Packaging and Intensity and Color Binning Options for Precision Optical Performance AlInGaP T-1 3/4 LED Lamps

Application Brief I-010

Introduction

Precision Optical Performance AlInGaP, nondiffused, T-1 3/4 LED lamps may be ordered with specific viewing angles, package configurations, light output and color selection options, combined with tape and reel packaging. The various viewing angles are designed to meet the needs of specific applications. The package configurations and tape and reel options provide compatibility with different manufacturing processes. Device light output and color binning options allow users to design for uniform appearance in large area multi-lamp arrays applications such as variable message signs and traffic signals.

Lamp Viewing Angles

Many of the AlInGaP LED lamp devices are available with one or more of the following viewing angles listed in Table 1. Each viewing angle and the associated spatial radiation pattern has been designed to meet the requirements of large area array applications such as those mentioned in Table 1.

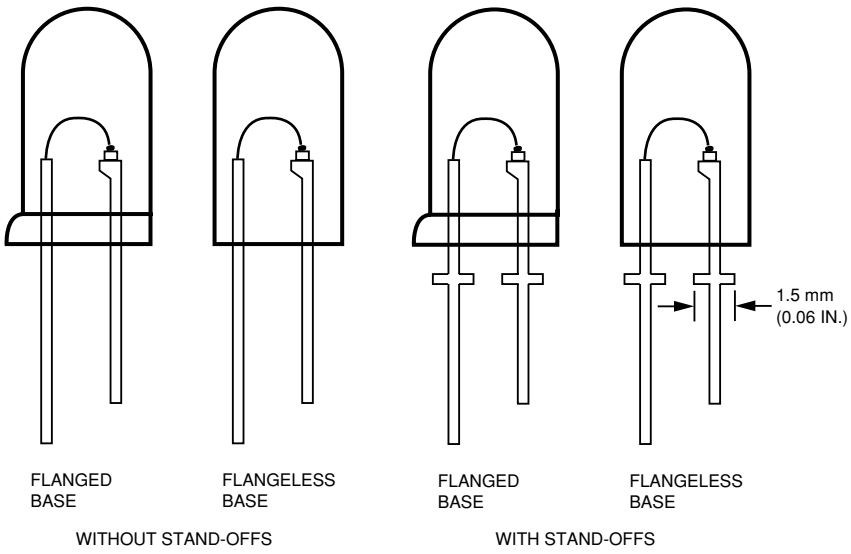

Figure 1. T-1 3/4 Lamp Configurations.

Table 1. Viewing Angles for Precision Optical Performance AlInGaP LED Lamps

Viewing Angle	Typical Applications
8°	Over Roadway Message Signs
15°	Over Roadway Message Signs
23°	Trailer Mounted Message Signs
30°	Traffic Signals

Lamp Package Configurations

The Precision Optical Performance T-1$^3/_4$ lamps may be A unique basic part number is associated with each viewing angle/ package configuration as illustrated in the example shown in Table 2. In Table 2, the 15° viewing angle, AlInGaP 590 nm amber lamp is available in one of the four package configurations shown.

Flanged Base, Without Stand-Offs, the Standard Package Configuration: Since it is not possible for Avago Technologies to maintain stocking inventory of all four possible package configurations, the flanged base, without stand-offs package configuration is used for stocking inventory. The other three package configurations are available on a build-to-order basis. Customers are encouraged to use flanged base, without stand-offs lamps whenever possible. A significant advantage to using this package configuration is the higher probability of obtaining specific luminous intensity-color options in high volume quantities.

Tape and Reel Options

Two basic tape and reel options, listed in Table 3, are available for autoinsertion assembly onto pc boards. An option code is associated with tape and reel option. These tape and reel options conform to IEC and ANSI standards for taped and reeled radial lead components. For specific details, please refer to the **Tape and Reel Solid State Lamps** product data sheet.

Table 2. Possible Basic Package Configurations for the 15° Viewing Angle, AlInGaP, 590 nm Amber Lamp (an example).

Basic Part No.	Leadframe Selection	Package Base Selection
HLMP-EL15	Without Stand-Offs	Flanged Base
HLMP-GL15	Without Stand-Offs	Flangeless Base
HLMP-EL17	With Stand-Offs	Flanged base
HLMP-GL17	With Stand-Offs	Flangeless Base

Table 3. Tape and Reel Options

Option	Description
001	Tape and reel, formed leads on 5 mm (0.197 in.) centers
002	Tape and reel, straight leads on 2.54 mm (0.100 in.) centers

Consult your local Avago Technologies Field Sales Engineer for other possible packaging options.

Luminous Intensity, I_v, Bins
Luminous intensity, I_v, bins are defined on a 2:1 ratio, maximum I_v / minimum I_v, which approximates the limit of the human eye's ability to discern light output differences between pixels in large area arrays. There is a 10% measurement overlap between adjacent luminous intensity bins. LED lamps selected from adjacent luminous intensity bins may be assembled into large area arrays on a random distribution basis. As long as the color is constant throughout the array, at distance the human eye cannot discern inter-pixel intensity differences. The human eye views a large area array as if the array has an even luminous intensity across the face of the array. An alpha letter is used to identify a specific intensity bin.

Color, λ_d, Bins
LED colors are identified and binned by dominant wavelength, λ_d (nm). Color bins are offered for the 590/592 nm amber lamp devices. Each color, λ_d, bin is 3 nm wide, which approximates the wavelength width necessary for the human eye to discern color differences in the amber color region. There is a nominal 1/2 nm measurement overlap between adjacent color bins. Only one color bin should be used within one array assembly to ensure a pleasing appearance. Color bins should not be mixed in a single array assembly to avoid a motley appearance which is objectionable to the human eye. A number is used to identify a specific color bin.

I_v and λ_d Bin Identifier Codes
Lamp devices are labeled with a two character bin identifier code, consisting of an alpha letter (to identify the luminous intensity, I_v, bin) followed by a number (to identify the color, λ_d, bin).

Table 4. Color and Luminous Intensity Selection Options.

Selection Option	Option Code	Color Binning	Intensity Binning
A	S11	1 - λ_d Bin	1 - I_v Bin
B	S22	2 - λ_d Bins	2 - I_v Bins
C	S12	1 - λ_d Bin	2 - I_v Bins
D	S01	No	1 - I_v Bin
E	S02	No	2 - I_v Bins

Notes:
1. The S01 and S02 options offer no color bin selection with luminous intensity selection.
2. The S01 and S11 options offer the selection of one luminous intensity.
3. The S02, S12 ,and S22 options offer the selection of two adjacent luminous intensity bins.
4. The S11 and S12 options offer the selection of one color bin with luminous intensity selection.
5. The S22 option offers color selection from two adjacent color bins, coupled with a selection from two adjacent luminous intensity bins.

Example: Bin code F3 identifies a lamp as being selected from luminous intensity bin F and color bin 3.

SXX Option Codes

Color and luminous intensity selections are called out as "SXX" Option Codes. The SXX options available are presented in Table 4. The first "X" is either "1" or "2" referring to either a single bin or two bin color selection and the second "X" is either "1" or "2" referring to either a single bin or two bin luminous intensity selection.

Example: S12 refers to the selection based on one color bin and two luminous intensity bins.

S1X Single Color, λ_d, Bin Options

S1X, offering selection from one color, λ_d, bin, are termed "floating" options. The λ_d bin selection may be different for each procurement depending upon the availability of LED wafer λ_d distribution to meet a single λ_d bin selection.

S2X Adjacent Color, λ_d, Bin Options

SX2 options offer two adjacent color, λ_d, bins selected from the center of the LED wafer overall collective λ_d distribution.

In a single large area array it is best to have the array assembled with LED lamps from the same S1X color, λ_d, selection option to ensure a pleasing, uniform appearance across the face of the array. Mixing S1X color, λ_d, selection options or using an S2X, λ_d, selection color selection option in a single large area array is not recommended.

SX1 Single Luminous Intensity, I_v, Bin Options

SX1, offering selection from one luminous intensity, I_v, bin are termed "floating" options. The I_v bin selection may be different for each procurement depending upon the availability of LED wafer luminous intensity distribution to meet a single I_v bin selection.

SX2 Adjacent Luminous Intensity, I_v, Bin Options

SX2 options offer two adjacent luminous intensity, I_v, bins selected from the center of the LED wafer overall collective luminous intensity distribution.

In some large area array applications it may be necessary to have the array assembled with LED lamps from the same SX1 luminous intensity, I_v, selection bin option to ensure a pleasing, uniform appearance. However, using an S12 luminous intensity, I_v, two-bin selection option with the LED lamps randomly mixed in a large area array can produce pleasing results across the face of the array.

Device Extended Part Number

AlInGaP Precision Optical Performance LED lamps, with options, are identified with an extended part number, as shown by the example in Figure 2.

The first eight hyphenated characters, HLMP-XXXX-(1)(2)(3)(4), are the basic lamp catalog part number, identifying the specific LED color, viewing angle, and package configuration for the device (i.e., HLMP-EL15).

(1) = Minimum intensity bin;

(2) = Maximum intensity bin;

(3) = Color bin selection,
where:
"0" = no color bin selection;
"K" = amber color bins 2 and 4 only;
"4" = amber color bin 4 only;

(4) = Mechanical or Packaging Option.

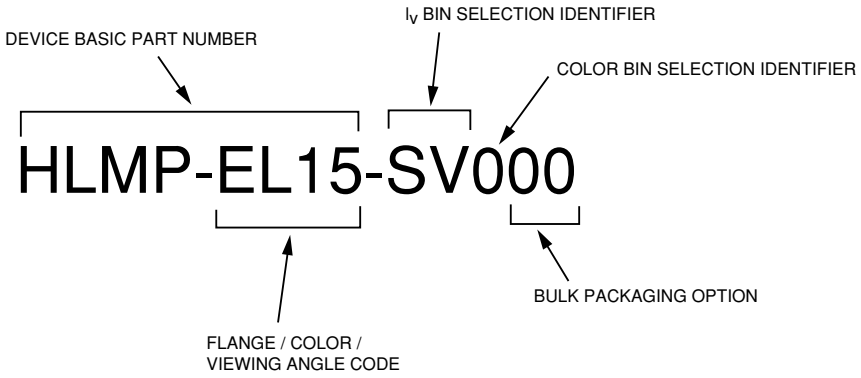

Figure 2. Example of an Extended Part Number for a T-1 3/4, AlInGaP LED Lamp, 590 nm Amber, 15° Viewing Angle, without stand-off, minimum intensity bin S and maximum intensity bin V, no color bin selection with bulk packaging option.

Ordering Selections — Contact Your Local Avago Technologies Field Sales Engineer

Due to the various viewing angles, package configurations, luminous intensity, I_v, and color, λ_d, bins customers may need, Avago Technologies is not able to stock all possible lamp configurations. A particular LED lamp configuration most likely will have to be built to order. Also, because light output and color distributions within LED wafer lots vary considerably, production run-to-production run, Avago Technologies may not be able to provide a particular I_v and λ_d combination. It is, therefore, necessary for customers to contact their local Avago Technologies Field Sales Engineer, and in cooperation with Avago determine which lamp configurations and binning options can be provided to meet the long term needs for a particular application.

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

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