

# HSMx-A10x-xxxxx PLCC-2

## Surface Mount LED Indicator



### Data Sheet



Lead (Pb) Free  
RoHS 6 fully  
compliant



### Description

This family of SMT LEDs is packaged in the industry standard PLCC-2 package. These SMT LEDs have high reliability performance and are designed to work under a wide range of environmental conditions. This high reliability feature makes them ideally suited to be used under harsh interior automotive as well as interior signs application conditions.

To facilitate easy pick & place assembly, the LEDs are packed in EIA-compliant tape and reel. Every reel will be shipped in single intensity and color bin, except red color, to provide close uniformity.

These LEDs are compatible with IR solder reflow process. Due to the high reliability feature of these products, they can also be mounted using through-the-wave soldering process.

The super wide viewing angle at 120° makes these LEDs ideally suited for panel, push button, or general backlighting in automotive interior, office equipment, industrial equipment, and home appliances. The flat top emitting surface makes it easy for these LEDs to mate with light pipes. With the built-in reflector pushing up the intensity of the light output, these LEDs are also suitable to be used as LED pixels in interior electronic signs.

### Features

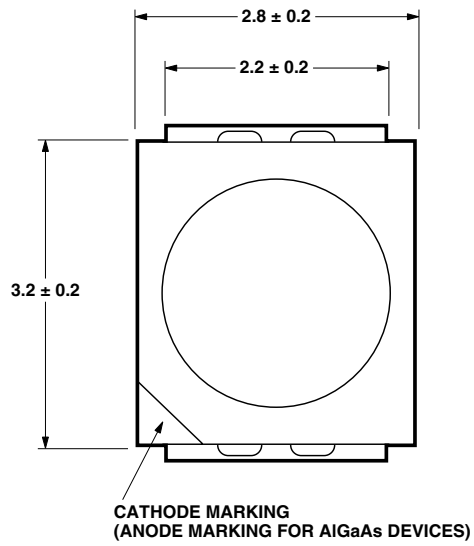
- Industry standard PLCC-2 package
- High reliability LED package
- High brightness using AlInGaP and InGaN dice technologies
- Available in full selection of colors
- Super wide viewing angle at 120°
- Available in 8 mm carrier tape on 7 inch reel (2000 pieces)
- Compatible with both IR and TTW soldering process

### Applications

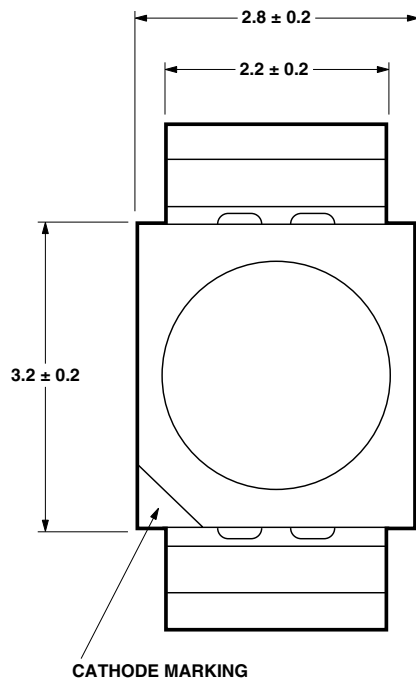
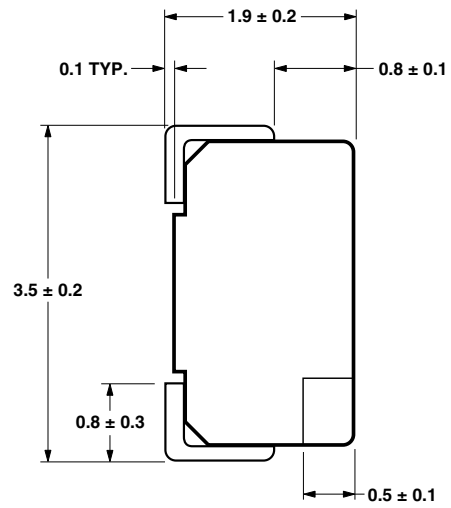
- Interior automotive
  - Instrument panel backlighting
  - Central console backlighting
  - Cabin backlighting
- Electronic signs and signals
  - Interior full color sign
  - Variable message sign
- Office automation, home appliances, industrial equipment
  - Front panel backlighting
  - Push button backlighting
  - Display backlighting

**CAUTION:** HSMN,M,K and E-A10x-xxxxx LEDs are Class 2 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Avago Application Note AN-1142 for additional details.

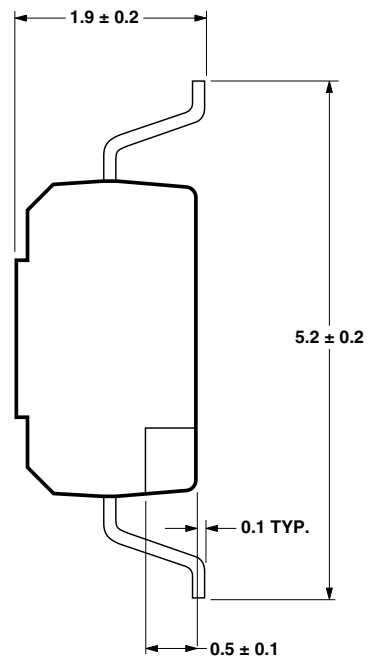
## Package Dimensions



TOP MOUNT



REVERSE MOUNT



NOTE: ALL DIMENSIONS IN MILLIMETERS.

**Table 1. Device Selection Guide**

| <b>Red</b>         |                     |                      |                      |                          |                        |
|--------------------|---------------------|----------------------|----------------------|--------------------------|------------------------|
| <b>Part Number</b> | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMS-A100-J00J1    | 4.50                | 15.00                | -                    | 20                       | GaP                    |
| HSMS-A100-L00J1    | 11.20               | 15.00                | -                    | 20                       | GaP                    |
| HSMS-A100-H70J2    | 3.55                | -                    | 7.20                 | 10                       | GaP                    |
| HSMS-A100-J80J2    | 5.60                | -                    | 14.00                | 10                       | GaP                    |
| HSMH-A100-L00J1    | 11.20               | 15.00                | -                    | 20                       | AlGaAs                 |
| HSMH-A100-N00J1    | 28.50               | 50.00                | -                    | 20                       | AlGaAs                 |
| HSMH-A100-L70J2    | 14.00               | -                    | 28.50                | 10                       | AlGaAs                 |
| HSMH-A100-M80J2    | 22.40               | -                    | 56.00                | 10                       | AlGaAs                 |
| HSMH-A100-P30J1    | 45.00               | -                    | 90.00                | 20                       | AlGaAs                 |
| HSMC-A100-J00J1    | 4.50                | 100.00               | -                    | 20                       | AllnGaP                |
| HSMC-A100-Q00J1    | 71.50               | 100.00               | -                    | 20                       | AllnGaP                |
| HSMC-A100-R00J1    | 112.50              | 140.00               | -                    | 20                       | AllnGaP                |
| HSMC-A101-S00J1    | 180.00              | 220.00               | -                    | 20                       | AllnGaP                |
| HSMZ-A100-T00J1    | 285.00              | 350.00               | -                    | 20                       | AllnGaP                |
| HSMC-A100-P30J1    | 45.00               | -                    | 90.00                | 20                       | AllnGaP                |
| HSMC-A101-R80J1    | 140.00              | -                    | 355.00               | 20                       | AllnGaP                |
| HSMZ-A100-S80J1    | 224.00              | -                    | 560.00               | 20                       | AllnGaP                |
| <b>Red Orange</b>  |                     |                      |                      |                          |                        |
| <b>Part Number</b> | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMJ-A100-Q00J1    | 71.50               | 100.00               | -                    | 20                       | AllnGaP                |
| HSMJ-A101-S00J1    | 180.00              | 200.00               | -                    | 20                       | AllnGaP                |
| HSMV-A100-T00J1    | 285.00              | 350.00               | -                    | 20                       | AllnGaP                |
| HSMJ-A100-Q30J1    | 71.50               | -                    | 140.00               | 20                       | AllnGaP                |
| HSMJ-A100-R40J1    | 112.50              | -                    | 285.00               | 20                       | AllnGaP                |
| HSMJ-A101-R80J1    | 140.00              | -                    | 355.00               | 20                       | AllnGaP                |
| HSMV-A100-S80J1    | 224.00              | -                    | 560.00               | 20                       | AllnGaP                |
| <b>Orange</b>      |                     |                      |                      |                          |                        |
| <b>Part Number</b> | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMD-A100-J00J1    | 4.50                | 15.00                | -                    | 20                       | GaP                    |
| HSMD-A100-L00J1    | 11.20               | 15.00                | -                    | 20                       | GaP                    |
| HSMD-A100-J7PJ2    | 5.60                | -                    | 11.20                | 10                       | GaP                    |
| HSMD-A100-K4PJ2    | 7.20                | -                    | 18.00                | 10                       | GaP                    |
| HSML-A100-Q00J1    | 71.50               | 100.00               | -                    | 20                       | AllnGaP                |
| HSML-A101-S00J1    | 180.00              | 220.00               | -                    | 20                       | AllnGaP                |
| HSML-A100-Q7PJ1    | 90.00               | -                    | 180.00               | 20                       | AllnGaP                |
| HSML-A100-R7PJ1    | 140.00              | -                    | 285.00               | 20                       | AllnGaP                |
| HSML-A101-R8WJ1    | 140.00              | -                    | 355.00               | 20                       | AllnGaP                |

| <b>Yellow / Amber</b> |                     |                      |                      |                          |                        |
|-----------------------|---------------------|----------------------|----------------------|--------------------------|------------------------|
| <b>Part Number</b>    | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMY-A100-J00J1       | 4.50                | 12.00                | -                    | 20                       | GaP                    |
| HSMY-A100-L00J1       | 11.20               | 12.00                | -                    | 20                       | GaP                    |
| HSMY-A100-J35J2       | 4.50                | -                    | 9.00                 | 10                       | GaP                    |
| HSMY-A100-K45J2       | 7.20                | -                    | 18.00                | 10                       | GaP                    |
| HSMA-A100-Q00J1       | 71.50               | 100.00               | -                    | 20                       | AllnGaP                |
| HSMA-A101-S00J1       | 180.00              | 220.00               | -                    | 20                       | AllnGaP                |
| HSMU-A100-S00J1       | 180.00              | 320.00               | -                    | 20                       | AllnGaP                |
| HSMA-A100-Q35J1       | 71.50               | -                    | 140.00               | 20                       | AllnGaP                |
| HSMA-A100-R45J1       | 112.50              | -                    | 285.00               | 20                       | AllnGaP                |
| HSMA-A101-R8WJ1       | 140.00              | -                    | 355.00               | 20                       | AllnGaP                |
| HSMU-A100-S4WJ1       | 180.00              | -                    | 450.00               | 20                       | AllnGaP                |
| <b>Yellow Green</b>   |                     |                      |                      |                          |                        |
| <b>Part Number</b>    | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMG-A100-J02J1       | 4.50                | 18.00                | -                    | 20                       | GaP                    |
| HSMG-A100-K72J2       | 9.00                | -                    | 18.00                | 10                       | GaP                    |
| HSME-A100-M02J1       | 18.00               | 70.00                | -                    | 20                       | AllnGaP                |
| HSME-A100-N82J1       | 35.50               | -                    | 90.00                | 20                       | AllnGaP                |
| <b>Emerald Green</b>  |                     |                      |                      |                          |                        |
| <b>Part Number</b>    | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMG-A100-H01J1       | 2.80                | 8.00                 | -                    | 20                       | GaP                    |
| HSMG-A100-G31J2       | 1.80                | -                    | 3.55                 | 10                       | GaP                    |
| HSMG-A100-H41J2       | 2.80                | -                    | 7.20                 | 10                       | GaP                    |
| HSME-A100-L01J1       | 11.20               | 40.00                | -                    | 20                       | AllnGaP                |
| HSME-A100-M3PJ1       | 18.00               | -                    | 35.50                | 20                       | AllnGaP                |
| <b>Green</b>          |                     |                      |                      |                          |                        |
| <b>Part Number</b>    | <b>Min IV (mcd)</b> | <b>Typ. IV (mcd)</b> | <b>Max. IV (mcd)</b> | <b>Test Current (mA)</b> | <b>Dice Technology</b> |
| HSMM-A101-R00J1       | 112.50              | 200.00               | -                    | 20                       | InGaN                  |
| HSMM-A100-S00J1       | 180.00              | 350.00               | -                    | 20                       | InGaN                  |
| HSMM-A101-Q7PJ1       | 90.00               | -                    | 140.00               | 20                       | InGaN                  |
| HSMM-A101-R7PJ1       | 140.00              | -                    | 285.00               | 20                       | InGaN                  |
| HSMM-A101-R8PJ1       | 140.00              | -                    | 355.00               | 20                       | InGaN                  |
| HSMM-A100-S8PJ1       | 224.00              | -                    | 560.00               | 20                       | InGaN                  |

**Cyan**

| Part Number     | Min IV (mcd) | Typ. IV (mcd) | Max. IV (mcd) | Test Current (mA) | Dice Technology |
|-----------------|--------------|---------------|---------------|-------------------|-----------------|
| HSMK-A101-R00J1 | 112.50       | 170.00        | -             | 20                | InGaN           |
| HSMK-A100-S00J1 | 180.00       | 280.00        | -             | 20                | InGaN           |
| HSMK-A100-S8WJ1 | 224.00       | -             | 560.00        | 20                | InGaN           |
| HSMK-A101-Q3WJ1 | 71.50        | -             | 140.00        | 20                | InGaN           |
| HSMK-A101-R4WJ1 | 112.50       | -             | 285.00        | 20                | InGaN           |

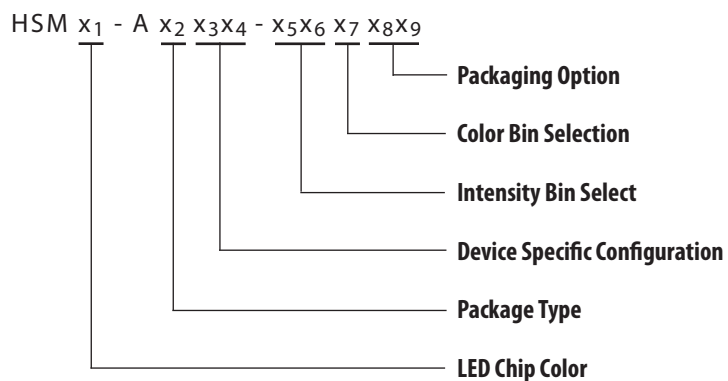
**Blue**

| Part Number     | Min IV (mcd) | Typ. IV (mcd) | Max. IV (mcd) | Test Current (mA) | Dice Technology |
|-----------------|--------------|---------------|---------------|-------------------|-----------------|
| HSMB-A100-J00J1 | 4.50         | 15.00         | -             | 20                | GaN             |
| HSMB-A100-J70J1 | 5.60         | -             | 11.20         | 10                | GaN             |
| HSMB-A100-K80J2 | 9.00         | -             | 22.40         | 10                | GaN             |
| HSMN-A101-N00J1 | 28.50        | 50.00         | -             | 20                | InGaN           |
| HSMN-A100-P00J1 | 45.00        | 70.00         | -             | 20                | InGaN           |
| HSMN-A101-N7YJ1 | 35.50        | -             | 71.50         | 20                | InGaN           |
| HSMN-A100-P8YJ1 | 56.00        | -             | 140.00        | 20                | InGaN           |

## Notes:

1. The luminous intensity IV, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. IV Tolerance =  $\pm 12\%$

## Part Numbering System



## Absolute Maximum Ratings (T<sub>A</sub> = 25°C)

| Parameters                          | HSM S/D/Y/G     | HSM H  | HSM C/J/L/A            | HSM E                | HSM Z/V/U              | HSM M/K/B/N |
|-------------------------------------|-----------------|--------|------------------------|----------------------|------------------------|-------------|
| DC Forward Current <sup>[1]</sup>   | 30 mA           | 30 mA  | 30 mA <sup>[3,4]</sup> | 20 mA <sup>[4]</sup> | 30 mA <sup>[3,4]</sup> | 30 mA       |
| Peak Forward Current <sup>[2]</sup> | 100 mA          | 100 mA | 100 mA                 | 100 mA               | 100 mA                 | 100 mA      |
| Power Dissipation                   | 63 mW           | 60 mW  | 63 mW                  | 48 mW                | 72 mW                  | 114 mW      |
| Reverse Voltage                     | 5 V             |        |                        |                      |                        |             |
| Junction Temperature                | 110°C           |        |                        |                      |                        |             |
| Operating Temperature               | -55°C to +100°C |        |                        |                      |                        |             |
| Storage Temperature                 | -55°C to +100°C |        |                        |                      |                        |             |

### Notes:

1. Derate linearly as shown in Figure 4.
2. Duty factor = 10%, Frequency = 1 kHz.
3. Drive current between 10 mA and 30 mA is recommended for best long term performance.
4. Operation at current below 5 mA is not recommended.

**Optical Characteristics (T<sub>A</sub> = 25°C)**

| Color         | Part Number | Dice Technology | Peak Wavelength<br>$\lambda_{PEAK}$ (nm)<br>Typ. | Dominant Wavelength <sup>[1]</sup><br>$\lambda_D$ (nm)<br>Typ. | Viewing Angle<br>$2\theta_{1/2}$ <sup>[2]</sup><br>(Degrees)<br>Typ. | Luminous Efficacy $\eta_V$ <sup>[3]</sup><br>(lm/W)<br>Typ. | Luminous Intensity/<br>Total Flux<br>$I_V(\text{mcd})/\Phi_V(\text{mlm})$<br>Typ. |
|---------------|-------------|-----------------|--------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Red           | HSMS-A100   | GaP             | 635                                              | 626                                                            | 120                                                                  | 120                                                         | 0.45                                                                              |
|               | HSMH-A100   | AlGaAs          | 645                                              | 637                                                            | 120                                                                  | 63                                                          | 0.45                                                                              |
|               | HSMC-A10x   | AlInGaP         | 635                                              | 626                                                            | 120                                                                  | 150                                                         | 0.45                                                                              |
|               | HSMZ-A100   | AlInGaP         | 639                                              | 630                                                            | 120                                                                  | 155                                                         | 0.45                                                                              |
| Red Orange    | HSMJ-A10x   | AlInGaP         | 621                                              | 615                                                            | 120                                                                  | 240                                                         | 0.45                                                                              |
|               | HSMV-A100   | AlInGaP         | 623                                              | 617                                                            | 120                                                                  | 263                                                         | 0.45                                                                              |
| Orange        | HSMD-A100   | GaP             | 600                                              | 602                                                            | 120                                                                  | 380                                                         | 0.45                                                                              |
|               | HSML-A10x   | AlInGaP         | 609                                              | 605                                                            | 120                                                                  | 320                                                         | 0.45                                                                              |
| Amber         | HSMY-A100   | GaP             | 583                                              | 585                                                            | 120                                                                  | 520                                                         | 0.45                                                                              |
|               | HSMA-A10x   | AlInGaP         | 592                                              | 590                                                            | 120                                                                  | 480                                                         | 0.45                                                                              |
|               | HSMU-A100   | AlInGaP         | 594                                              | 592                                                            | 120                                                                  | 500                                                         | 0.45                                                                              |
| Yellow Green  | HSMG-A100   | GaP             | 565                                              | 569                                                            | 120                                                                  | 590                                                         | 0.45                                                                              |
|               | HSME-A100   | AlInGaP         | 575                                              | 570                                                            | 120                                                                  | 560                                                         | 0.45                                                                              |
| Emerald Green | HSMG-A100   | GaP             | 558                                              | 560                                                            | 120                                                                  | 650                                                         | 0.45                                                                              |
|               | HSME-A100   | AlInGaP         | 566                                              | 560                                                            | 120                                                                  | 610                                                         | 0.45                                                                              |
| Green         | HSMM-A10x   | InGaN           | 523                                              | 525                                                            | 120                                                                  | 500                                                         | 0.45                                                                              |
| Cyan          | HSMK-A10x   | InGaN           | 502                                              | 505                                                            | 120                                                                  | 300                                                         | 0.45                                                                              |
| Blue          | HSMB-A100   | GaN             | 428                                              | 462                                                            | 120                                                                  | 65                                                          | 0.45                                                                              |
|               | HSMN-A10x   | InGaN           | 468                                              | 470                                                            | 120                                                                  | 75                                                          | 0.45                                                                              |

**Notes:**

1. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. Radiant intensity,  $I_e$  in watts/steradian, may be calculated from the equation  $I_e = I_V/\eta_V$ , where  $I_V$  is the luminous intensity in candelas and  $\eta_V$  is the luminous efficacy in lumens/watt.

**Electrical Characteristics (T<sub>A</sub> = 25°C)**

| Part Number  | Forward Voltage<br>V <sub>F</sub> (Volts) @ I <sub>F</sub> = 20 mA<br>Typ.                      Max. |      | Reverse Voltage<br>V <sub>R</sub> @ 100 $\mu$ A<br>Min. | Reverse Voltage<br>V <sub>R</sub> @ 10 $\mu$ A<br>Min. | Thermal Resistance<br>R $\theta_{JP}$ (°C/W) |
|--------------|------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------|--------------------------------------------------------|----------------------------------------------|
| HSMS/D/Y/G   | 2.2                                                                                                  | 2.6  | 5                                                       | —                                                      | 180                                          |
| HSMH         | 1.9                                                                                                  | 2.6  | 5                                                       | —                                                      | 180                                          |
| HSMC/J/L/A/E | 1.9                                                                                                  | 2.4  | 5                                                       | —                                                      | 280                                          |
| HSMZ/V/U     | 2.2                                                                                                  | 2.6  | 5                                                       | —                                                      | 280                                          |
| HSMB         | 3.9                                                                                                  | 4.3  | —                                                       | 5                                                      | 280                                          |
| HSMM/K/N     | 3.4                                                                                                  | 4.05 | —                                                       | 5                                                      | 280                                          |

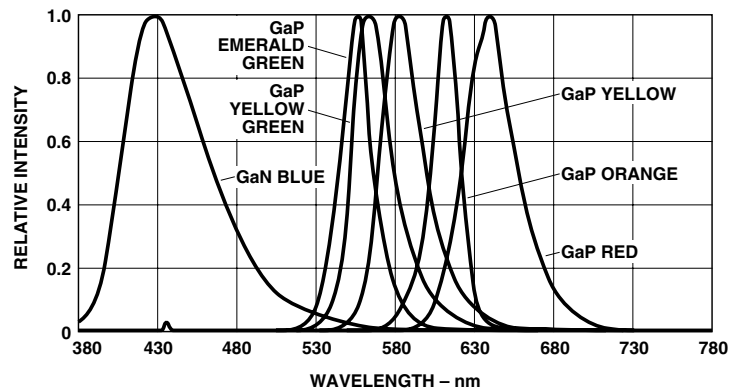
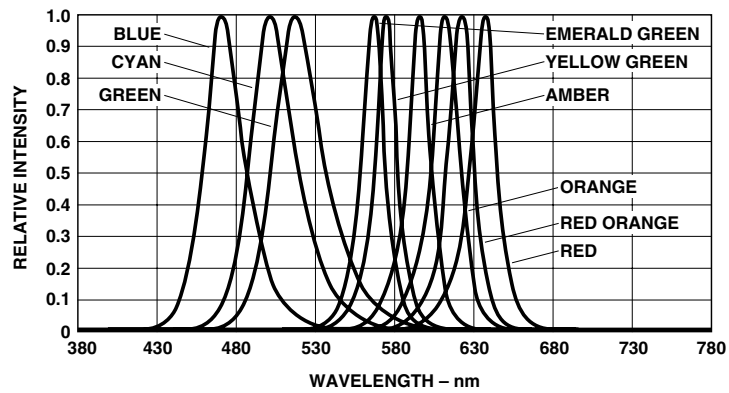


Figure 1. Relative intensity vs. wavelength.

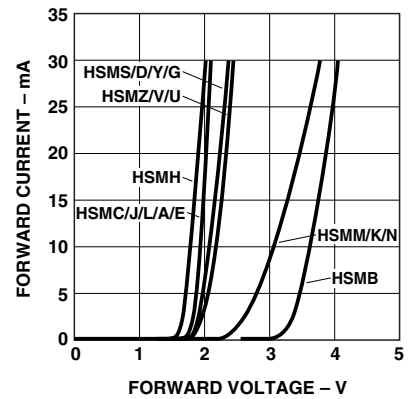


Figure 2. Forward current vs. forward voltage.

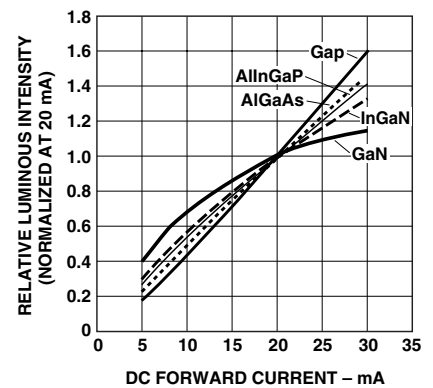


Figure 3. Relative intensity vs. forward current.

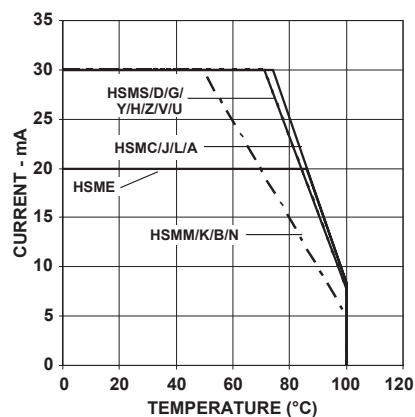


Figure 4. Maximum forward current vs. ambient temperature. Derated based on  $T_J\text{MAX} = 110^\circ\text{C}$ ,  $R\theta_{JA} = 500^\circ\text{C/W}$ .

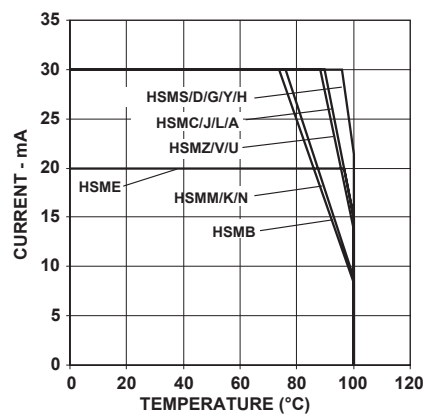


Figure 4b. Maximum Forward Current Vs. Solder Point Temperature. Derated based on  $T_J\text{MAX} = 110^\circ\text{C}$ ,  $R\theta_{JP} = 180^\circ\text{C/W}$  or  $280^\circ\text{C/W}$ .

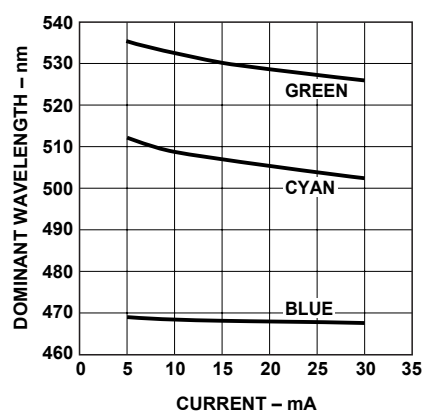


Figure 5. Dominant wavelength vs. forward current – InGaN devices.



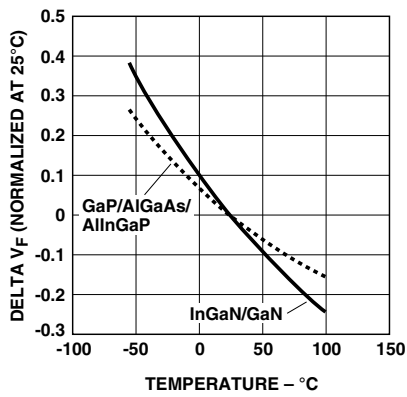


Figure 6. Forward voltage shift vs. temperature.

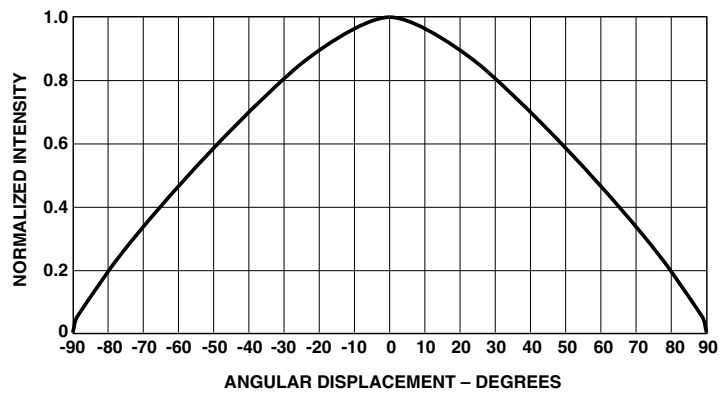


Figure 7. Radiation Pattern.

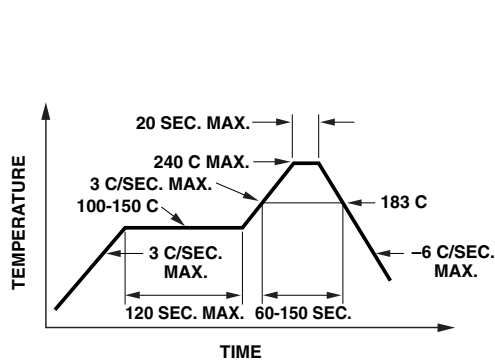


Figure 8a. Recommended SnPb reflow soldering profile.

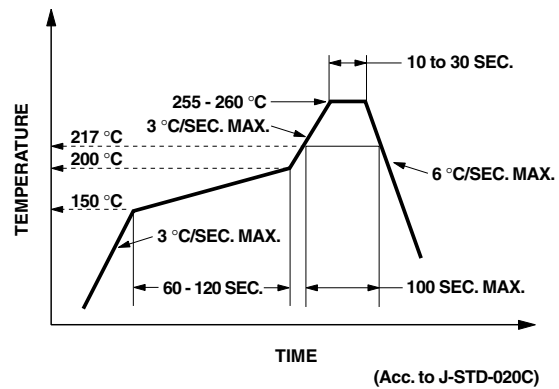
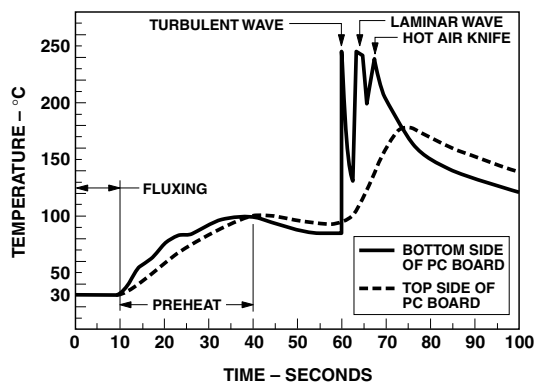


Figure 8b. Recommended Pb-free reflow soldering profile.

Note: For detail information on reflow soldering of Avago surface mount LEDs, do refer to Avago Application Note AN 1060 Surface Mounting SMT LED Indicator Components.



CONVEYOR SPEED = 1.83 M/MIN (6 FT/MIN)  
 PREHEAT SETTING = 150°C (100°C PCB)  
 SOLDER WAVE TEMPERATURE = 245°C  
 AIR KNIFE AIR TEMPERATURE = 390°C  
 AIR KNIFE DISTANCE = 1.91 mm (0.25 IN.)  
 AIR KNIFE ANGLE = 40°  
 LEADED SOLDER: SN63; FLUX: RMA  
 LEAD-FREE SOLDER: 96.5 wt% SN, 3 wt% Ag, 0.5 wt% Cu

NOTE: ALLOW FOR BOARDS TO BE SUFFICIENTLY COOLED BEFORE EXERTING MECHANICAL FORCE.

Figure 9. Recommended wave soldering profile.

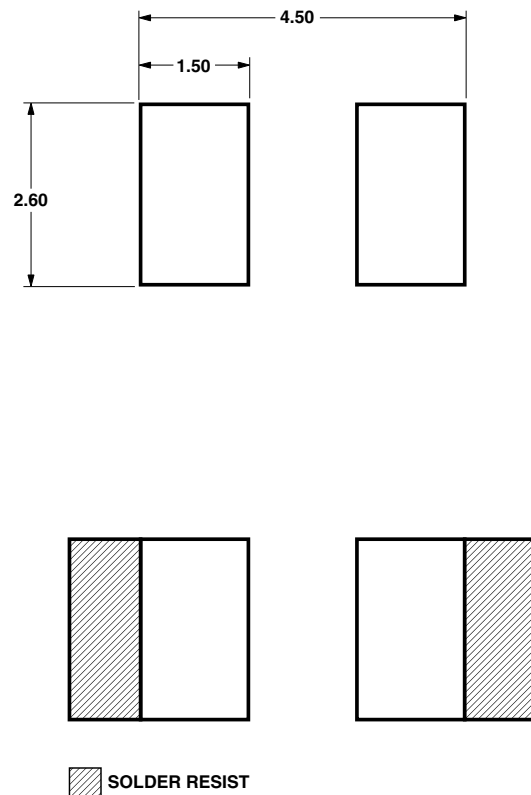


Figure 10. Recommended soldering pad pattern.



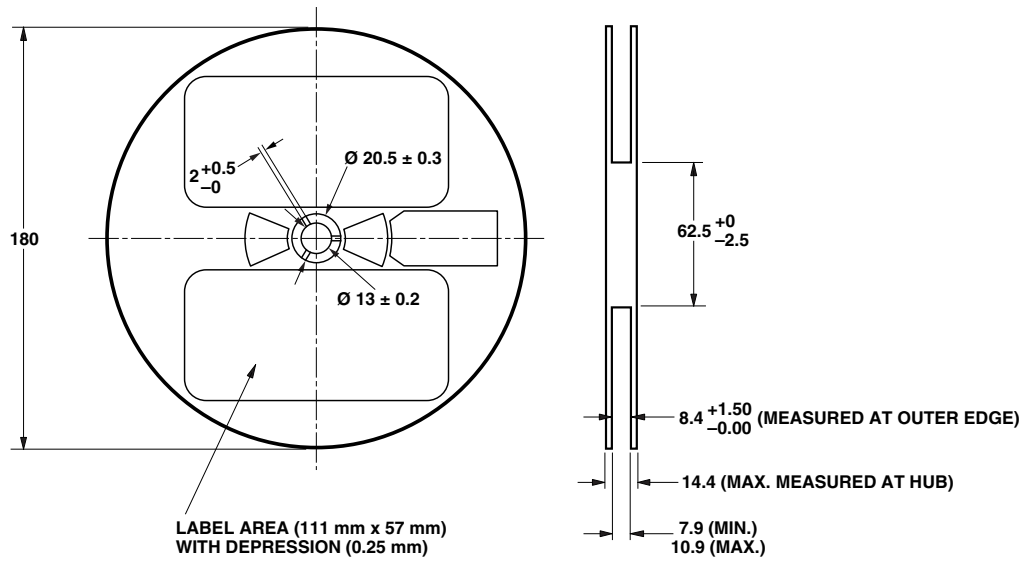


Figure 13. Reel dimensions.

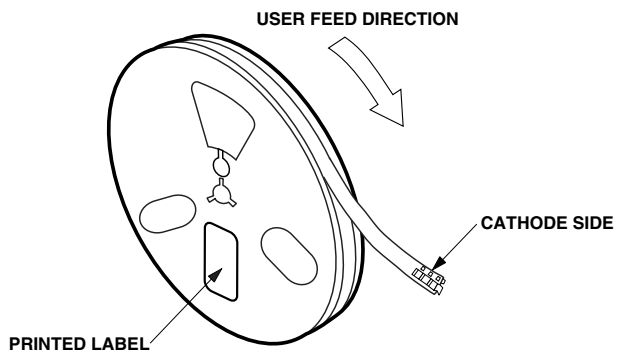


Figure 14. Reeling orientation.

**Intensity Bin Select (X<sub>5</sub>X<sub>6</sub>)**

Individual reel will contain parts from one half bin only.

| X <sub>5</sub>       | Min I <sub>v</sub> Bin                     |
|----------------------|--------------------------------------------|
| <b>X<sub>6</sub></b> |                                            |
| 0                    | Full Distribution                          |
| 2                    | 2 half bins starting from X <sub>5</sub> 1 |
| 3                    | 3 half bins starting from X <sub>5</sub> 1 |
| 4                    | 4 half bins starting from X <sub>5</sub> 1 |
| 5                    | 5 half bins starting from X <sub>5</sub> 1 |
| 6                    | 2 half bins starting from X <sub>5</sub> 2 |
| 7                    | 3 half bins starting from X <sub>5</sub> 2 |
| 8                    | 4 half bins starting from X <sub>5</sub> 2 |
| 9                    | 5 half bins starting from X <sub>5</sub> 2 |

**Intensity Bin Limits**

| Bin ID | Min. (mcd) | Max. (mcd) |
|--------|------------|------------|
| G1     | 1.80       | 2.24       |
| G2     | 2.24       | 2.80       |
| H1     | 2.80       | 3.55       |
| H2     | 3.55       | 4.50       |
| J1     | 4.50       | 5.60       |
| J2     | 5.60       | 7.20       |
| K1     | 7.20       | 9.00       |
| K2     | 9.00       | 11.20      |
| L1     | 11.20      | 14.00      |
| L2     | 14.00      | 18.00      |
| M1     | 18.00      | 22.40      |
| M2     | 22.40      | 28.50      |
| N1     | 28.50      | 35.50      |
| N2     | 35.50      | 45.00      |
| P1     | 45.00      | 56.00      |
| P2     | 56.00      | 71.50      |
| Q1     | 71.50      | 90.00      |
| Q2     | 90.00      | 112.50     |
| R1     | 112.50     | 140.00     |
| R2     | 140.00     | 180.00     |
| S1     | 180.00     | 224.00     |
| S2     | 224.00     | 285.00     |
| T1     | 285.00     | 355.00     |
| T2     | 355.00     | 450.00     |
| U1     | 450.00     | 560.00     |
| U2     | 560.00     | 715.00     |
| V1     | 715.00     | 900.00     |
| V2     | 900.00     | 1125.00    |

Tolerance of each bin limit = ± 12%

**Color Bin Select (X<sub>7</sub>)**

Individual reel will contain parts from one full bin only.

| X <sub>7</sub> |                        |
|----------------|------------------------|
| 0              | Full Distribution      |
| Z              | A and B only           |
| Y              | B and C only           |
| W              | C and D only           |
| V              | D and E only           |
| U              | E and F only           |
| T              | F and G only           |
| S              | G and H only           |
| Q              | A, B, and C only       |
| P              | B, C, and D only       |
| N              | C, D, and E only       |
| M              | D, E, and F only       |
| L              | E, F, and G only       |
| K              | F, G, and H only       |
| 1              | A, B, C, and D only    |
| 2              | E, F, G, and H only    |
| 3              | B, C, D, and E only    |
| 4              | C, D, E, and F only    |
| 5              | A, B, C, D, and E only |
| 6              | B, C, D, E, and F only |

**Color Bin Limits**

| Blue | Min. (nm) | Max. (nm) |
|------|-----------|-----------|
| A    | 460.0     | 465.0     |
| B    | 465.0     | 470.0     |
| C    | 470.0     | 475.0     |
| D    | 475.0     | 480.0     |

| Cyan | Min. (nm) | Max. (nm) |
|------|-----------|-----------|
| A    | 490.0     | 495.0     |
| B    | 495.0     | 500.0     |
| C    | 500.0     | 505.0     |
| D    | 505.0     | 510.0     |

| Green | Min. (nm) | Max. (nm) |
|-------|-----------|-----------|
| A     | 515.0     | 520.0     |
| B     | 520.0     | 525.0     |
| C     | 525.0     | 530.0     |
| D     | 530.0     | 535.0     |

**Color Bin Limits**

| Emerald Green | Min. (nm) | Max. (nm) |
|---------------|-----------|-----------|
| A             | 552.5     | 555.5     |
| B             | 555.5     | 558.5     |
| C             | 558.5     | 561.5     |
| D             | 561.5     | 564.5     |

| Yellow Green | Min. (nm) | Max. (nm) |
|--------------|-----------|-----------|
| E            | 564.5     | 567.5     |
| F            | 567.5     | 570.5     |
| G            | 570.5     | 573.5     |
| H            | 573.5     | 576.5     |

| Amber | Min. (nm) | Max. (nm) |
|-------|-----------|-----------|
| A     | 582.0     | 584.5     |
| B     | 584.5     | 587.0     |
| C     | 587.0     | 589.5     |
| D     | 589.5     | 592.0     |
| E     | 592.0     | 594.5     |
| F     | 594.5     | 597.0     |

| Orange | Min. (nm) | Max. (nm) |
|--------|-----------|-----------|
| A      | 597.0     | 600.0     |
| B      | 600.0     | 603.0     |
| C      | 603.0     | 606.0     |
| D      | 606.0     | 609.0     |
| E      | 609.0     | 612.0     |

| Red Orange | Min. (nm) | Max. (nm) |
|------------|-----------|-----------|
| A          | 611.0     | 616.0     |
| B          | 616.0     | 620.0     |

| Red               | Min. (nm) | Max. (nm) |
|-------------------|-----------|-----------|
| Full Distribution |           |           |

Tolerance of each bin limit = ± 1 nm.

**Packaging Option (XgXg)**

| Option | Test Current | Package Type  | Reel Size |
|--------|--------------|---------------|-----------|
| J1     | 20 mA        | Top Mount     | 7 inch    |
| J4     | 20 mA        | Top Mount     | 13 inch   |
| H1     | 20 mA        | Reverse Mount | 7 inch    |
| H4     | 20 mA        | Reverse Mount | 13 inch   |
| J2     | 10 mA        | Top Mount     | 7 inch    |
| J5     | 10 mA        | Top Mount     | 13 inch   |
| H2     | 10 mA        | Reverse Mount | 7 inch    |
| H5     | 10 mA        | Reverse Mount | 13 inch   |

**Moisture Sensitivity**

This product is qualified as Moisture Sensitive Level 2a per Jedec J-STD-020. Precautions when handling this moisture sensitive product is important to ensure the reliability of the product. Do refer to Avago Application Note AN5305 Handling of Moisture Sensitive Surface Mount Devices for details.

**A. Storage before use**

- Unopen moisture barrier bag (MBB) can be stored at <40°C/90%RH for 12 months. If the actual shelf life has exceeded 12 months and the HIC indicates that baking is not required, then it is safe to reflow the LEDs per the original MSL rating.
- It is not recommended to open the MBB prior to assembly (e.g. for IQC).

**B. Control after opening the MBB**

- The humidity indicator card (HIC) shall be read immediately upon opening of MBB.
- The LEDs must be kept at <30°C / 60%RH at all time and all high temperature related process including soldering, curing or rework need to be completed within 672 hours.

**C. Control for unfinished reel**

- For any unused LEDs, they need to be stored in sealed MBB with desiccant or desiccator at <5%RH.

**D. Control of assembled boards**

- If the PCB soldered with the LEDs is to be subjected to other high temperature processes, the PCB need to be stored in sealed MBB with desiccant or desiccator at <5%RH to ensure no LEDs have exceeded their floor life of 672 hours.

**E. Baking is required if:**

- "10%" is Not blue and "5%" HIC indicator turns pink.
- The LEDs are exposed to condition of >30°C / 60% RH at any time.
- The LEDs floor life exceeded 672 hours.

Recommended baking condition: 60±5°C for 20 hours.

For product information and a complete list of distributors, please go to our website: [www.avagotech.com](http://www.avagotech.com)

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