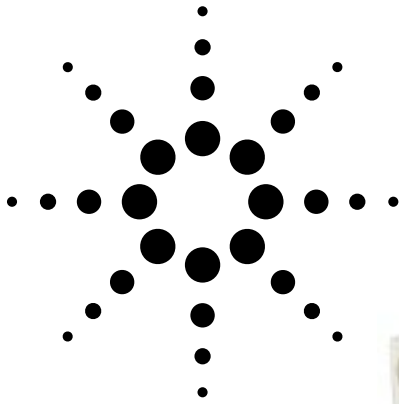


Agilent HSMx-A10x-xxxxx PLCC-2 Surface Mount LED Indicator Data Sheet



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

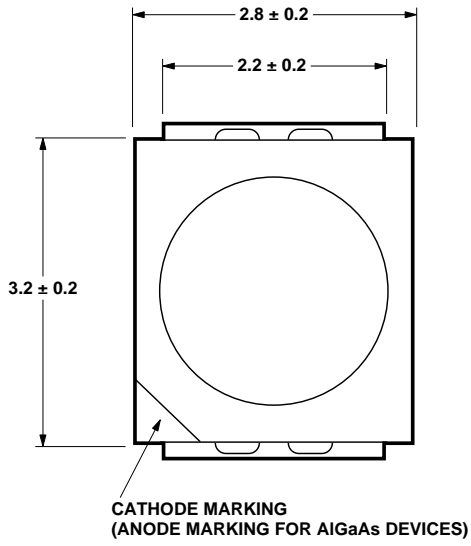
Applications

- 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

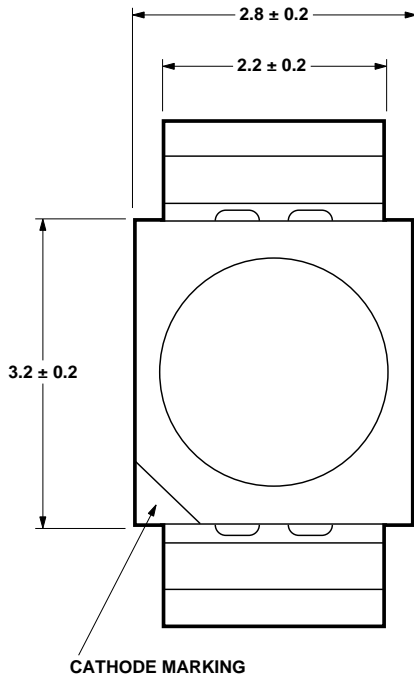
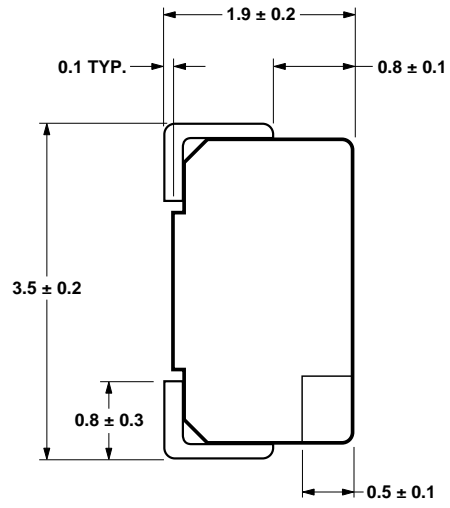
CAUTION: HSMN,M,K and E-A10x-xxxxx LEDs are Class 2 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Agilent Application Note AN-1142 for additional details.



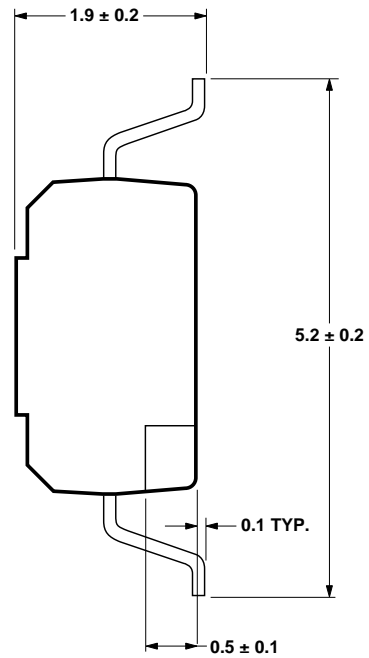
Package Dimensions



TOP MOUNT



REVERSE MOUNT



NOTE: ALL DIMENSIONS IN MILLIMETERS.

Device Selection Guide

Red

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|-----------------|---------------|---------------|---------------|-------------------|-----------------|
| HSMS-A100-J00J1 | 4.0 | 15.0 | - | 20 | GaP |
| HSMS-A100-L00J1 | 10.0 | 15.0 | - | 20 | GaP |
| HSMS-A100-H70J2 | 3.0 | - | 8.0 | 10 | GaP |
| HSMS-A100-J80J2 | 5.0 | - | 15.5 | 10 | GaP |
| HSMH-A100-L00J1 | 10.0 | 15.0 | - | 20 | AlGaAs |
| HSMH-A100-N00J1 | 25.0 | 50.0 | - | 20 | AlGaAs |
| HSMH-A100-L70J2 | 12.5 | - | 32.0 | 10 | AlGaAs |
| HSMH-A100-M80J2 | 20.0 | - | 62.0 | 10 | AlGaAs |
| HSMH-A100-P30J1 | 40.0 | - | 100.0 | 20 | AlGaAs |
| HSMC-A100-J00J1 | 4.0 | 100.0 | - | 20 | AllnGaP |
| HSMC-A100-Q00J1 | 63.0 | 100.0 | - | 20 | AllnGaP |
| HSMC-A100-R00J1 | 100.0 | 140.0 | - | 20 | AllnGaP |
| HSMC-A101-S00J1 | 160.0 | 220.0 | - | 20 | AllnGaP |
| HSMZ-A100-T00J1 | 250.0 | 350.0 | - | 20 | AllnGaP |
| HSMC-A100-P30J1 | 40.0 | - | 100.0 | 20 | AllnGaP |
| HSMC-A100-Q40J1 | 63.0 | - | 200.0 | 20 | AllnGaP |
| HSMC-A101-R80J1 | 125.0 | - | 395.0 | 20 | AllnGaP |
| HSMZ-A100-S80J1 | 200.0 | - | 620.0 | 20 | AllnGaP |

Red Orange

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|-----------------|---------------|---------------|---------------|-------------------|-----------------|
| HSMJ-A100-Q00J1 | 63.0 | 100.0 | - | 20 | AllnGaP |
| HSMJ-A101-S00J1 | 160.0 | 200.0 | - | 20 | AllnGaP |
| HSMV-A100-T00J1 | 250.0 | 350.0 | - | 20 | AllnGaP |
| HSMJ-A100-Q30J1 | 63.0 | - | 155.0 | 20 | AllnGaP |
| HSMJ-A100-R40J1 | 100.0 | - | 315.0 | 20 | AllnGaP |
| HSMJ-A101-R80J1 | 125.0 | - | 395.0 | 20 | AllnGaP |
| HSMV-A100-S80J1 | 200.0 | - | 620.0 | 20 | AllnGaP |

Orange

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|-----------------|---------------|---------------|---------------|-------------------|-----------------|
| HSMD-A100-J00J1 | 4.0 | 15.0 | - | 20 | GaP |
| HSMD-A100-L00J1 | 10.0 | 15.0 | - | 20 | GaP |
| HSMD-A100-J7PJ2 | 5.0 | - | 12.5 | 10 | GaP |
| HSMD-A100-K4PJ2 | 6.3 | - | 20.0 | 10 | GaP |
| HSML-A100-Q00J1 | 63.0 | 100.0 | - | 20 | AllnGaP |
| HSML-A101-S00J1 | 160.0 | 220.0 | - | 20 | AllnGaP |
| HSML-A100-Q7PJ1 | 80.0 | - | 200.0 | 20 | AllnGaP |
| HSML-A100-R7PJ1 | 125.0 | - | 315.0 | 20 | AllnGaP |
| HSML-A101-R8WJ1 | 125.0 | - | 395.0 | 20 | AllnGaP |

Device Selection Guide, continued**Yellow/Amber**

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|--------------------|----------------------|----------------------|----------------------|--------------------------|------------------------|
| HSMY-A100-J00J1 | 4.0 | 12.0 | - | 20 | GaP |
| HSMY-A100-L00J1 | 10.0 | 12.0 | - | 20 | GaP |
| HSMY-A100-J35J2 | 4.0 | - | 10.0 | 10 | GaP |
| HSMY-A100-K45J2 | 6.3 | - | 20.0 | 10 | GaP |
| HSMA-A100-Q00J1 | 63.0 | 100.0 | - | 20 | AllnGaP |
| HSMA-A101-S00J1 | 160.0 | 220.0 | - | 20 | AllnGaP |
| HSMU-A100-S00J1 | 160.0 | 320.0 | - | 20 | AllnGaP |
| HSMA-A100-Q35J1 | 63.0 | - | 155.0 | 20 | AllnGaP |
| HSMA-A100-R45J1 | 100.0 | - | 315.0 | 20 | AllnGaP |
| HSMA-A101-R8WJ1 | 125.0 | - | 395.0 | 20 | AllnGaP |
| HSMU-A100-S4WJ1 | 160.0 | - | 500.0 | 20 | AllnGaP |

Yellow Green

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|--------------------|----------------------|----------------------|----------------------|--------------------------|------------------------|
| HSMG-A100-J02J1 | 4.0 | 18.0 | - | 20 | GaP |
| HSMG-A100-K72J2 | 8.0 | - | 20.0 | 10 | GaP |
| HSME-A100-M02J1 | 16.0 | 70.0 | - | 20 | AllnGaP |
| HSME-A100-N82J1 | 30.0 | - | 100.0 | 20 | AllnGaP |

Emerald Green

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|--------------------|----------------------|----------------------|----------------------|--------------------------|------------------------|
| HSMG-A100-H01J1 | 2.5 | 8.0 | - | 20 | GaP |
| HSMG-A100-G31J2 | 1.6 | - | 4.0 | 10 | GaP |
| HSMG-A100-H41J2 | 2.5 | - | 8.0 | 10 | GaP |
| HSME-A100-L01J1 | 10.0 | 40.0 | - | 20 | AllnGaP |
| HSME-A100-M3PJ1 | 16.0 | - | 40.0 | 20 | AllnGaP |

Green

| Part Number | Min. Iv (mcd) | Typ. Iv (mcd) | Max. Iv (mcd) | Test Current (mA) | Dice Technology |
|--------------------|----------------------|----------------------|----------------------|--------------------------|------------------------|
| HSMM-A101-R00J1 | 100.0 | 200.0 | - | 20 | InGaN |
| HSMM-A100-S00J1 | 160.0 | 350.0 | - | 20 | InGaN |
| HSMM-A100-S8PJ1 | 200.0 | - | 620.0 | 20 | InGaN |
| HSMM-A101-Q7PJ1 | 80.0 | - | 200.0 | 20 | InGaN |
| HSMM-A101-R7PJ1 | 125.0 | - | 315.0 | 20 | InGaN |
| HSMM-A101-R8PJ1 | 125.0 | - | 395.0 | 20 | InGaN |

Device Selection Guide, continued**Cyan**

| Part Number | Min. I_v (mcd) | Typ. I_v (mcd) | Max. I_v (mcd) | Test Current (mA) | Dice Technology |
|--------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------|------------------------|
| HSMK-A101-R00J1 | 100.0 | 170.0 | - | 20 | InGaN |
| HSMK-A100-S00J1 | 160.0 | 280.0 | - | 20 | InGaN |
| HSMK-A100-S8WJ1 | 200.0 | - | 620.0 | 20 | InGaN |
| HSMK-A101-Q3WJ1 | 63.0 | - | 155.0 | 20 | InGaN |
| HSMK-A101-R4WJ1 | 100.0 | - | 315.0 | 20 | InGaN |

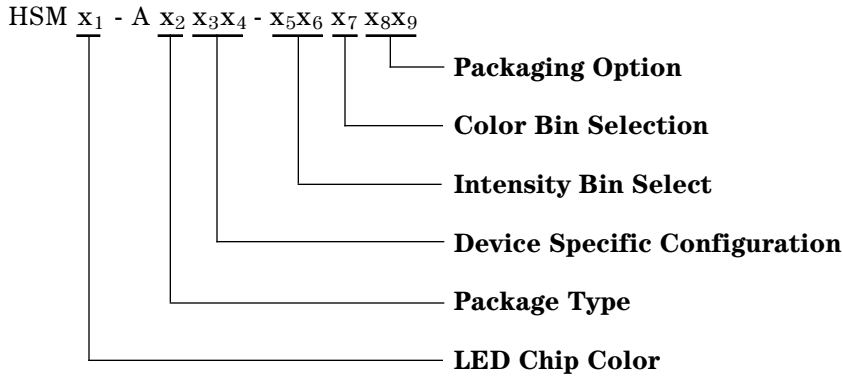
Blue

| Part Number | Min. I_v (mcd) | Typ. I_v (mcd) | Max. I_v (mcd) | Test Current (mA) | Dice Technology |
|--------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------|------------------------|
| HSMB-A100-J00J1 | 4.0 | 15.0 | - | 20 | GaN |
| HSMB-A100-J70J2 | 5.0 | - | 12.5 | 10 | GaN |
| HSMN-A101-N00J1 | 25.0 | 50.0 | - | 20 | InGaN |
| HSMN-A100-P00J1 | 40.0 | 70.0 | - | 20 | InGaN |
| HSMB-A100-K80J2 | 8.0 | - | 25.0 | 10 | InGaN |
| HSMN-A100-P8YJ1 | 50.0 | - | 155.0 | 20 | InGaN |
| HSMN-A101-N7YJ1 | 30.0 | - | 80.0 | 20 | InGaN |
| HSMN-A101-N8YJ1 | 30.0 | - | 100.0 | 20 | InGaN |

Note:

1. The luminous intensity, I_v, 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.

Part Numbering System



Absolute Maximum Ratings (T_A = 25°C)

| Parameters | HSMS/D/G/Y | HSMH | HSMC/J/L/A | HSME | HSMV/U/Z | HSMB/N/K/M |
|-------------------------------------|-----------------|--------|------------------------|------------------------|------------------------|------------|
| DC Forward Current ^[1] | 30 mA | 30 mA | 30 mA ^[3,4] | 20 mA ^[3,4] | 30 mA ^[3,4] | 30 mA |
| Peak Forward Current ^[2] | 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:

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

Optical Characteristics at $T_A = 25^\circ\text{C}$

| Color | Part Number | Dice Technology | Peak Wavelength λ_{peak} (nm) Typ. | Dominant Wavelength λ_D (nm) Typ. | Viewing Angle $2\theta_{1/2}$ (Degrees) Typ. | Luminous Efficacy $\eta_v^{[5]}$ (lm/w) Typ. | Luminous Intensity/ Total Flux $I_v(\text{mcd})/\phi_v(\text{mlm})$ Typ. |
|---------------|-------------|-----------------|--|--|---|---|---|
| Red | HSMS-A100 | GaP | 635 | 626 | 120 | 120 | 0.45 |
| | HSMH-A100 | AlGaAs | 645 | 637 | 120 | 63 | 0.45 |
| | HSMC-A10x | AllnGaP | 635 | 626 | 120 | 150 | 0.45 |
| | HSMZ-A100 | AllnGaP | 639 | 630 | 120 | 155 | 0.45 |
| Red Orange | HSMJ-A10x | AllnGaP | 621 | 615 | 120 | 240 | 0.45 |
| | HSMV-A100 | AllnGaP | 623 | 617 | 120 | 263 | 0.45 |
| Orange | HSMD-A100 | GaP | 600 | 602 | 120 | 380 | 0.45 |
| | HSML-A10x | AllnGaP | 609 | 605 | 120 | 320 | 0.45 |
| Amber | HSMY-A100 | GaP | 583 | 585 | 120 | 520 | 0.45 |
| | HSMA-A10x | AllnGaP | 592 | 590 | 120 | 480 | 0.45 |
| | HSMU-A100 | AllnGaP | 594 | 592 | 120 | 500 | 0.45 |
| Yellow Green | HSMG-A100 | GaP | 565 | 569 | 120 | 590 | 0.45 |
| | HSME-A100 | AllnGaP | 575 | 576 | 120 | 560 | 0.45 |
| Emerald Green | HSMG-A100 | GaP | 558 | 560 | 120 | 650 | 0.45 |
| | HSME-A100 | AllnGaP | 566 | 567 | 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, λ_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 η_v is the luminous efficacy in lumens/watt.

Electrical Characteristics at $T_A = 25^\circ\text{C}$

| Part Number | Forward Voltage V_F (Volts) @ $I_F = 20\text{ mA}$ | | Reverse Voltage V_R @ $100\ \mu\text{A}$ | Reverse Voltage V_R @ $10\ \mu\text{A}$ | Thermal Resistance $R\theta_{JP}$ ($^\circ\text{C}/\text{W}$) |
|--------------|--|------|--|---|---|
| | Typ. | Max. | Min. | Min. | |
| HSMS/D/G/Y | 2.2 | 2.6 | 5 | — | 180 |
| HSMH | 1.9 | 2.6 | 5 | — | 180 |
| HSMC/J/L/A/E | 1.9 | 2.4 | 5 | — | 280 |
| HSMU/V/Z | 2.2 | 2.6 | 5 | — | 280 |
| HSMB | 3.9 | 4.3 | — | 5 | 280 |
| HSMN/K/M | 3.4 | 4.05 | — | 5 | 280 |

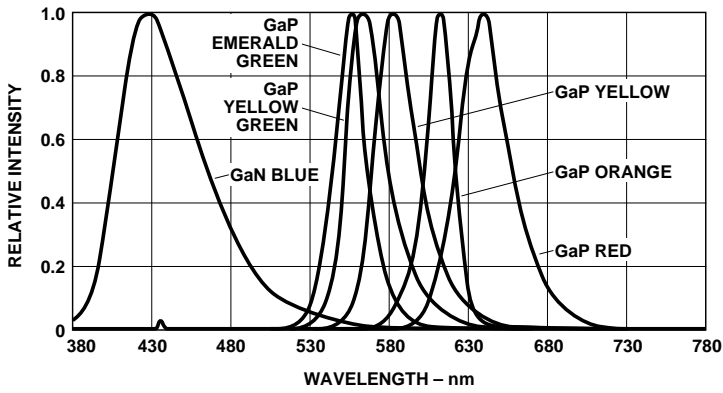
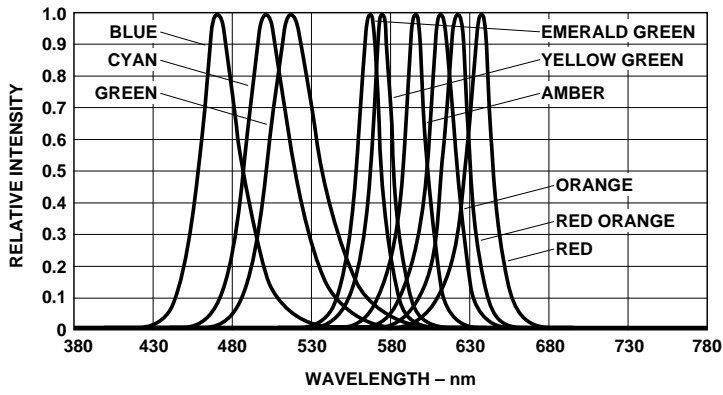


Figure 1. Relative intensity vs. wavelength.

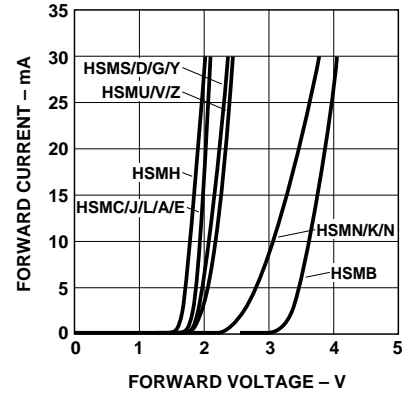


Figure 2. Forward current vs. forward voltage.

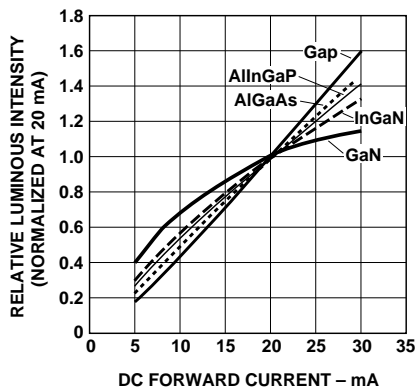


Figure 3. Relative intensity vs. forward current.

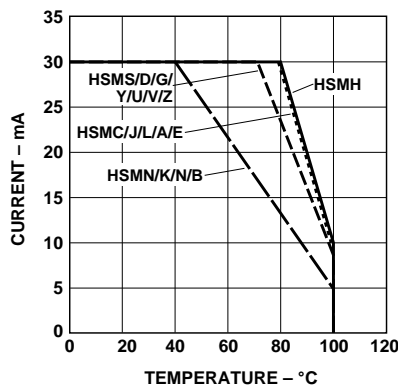


Figure 4. Maximum forward current vs. ambient temperature. Derated based on $T_{jMAX} = 110^{\circ}C$, $R_{\theta JA} = 500^{\circ}W$.

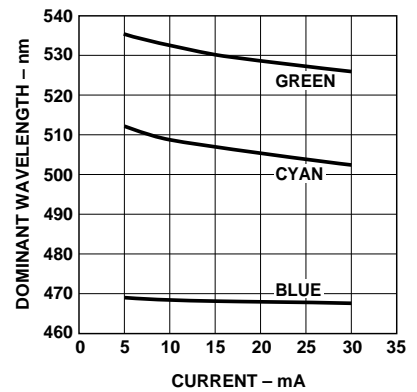


Figure 5. Dominant wavelength vs. forward current - InGaN devices.

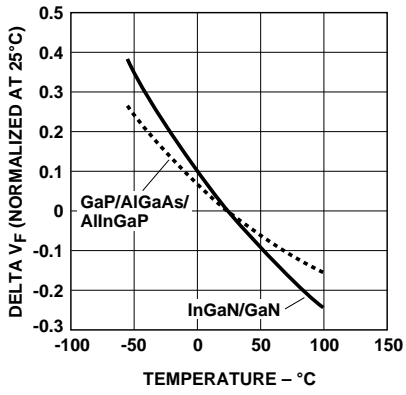


Figure 6. Forward voltage shift vs. temperature.

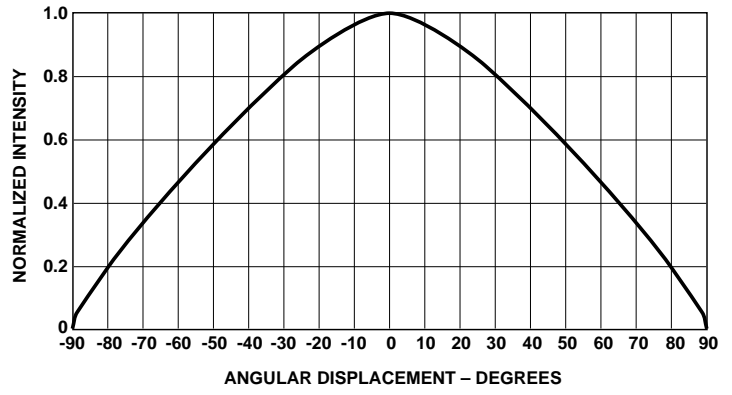


Figure 7. Radiation Pattern.

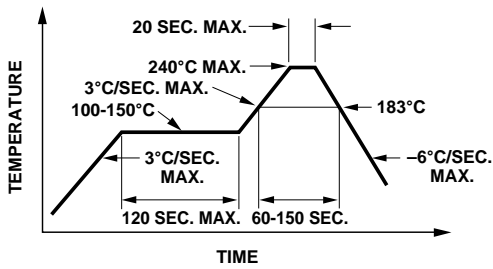


Figure 8. Recommended reflow soldering profile.

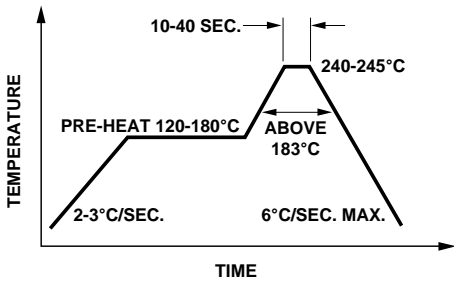
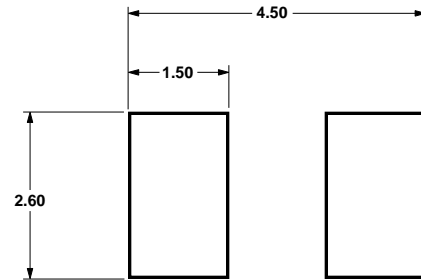


Figure 8a. Recommended wave soldering profile.

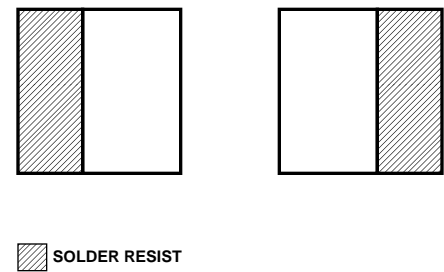


Figure 9. Recommended soldering pad pattern.

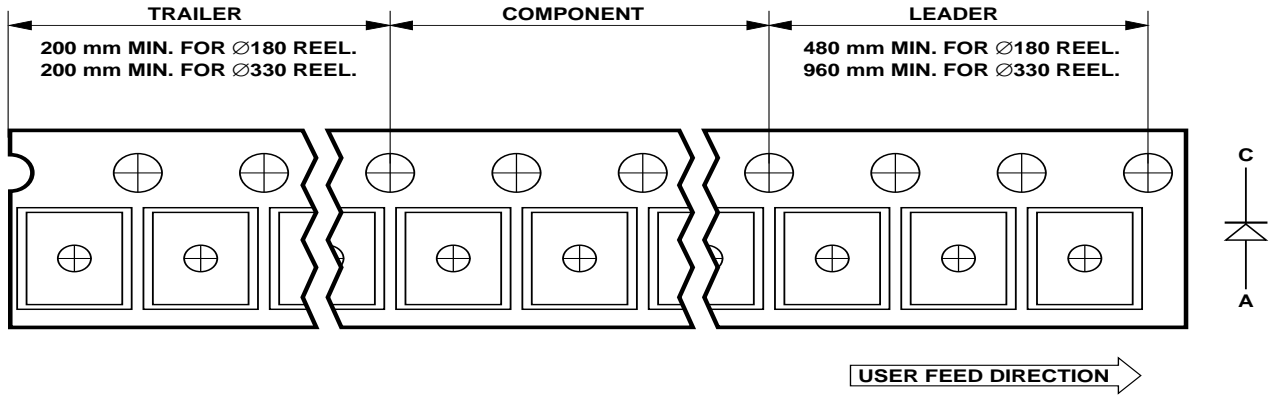


Figure 10. Tape leader and trailer dimension.

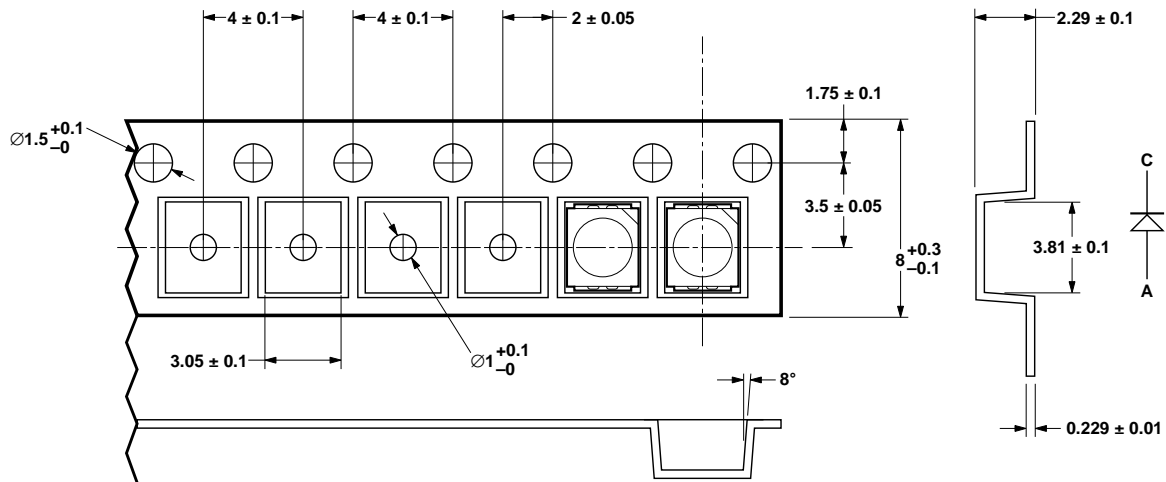


Figure 11. Tape dimension.

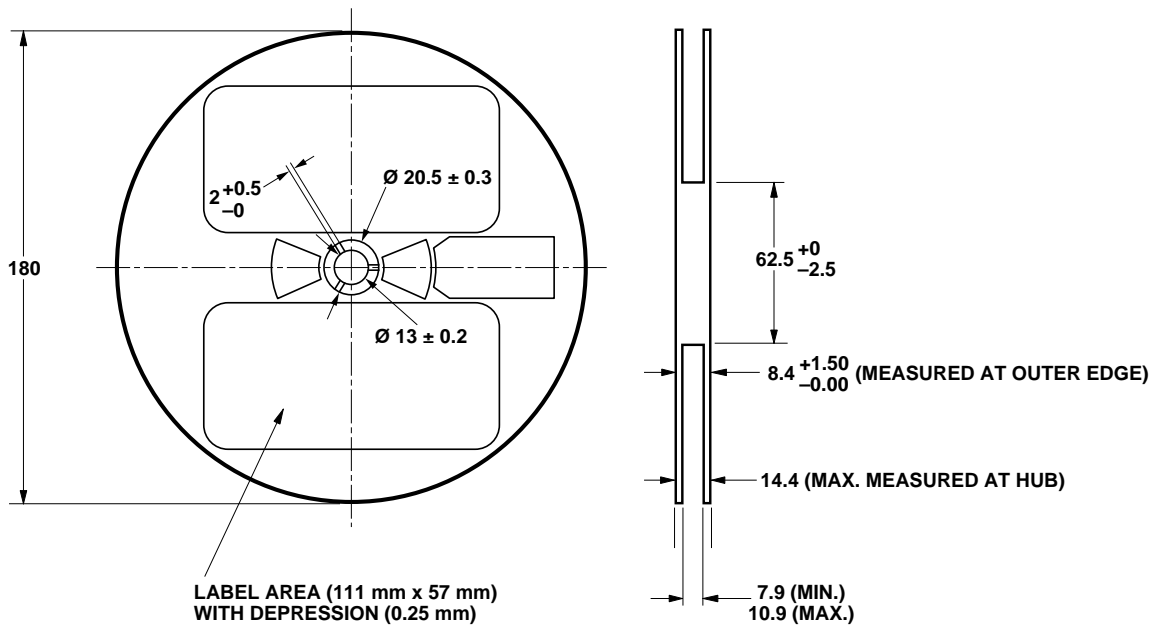


Figure 12. Reel dimension.

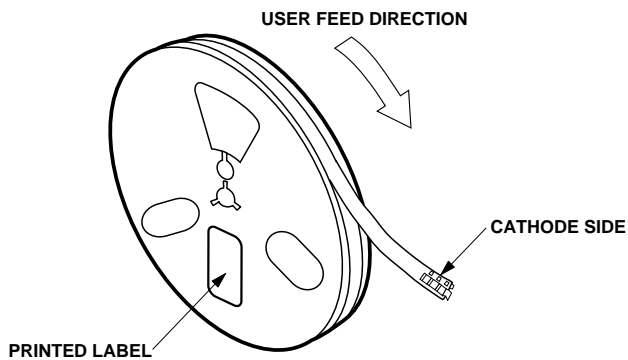


Figure 13. Reeling orientation.

Baking is required under the following conditions:

- a) the humidity indicator turns pink
- b) the pack has been opened for more than four weeks.

Baking recommended condition: $60 \pm 5^\circ\text{C}$ for 20 hours.

This product is qualified as Moisture Sensitive JEDEC Level 2A.

Intensity Bin Select (X₅X₆)

Individual reel will contain parts from one half bin only.

| | |
|----------------------|--|
| X₅ | Min I _v Bin |
| X₆ | |
| 0 | Full Distribution |
| 3 | 3 half bins starting from X ₅ 1 |
| 4 | 4 half bins starting from X ₅ 1 |
| 5 | 5 half bins starting from X ₅ 1 |
| 7 | 3 half bins starting from X ₅ 2 |
| 8 | 4 half bins starting from X ₅ 2 |
| 9 | 5 half bins starting from X ₅ 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 (X₇)

Individual reel will contain parts from one full bin only.

| | |
|----------------------|------------------------|
| X₇ | |
| 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 |

| 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 |

| 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 |

Color Bin Limits

| Emerald | 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 | 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.

| 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 |

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Obsoletes 5988-9364EN

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