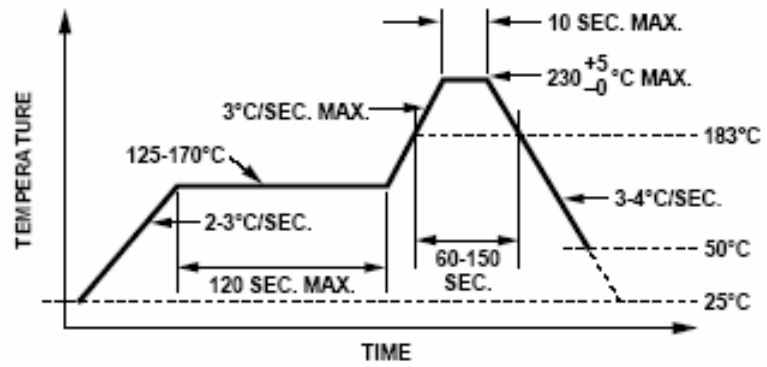


Figure 12. Recommended reflow soldering profile

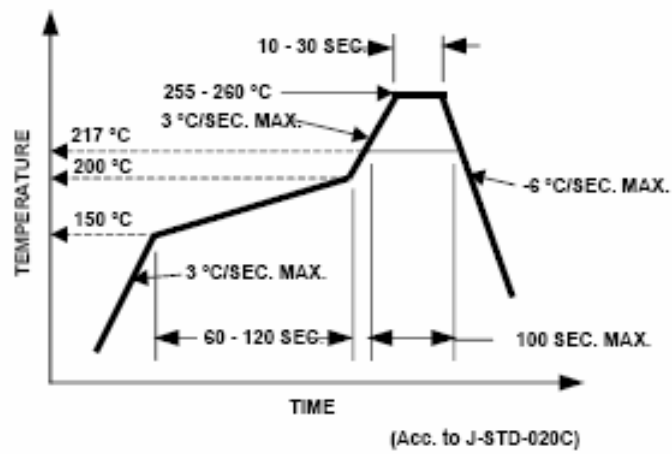


Figure 13. Recommended Pb-free reflow soldering profile

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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