

# PhlatLight® White LED Illumination Products

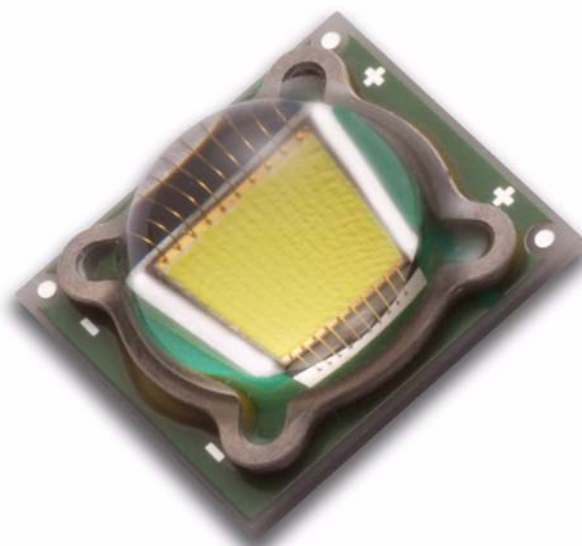
## SST-90 Series

### Features

- Extremely high optical output: Over 2,250 lumens from a single chip (white)
- Extremely high efficiency: Over 100 lumens per watt at 3.15A
- High thermal conductivity package - junction to case thermal resistance of only 0.64 °C/W
- Large, monolithic chip with uniform emitting area of 9 mm<sup>2</sup>
- Lumen maintenance of greater than 70% after 60,000 hours
- Environmentally friendly: RoHS compliant
- Variable drive currents: less than 1 A through 9 A to full reliability specifications.
- High reliability
- Electrically isolated thermal path

### Applications

- Replacement Lamps
- Architectural Lighting
- Retail Lighting
- Residential Lighting
- Consumer Portable
- Spot Lighting
- High Bay Lighting
- Wide Area Lighting
- Street Lighting



*PhlatLight® LEDs enable a new class of illumination applications.*

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## Technology Overview

PhlatLight LEDs benefit from a suite of innovations in the fields of chip technology, packaging, and thermal management. These breakthroughs allow illumination designers to achieve efficient light engine designs and deliver high brightness solutions.

### PhlatLight Technology

The name PhlatLight is derived from Photonic Lattice. Photonic lattice technology creates true surface emission from the source, which enables large area LED chips with uniform brightness over the entire LED chip surface. The optical power and brightness produced by these large monolithic chips enable solutions which replace arc and halogen lamps where arrays of traditional high power LEDs cannot.

### Packaging Technology

Thermal management is critical in high power LED applications. With a thermal resistance from junction to case of  $0.64^{\circ}\text{C}/\text{W}$ , PhlatLight SST-90 devices have the lowest thermal resistance of any LED on the market. This allows the LED to be driven at higher current densities while maintaining a low junction temperature, thereby resulting in brighter and longer lifetimes. The package is easy to use, and ready to be mounted in the lighting system.

### Reliability

Designed from the ground up, PhlatLight LEDs are one of the most reliable light sources in the world today. PhlatLight LEDs have passed a rigorous suite of environmental and mechanical stress tests, including mechanical shock, vibration, temperature cycling and humidity, and have been fully qualified for use in extreme high power and high current applications. With very low failure rates and median lifetimes that are well above 60,000 hours, PhlatLight LEDs are ready for the most demanding applications.

### Environmental Benefits

PhlatLight LEDs help reduce power consumption and the amount of hazardous waste entering the environment. All PhlatLight products manufactured by Luminus are RoHS compliant and free of hazardous materials, including lead and mercury.

## Understanding PhlatLight Test Specifications

Every PhlatLight LED device is fully tested to ensure that it meets the high quality standards of Luminus' products.

### Multiple Operating Points (3.2 A, 9.0 A)

The tables on the following pages provide typical optical and electrical characteristics. Since the LEDs can be operated over a wide range of drive conditions (currents from less than 1.0 A to 9.0 A, and duty cycle from <1% to 100%) multiple drive conditions are listed.

PhlatLight SST-90 devices are production tested at 3.2 A. The values shown at 9.0 A are for additional reference at other possible drive conditions.

### PhlatLight White Binning Structure

PhlatLight SST-90 White LEDs are tested for luminous flux and chromaticity at a drive current of 3.15A and placed into one of the following luminous flux (FF) and chromaticity (WW) bins:

For ordering information, please refer to page 17 or PDS-001692: SST-90 LED Binning and Labeling.

#### Flux Bins ( $T_J = 25\text{ }^{\circ}\text{C}$ )

| Color                                         | Flux Bin (FF) | Minimum Flux (lm)<br>@ 3.15 A | Maximum Flux (lm)<br>@ 3.15 A |
|-----------------------------------------------|---------------|-------------------------------|-------------------------------|
| <b>W65S</b><br>6500K, Standard CRI (typ. 70)  | WM1           | 700                           | 750                           |
|                                               | WM2           | 750                           | 800                           |
|                                               | WM3           | 800                           | 850                           |
|                                               | WN1           | 850                           | 900                           |
|                                               | WN2           | 900                           | 950                           |
|                                               | WN3           | 950                           | 1,000                         |
|                                               | WP1           | 1,000                         | 1,060                         |
|                                               | WP2           | 1,060                         | 1,130                         |
|                                               | WP3           | 1,130                         | 1,200                         |
| <b>W57S</b><br>5700K, Standard CRI (typ. 70)  | WM1           | 700                           | 750                           |
|                                               | WM2           | 750                           | 800                           |
|                                               | WM3           | 800                           | 850                           |
|                                               | WN1           | 850                           | 900                           |
|                                               | WN2           | 900                           | 950                           |
|                                               | WN3           | 950                           | 1,000                         |
|                                               | WP1           | 1,000                         | 1,060                         |
|                                               | WP2           | 1,060                         | 1,130                         |
|                                               | WP3           | 1,130                         | 1,200                         |
| <b>W45S</b><br>4500K, Standard CRI, (typ. 70) | WM1           | 700                           | 750                           |
|                                               | WM2           | 750                           | 800                           |
|                                               | WM3           | 800                           | 850                           |
|                                               | WN1           | 850                           | 900                           |
|                                               | WN2           | 900                           | 950                           |
|                                               | WN3           | 950                           | 1,000                         |

•Note: Luminus maintains a tolerance of +/-6% on flux measurements

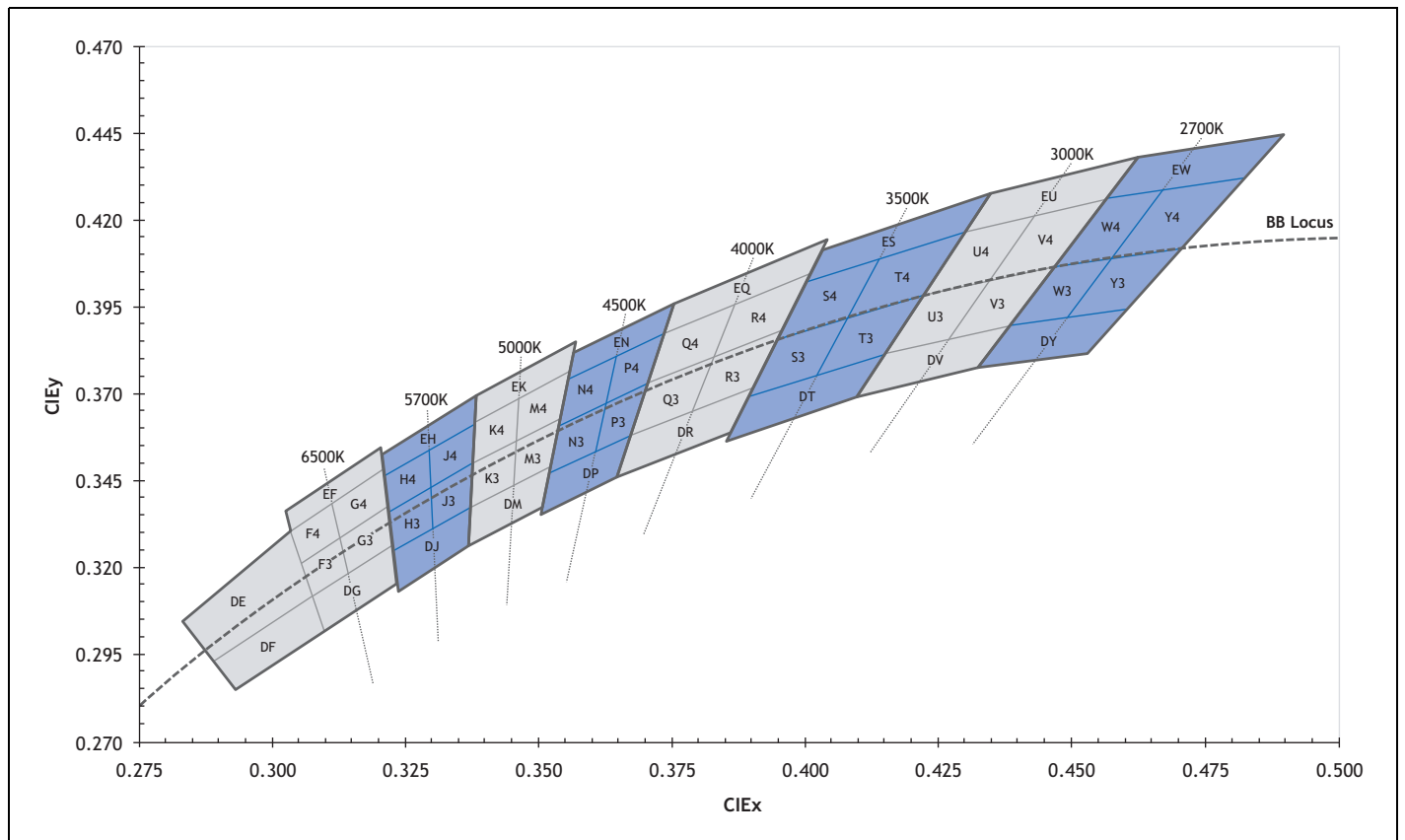
Flux Bins ( $T_J = 25\text{ }^{\circ}\text{C}$ )

| Color                                        | Flux Bin (FF) | Minimum Flux (lm)<br>@ 3.15 A | Maximum Flux (lm)<br>@ 3.15 A |
|----------------------------------------------|---------------|-------------------------------|-------------------------------|
| <b>W30M</b><br>3000K, Standard CRI (typ. 83) | WK1           | 500                           | 530                           |
|                                              | WK2           | 530                           | 565                           |
|                                              | WK3           | 565                           | 600                           |
|                                              | WL1           | 600                           | 630                           |
|                                              | WL2           | 630                           | 665                           |
|                                              | WL3           | 665                           | 700                           |

•Note: Luminus maintains a +/- 6% tolerance on flux measurements.

## Chromaticity Bins

Luminus' Standard Chromaticity Bins: 1931 CIE Curve



The following tables describe the four chromaticity points that bound each chromaticity bin. Chromaticity bins are grouped together based on the color temperature.

| 6500K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| DG                      | 0.307 | 0.311 |
|                         | 0.322 | 0.326 |
|                         | 0.323 | 0.316 |
|                         | 0.309 | 0.302 |
| F3*                     | 0.305 | 0.321 |
|                         | 0.313 | 0.329 |
|                         | 0.315 | 0.319 |
|                         | 0.307 | 0.311 |
| F4*                     | 0.303 | 0.330 |
|                         | 0.312 | 0.339 |
|                         | 0.313 | 0.329 |
|                         | 0.305 | 0.321 |
| G3*                     | 0.313 | 0.329 |
|                         | 0.321 | 0.337 |
|                         | 0.322 | 0.326 |
|                         | 0.315 | 0.319 |
| G4*                     | 0.312 | 0.339 |
|                         | 0.321 | 0.348 |
|                         | 0.321 | 0.337 |
|                         | 0.313 | 0.329 |
| EF                      | 0.302 | 0.335 |
|                         | 0.320 | 0.354 |
|                         | 0.321 | 0.348 |
|                         | 0.303 | 0.330 |
| DE                      | 0.283 | 0.304 |
|                         | 0.303 | 0.330 |
|                         | 0.307 | 0.311 |
|                         | 0.289 | 0.293 |
| DF                      | 0.289 | 0.293 |
|                         | 0.307 | 0.311 |
|                         | 0.309 | 0.302 |
|                         | 0.293 | 0.285 |

| 5700K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| DJ                      | 0.322 | 0.324 |
|                         | 0.337 | 0.337 |
|                         | 0.336 | 0.326 |
|                         | 0.323 | 0.314 |
| H3*                     | 0.321 | 0.335 |
|                         | 0.329 | 0.342 |
|                         | 0.329 | 0.331 |
|                         | 0.322 | 0.324 |
| H4*                     | 0.321 | 0.346 |
|                         | 0.329 | 0.354 |
|                         | 0.329 | 0.342 |
|                         | 0.321 | 0.335 |
| J3*                     | 0.329 | 0.342 |
|                         | 0.337 | 0.349 |
|                         | 0.337 | 0.337 |
|                         | 0.330 | 0.331 |
| J4*                     | 0.329 | 0.354 |
|                         | 0.338 | 0.362 |
|                         | 0.337 | 0.349 |
|                         | 0.329 | 0.342 |
| EH                      | 0.320 | 0.352 |
|                         | 0.338 | 0.368 |
|                         | 0.338 | 0.362 |
|                         | 0.321 | 0.346 |

| 5000K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| EK                      | 0.338 | 0.368 |
|                         | 0.356 | 0.384 |
|                         | 0.355 | 0.376 |
|                         | 0.338 | 0.362 |
| K3*                     | 0.337 | 0.349 |
|                         | 0.345 | 0.355 |
|                         | 0.345 | 0.343 |
|                         | 0.337 | 0.337 |
| K4*                     | 0.338 | 0.362 |
|                         | 0.347 | 0.369 |
|                         | 0.345 | 0.355 |
|                         | 0.337 | 0.349 |
| M3*                     | 0.345 | 0.355 |
|                         | 0.353 | 0.362 |
|                         | 0.352 | 0.349 |
|                         | 0.344 | 0.343 |
| M4*                     | 0.346 | 0.369 |
|                         | 0.355 | 0.376 |
|                         | 0.353 | 0.362 |
|                         | 0.345 | 0.355 |
| DM                      | 0.337 | 0.337 |
|                         | 0.352 | 0.349 |
|                         | 0.350 | 0.337 |
|                         | 0.336 | 0.326 |

\* Sub-bins within ANSI defined quadrangles per ANSI C78.377-2008

| 4500k Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| EN                      | 0.356 | 0.384 |
|                         | 0.376 | 0.396 |
|                         | 0.374 | 0.387 |
|                         | 0.355 | 0.374 |
| N3*                     | 0.353 | 0.360 |
|                         | 0.361 | 0.366 |
|                         | 0.359 | 0.352 |
|                         | 0.351 | 0.347 |
| N4*                     | 0.355 | 0.374 |
|                         | 0.364 | 0.381 |
|                         | 0.361 | 0.366 |
|                         | 0.353 | 0.360 |
| P3*                     | 0.361 | 0.366 |
|                         | 0.370 | 0.373 |
|                         | 0.367 | 0.358 |
|                         | 0.359 | 0.352 |
| P4*                     | 0.364 | 0.381 |
|                         | 0.374 | 0.387 |
|                         | 0.370 | 0.373 |
|                         | 0.361 | 0.366 |
| DP                      | 0.351 | 0.347 |
|                         | 0.367 | 0.358 |
|                         | 0.364 | 0.346 |
|                         | 0.350 | 0.335 |

| 4000K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| EQ                      | 0.376 | 0.396 |
|                         | 0.404 | 0.414 |
|                         | 0.401 | 0.404 |
|                         | 0.374 | 0.387 |
| Q3*                     | 0.370 | 0.373 |
|                         | 0.382 | 0.380 |
|                         | 0.378 | 0.365 |
|                         | 0.367 | 0.358 |
| Q4*                     | 0.374 | 0.387 |
|                         | 0.387 | 0.396 |
|                         | 0.382 | 0.380 |
|                         | 0.370 | 0.373 |
| R3*                     | 0.382 | 0.380 |
|                         | 0.395 | 0.388 |
|                         | 0.390 | 0.372 |
|                         | 0.378 | 0.365 |
| R4*                     | 0.387 | 0.396 |
|                         | 0.401 | 0.404 |
|                         | 0.395 | 0.388 |
|                         | 0.382 | 0.380 |
| DR                      | 0.367 | 0.358 |
|                         | 0.390 | 0.372 |
|                         | 0.386 | 0.359 |
|                         | 0.364 | 0.346 |

| 3500K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| ES                      | 0.403 | 0.411 |
|                         | 0.435 | 0.427 |
|                         | 0.430 | 0.417 |
|                         | 0.400 | 0.402 |
| S3*                     | 0.394 | 0.385 |
|                         | 0.407 | 0.392 |
|                         | 0.402 | 0.375 |
|                         | 0.389 | 0.369 |
| S4*                     | 0.400 | 0.402 |
|                         | 0.415 | 0.409 |
|                         | 0.407 | 0.392 |
|                         | 0.394 | 0.385 |
| T3*                     | 0.407 | 0.392 |
|                         | 0.422 | 0.399 |
|                         | 0.415 | 0.381 |
|                         | 0.402 | 0.375 |
| T4*                     | 0.415 | 0.409 |
|                         | 0.430 | 0.417 |
|                         | 0.422 | 0.399 |
|                         | 0.407 | 0.392 |
| DT                      | 0.389 | 0.369 |
|                         | 0.415 | 0.381 |
|                         | 0.409 | 0.369 |
|                         | 0.385 | 0.357 |

| 3000K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| EU                      | 0.435 | 0.427 |
|                         | 0.462 | 0.437 |
|                         | 0.456 | 0.426 |
|                         | 0.430 | 0.417 |
| U3*                     | 0.422 | 0.399 |
|                         | 0.434 | 0.403 |
|                         | 0.426 | 0.385 |
|                         | 0.415 | 0.381 |
| U4*                     | 0.430 | 0.417 |
|                         | 0.443 | 0.421 |
|                         | 0.434 | 0.403 |
|                         | 0.422 | 0.399 |
| V3*                     | 0.434 | 0.403 |
|                         | 0.447 | 0.408 |
|                         | 0.437 | 0.389 |
|                         | 0.426 | 0.385 |
| V4*                     | 0.443 | 0.421 |
|                         | 0.456 | 0.426 |
|                         | 0.447 | 0.408 |
|                         | 0.434 | 0.403 |
| DV                      | 0.415 | 0.381 |
|                         | 0.437 | 0.389 |
|                         | 0.431 | 0.377 |
|                         | 0.409 | 0.369 |

| 2700K Chromaticity Bins |       |       |
|-------------------------|-------|-------|
| Bin Code (WW)           | CIEx  | CIEy  |
| EW                      | 0.462 | 0.437 |
|                         | 0.488 | 0.444 |
|                         | 0.481 | 0.432 |
|                         | 0.456 | 0.426 |
| W3*                     | 0.447 | 0.408 |
|                         | 0.458 | 0.410 |
|                         | 0.448 | 0.392 |
|                         | 0.437 | 0.389 |
| W4*                     | 0.456 | 0.426 |
|                         | 0.469 | 0.429 |
|                         | 0.458 | 0.410 |
|                         | 0.447 | 0.408 |
| Y3*                     | 0.458 | 0.410 |
|                         | 0.470 | 0.413 |
|                         | 0.459 | 0.394 |
|                         | 0.448 | 0.392 |
| Y4*                     | 0.469 | 0.429 |
|                         | 0.481 | 0.432 |
|                         | 0.470 | 0.413 |
|                         | 0.458 | 0.410 |
| DY                      | 0.437 | 0.389 |
|                         | 0.459 | 0.394 |
|                         | 0.452 | 0.382 |
|                         | 0.431 | 0.377 |

\* Sub-bins within ANSI defined quadrangles per ANSI C78.377-2008

### PhlatLight Product Shipping and Labeling Information

All PhlatLight products are packaged and labeled with their respective bin as outlined in the tables on pages 3 and 4. When shipped, each package will only contain one bin. The part number designation is as follows:

**SST**      —      **90**      —      **WNNX**      —      **F11**      —      **FF**      —      **WW**

| Product Family    | Chip Area               | Color                                 | Package Configuration     | Flux Bin               | Chromaticity Bin          |
|-------------------|-------------------------|---------------------------------------|---------------------------|------------------------|---------------------------|
| SST:Surface mount | 90: 9.0 mm <sup>2</sup> | WNNX: CCT and CRI<br>See Note 1 Below | F11: 10 x 11mm<br>emitter | See page 3 for<br>bins | See pages 4-5 for<br>bins |

Note 1. WNNX nomenclature corresponds to the following:

W = White

NN = color temperature, where:

65 corresponds to 6500K

40 corresponds to 4000K

30 corresponds to 3000K, etc.

X = color rendering index, where:

S (standard) corresponds to a typical CRI of 70

M (moderate) corresponds to a typical CRI of 83

H (high) corresponds to a typical CRI of 92.

Note 2. Some flux and chromaticity bins may have limited availability. Application specific bin kits, consisting of multiple bins, may be available. For ordering information, please refer to page 16 and reference PDS-001393: PhlatLight Binning and Labeling document.

Example: The part label SST-90-W65S-F11-WN-G4 refers to a 6500K standard CRI white, SST-90 emitter, F11 package configuration, with a flux range of 1,000 to 1,200 lumens and a chromaticity value within the box defined by the four points (0.313, 0.338), (0.321, 0.348), (0.322, 0.336), (0.312, 0.328).

Example: The part label SST-90-W30M-F11-WL-U3 refers to a 3000K moderate CRI white, SST-90 emitter, F11 package configuration, with a flux range of 700 to 850 lumens and a chromaticity value within the box defined by the four points (0.422, 0.399), (0.434, 0.403), (0.426, 0.386), (0.415, 0.381).

Optical and Electrical Characteristics ( $T_J = 25\text{ }^{\circ}\text{C}$ )

| White                        |                     |                                |                                           |                   |
|------------------------------|---------------------|--------------------------------|-------------------------------------------|-------------------|
| Drive Condition <sup>1</sup> |                     | 3.15 A                         | 9.0 A                                     |                   |
| Parameter                    | Symbol              | Typical Values at Test Current | Values at Indicated Currents <sup>2</sup> | Unit              |
| Current Density              | j                   | 0.35                           | 1.0                                       | A/mm <sup>2</sup> |
| Forward Voltage              | V <sub>F, min</sub> | 2.50                           |                                           |                   |
|                              | V <sub>F, typ</sub> | 3.25                           | 3.87                                      | V                 |
|                              | V <sub>F, max</sub> | 3.90                           |                                           |                   |

## Common Characteristics

|                                                      | Symbol           | Values | Unit            |
|------------------------------------------------------|------------------|--------|-----------------|
| Viewing Angle                                        | 2 $\theta_{1/2}$ | 100    | degrees         |
| Emitting Area                                        |                  | 9.0    | mm <sup>2</sup> |
| Emitting Area Dimensions                             |                  | 3 x 3  | mm x mm         |
| Forward Voltage Temperature Coefficient <sup>3</sup> |                  | -2.45  | mV/°C           |

## Absolute Maximum Ratings

|                                           | Symbol             | Values      | Unit |
|-------------------------------------------|--------------------|-------------|------|
| Maximum Current <sup>4</sup>              |                    | 9           | A    |
| Maximum Reverse Current                   |                    | Not Allowed | A    |
| Maximum Junction Temperature <sup>5</sup> | T <sub>j-max</sub> | 150         | °C   |
| Storage Temperature Range                 |                    | -40/+100    | °C   |

Note 1: Listed drive conditions are typical for common applications. PhlatLight SST-90-W devices can be driven at currents ranging from <1A to 9A and at duty cycles ranging from <1% to 100%. Drive current and duty cycle should be adjusted as necessary to maintain the junction temperature desired to meet application lifetime requirements.

Note 2: Unless otherwise noted, values listed are typical.

Note 3: Forward voltage temperature coefficient at 3.15 A. Contact Luminus for value at other drive conditions.

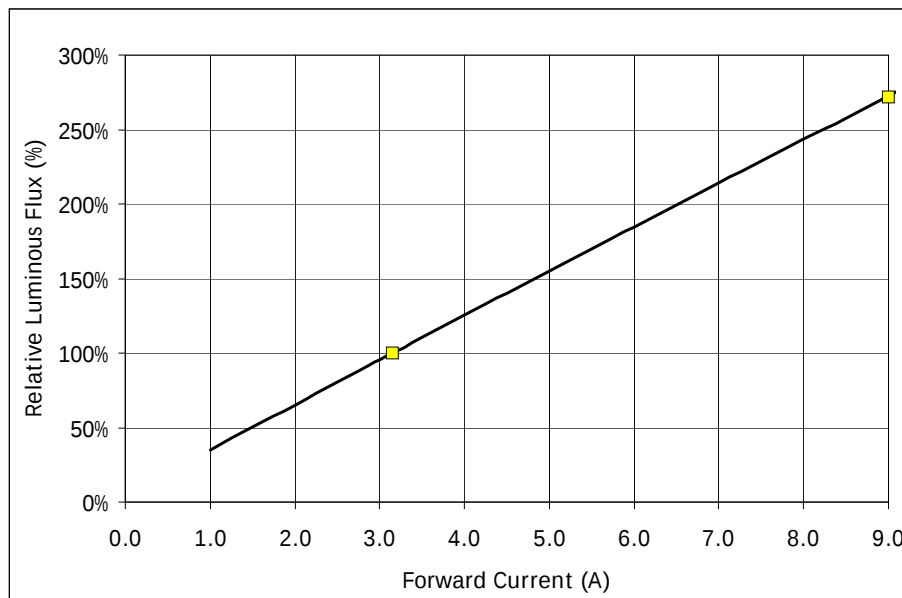
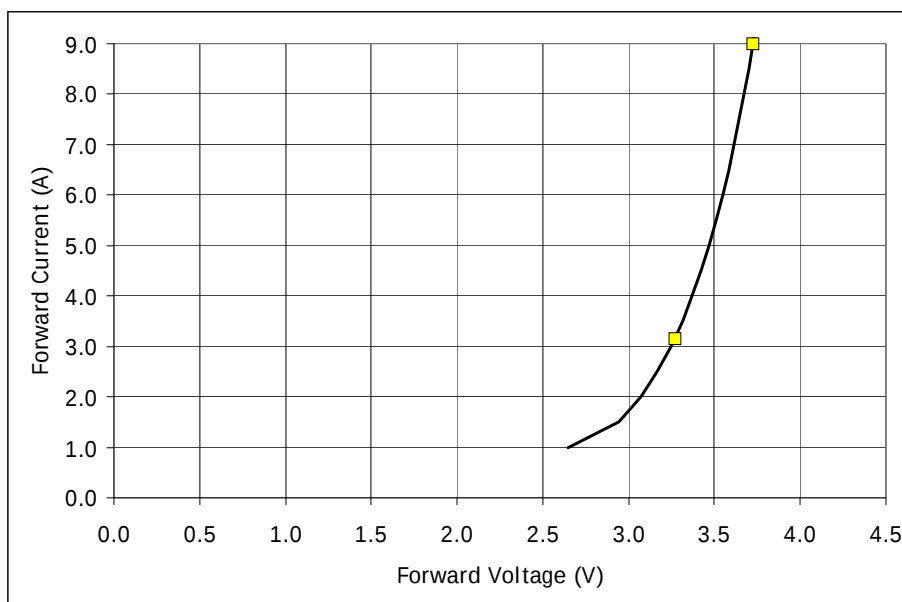
Note 4: Luminus PhlatLight SST-90-W LEDs are designed for operation to an absolute maximum forward drive current of 9 A. Product lifetime data is specified at recommended forward drive currents. Sustained operation at absolute maximum currents will result in a reduction of device lifetime compared to recommended forward drive currents. Actual device lifetimes will also depend on junction temperature. Refer to the APN-001522: Reliability Application Note for SST-90-W for further information. In pulsed operation, rise time from 10-90% of forward current should be larger than 0.5 microseconds.

Note 5: Lifetime dependent on LED junction temperature. Thermal calculations based on input power and thermal management system should be performed to ensure T<sub>j</sub> is maintained below T<sub>jmax</sub> rating or life will be reduced. Refer to APN-001522 for further information.

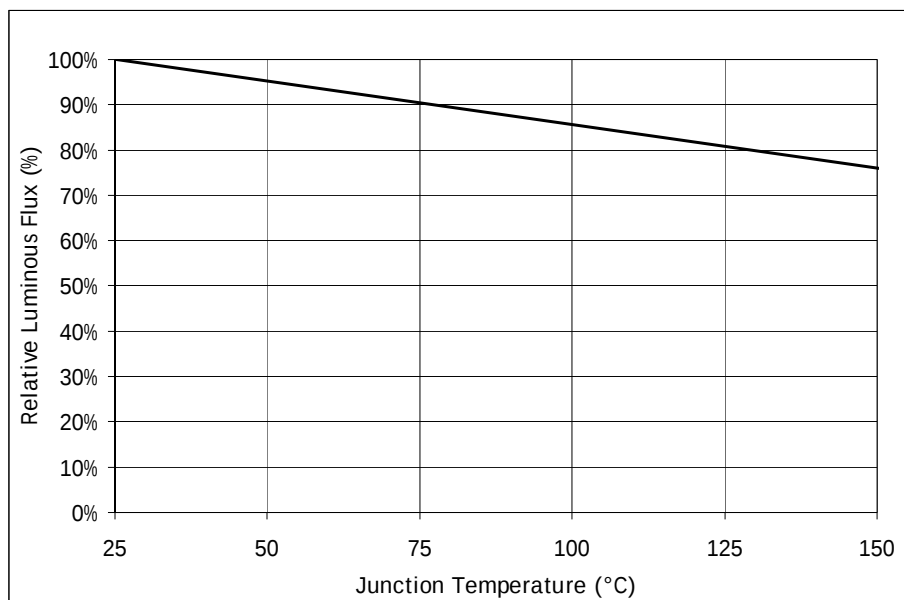
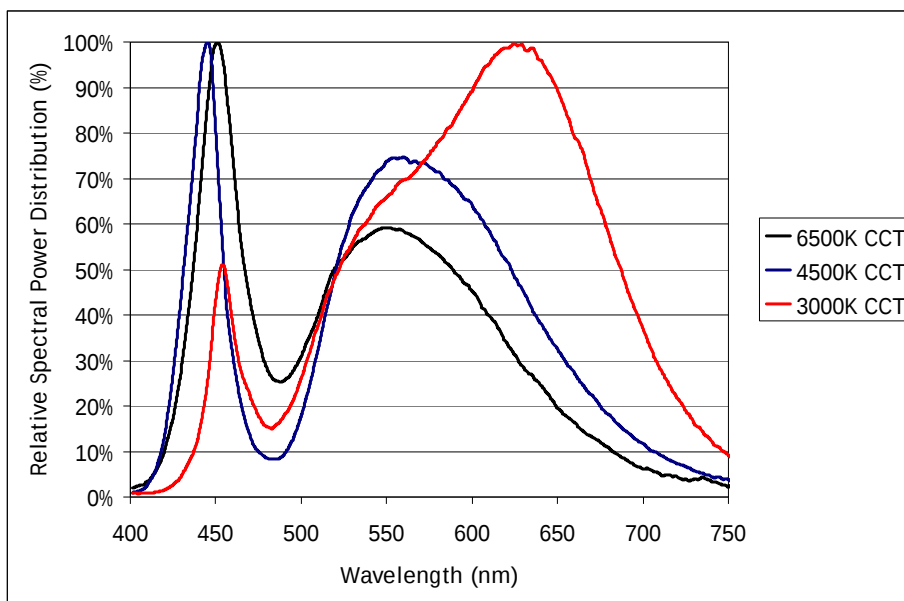
Note 6: CIE measurement uncertainty for white devices is estimated to be +/- 0.01.

Note 7: Special design considerations must be observed for operation under 1 A. Please contact Luminus for further information.

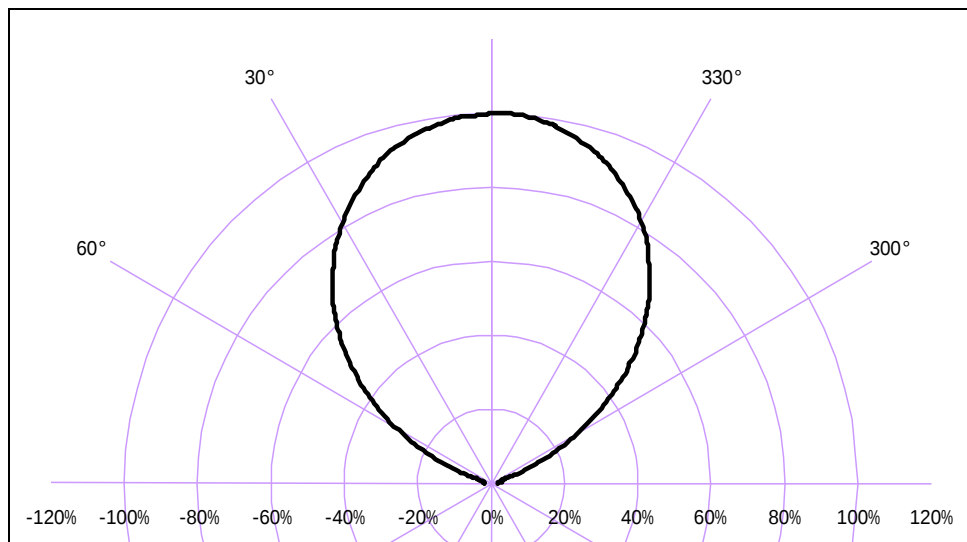
Note 8: Caution must be taken not to stare at the light emitted from these LEDs. Under special circumstances, the high intensity could damage the eye.

**Relative Luminous Flux vs. Forward Current ( $T_J = 25\text{ }^{\circ}\text{C}$ )<sup>1</sup>****Forward Current vs. Forward Voltage ( $T_J = 25\text{ }^{\circ}\text{C}$ )**

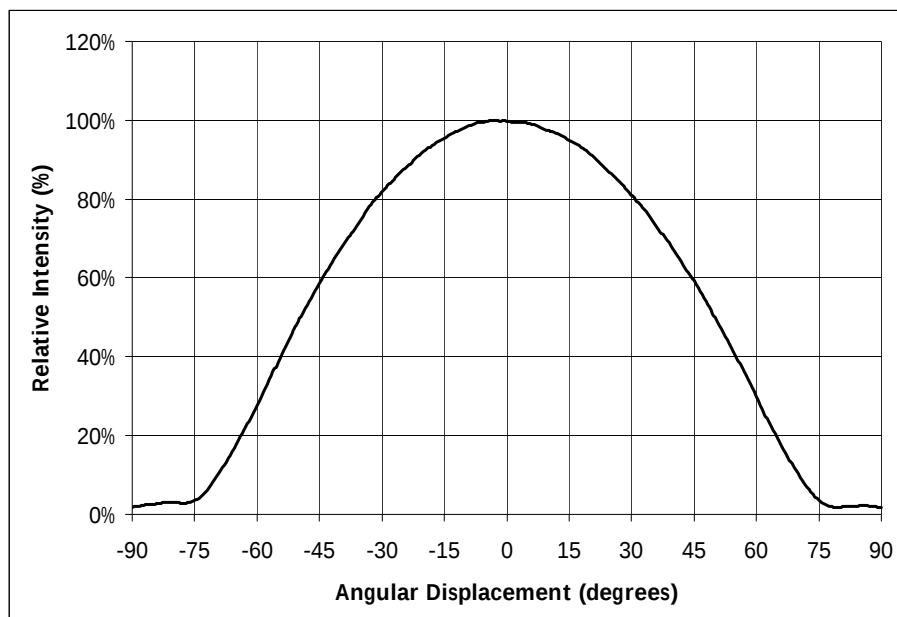
Note1. Yellow squares indicate typical operating conditions

**Relative Output Flux vs. Junction Temperature ( $I_F = 3.15$  A)****Typical Relative Spectral Power ( $T_J = 25^\circ\text{C}$ )**

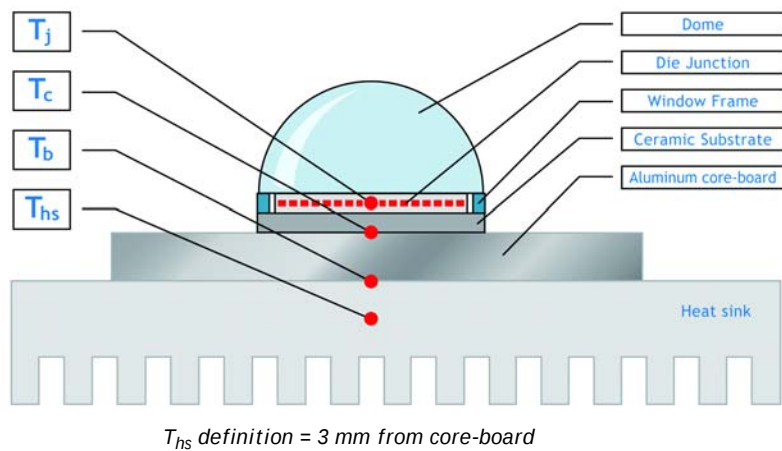
### Typical Polar Radiation Pattern



### Typical Angular Radiation Pattern



## Thermal Resistance



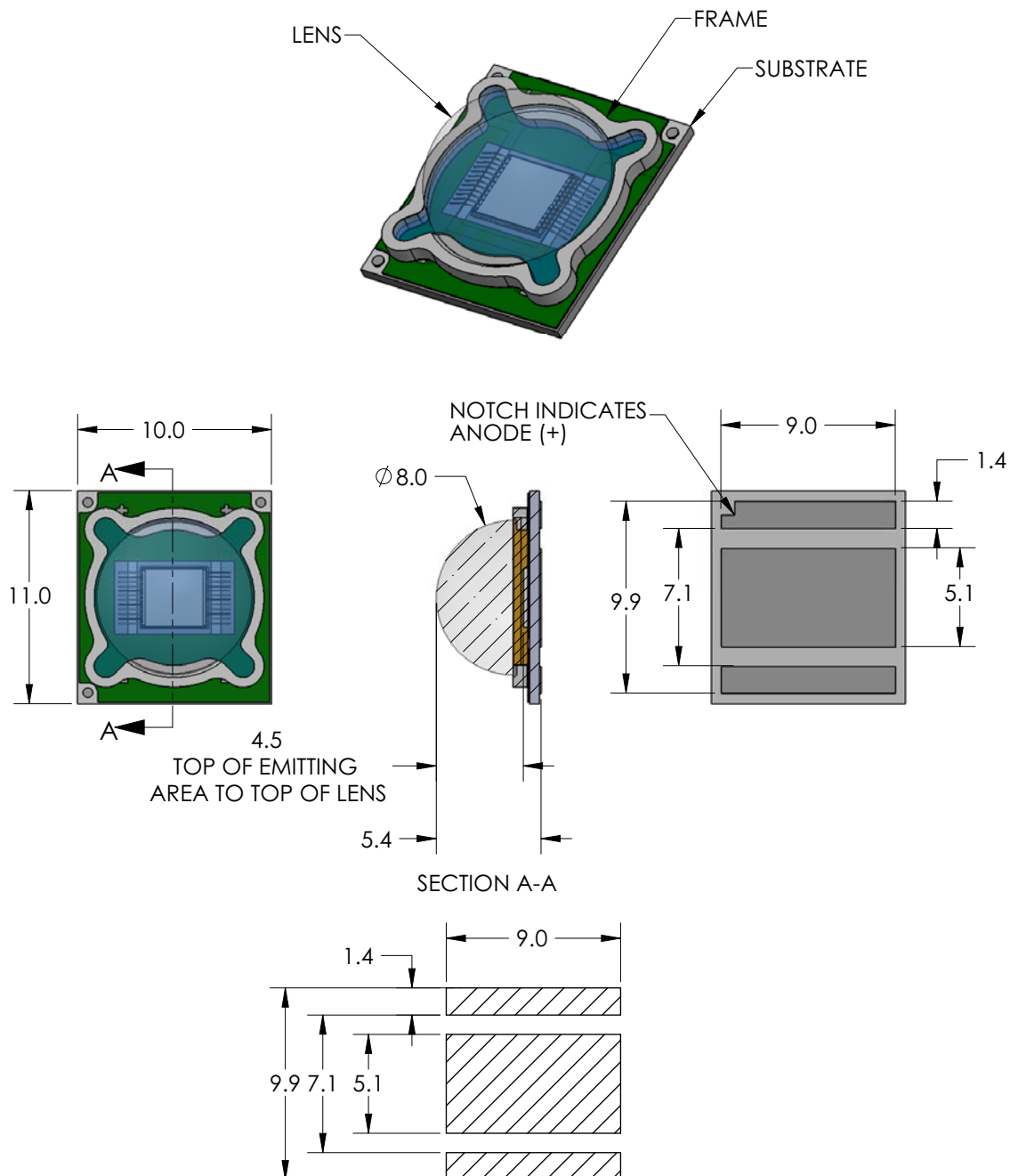
### Typical Thermal Resistance

|              |           |
|--------------|-----------|
| $R_{j-c}^1$  | 0.64 °C/W |
| $R_{j-b}^1$  | 2.02 °C/W |
| $R_{j-hs}^2$ | 2.15 °C/W |

Note 1: Thermal resistance values are based on FEA model results correlated to measured  $R_{\theta j-hs}$  data.

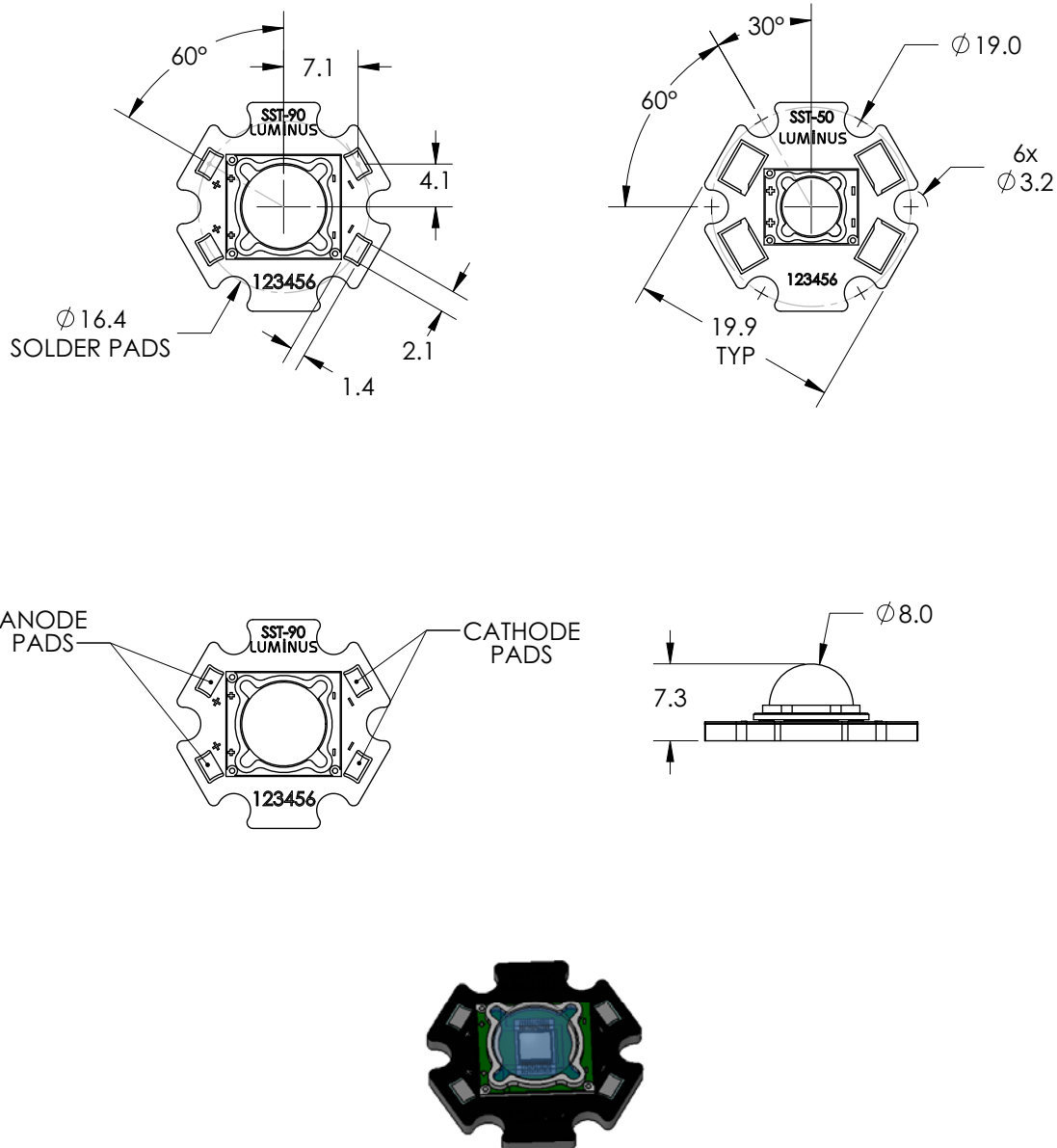
Note 2: Thermal resistance is measured using a SAC305 solder, a Bergquist Al-clad MCPCB, and eGraf 1205 thermal interface material.

## Mechanical Dimensions - SST-90 Emitter



## Mechanical Dimensions - SST-90 Star

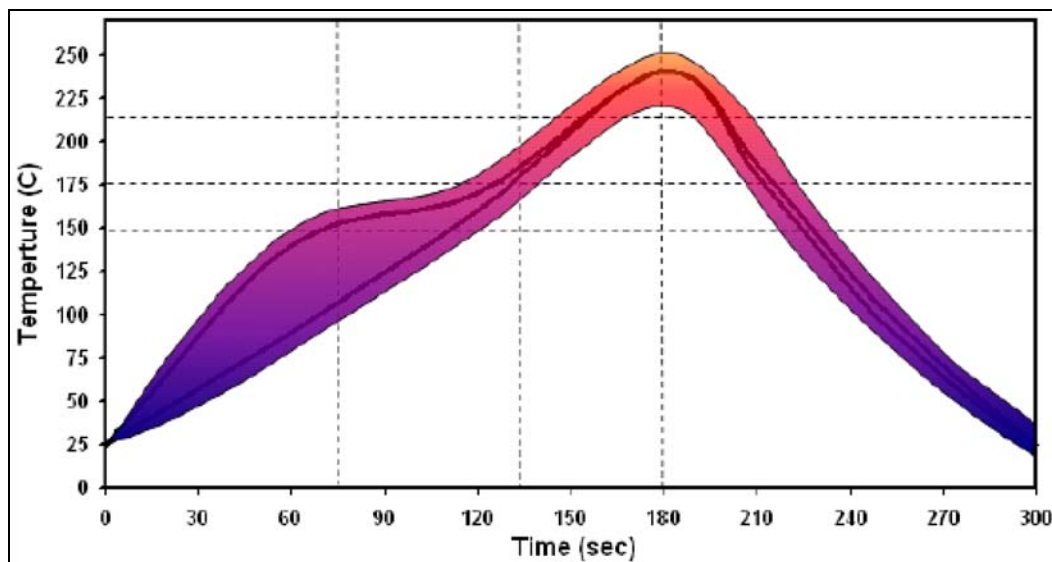
PhlatLight SST-90-W devices are available on a star board for prototyping purposes. Please see page 16 for ordering information.



### Notes:

1. Recommended mounting screw: M3 or #4
2. All dimensions in millimeters
3. All anode pads on board are interconnected. All cathode pads on board are interconnected

## Reflow Soldering Characteristics



## Solder profile guideline

| Solder Profile Stage               | Lead-free solder              | Lead-based solder             |
|------------------------------------|-------------------------------|-------------------------------|
| Profile Length, Ambient to Peak    | 2.75 - 3.5 minutes            | 2.75 - 3.5 minutes            |
| Time Maintained Above: Temperature | 217 °C                        | 183 °C                        |
| Time Maintained Above: Time        | 30 - 60 seconds               | 30-60 seconds                 |
| Cooldown Rate                      | $\leq 4^{\circ} \text{C/sec}$ | $\leq 4^{\circ} \text{C/sec}$ |
| Cooldown Duration                  | $45 \pm 15 \text{ sec}$       | $45 \pm 15 \text{ sec}$       |

Note: 1. Temperatures are taken and monitored at the component copper layer

Note: 2. Optimum profile may differ due to oven type, circuit board or assembly layout

Note: 3. Recommended lead free, no-clean solder: AIM NC254-SAC305

Note: 4. Refer to APN-001473: PhlatLight Soldering and Handling application note for additional solder profiles and details.

## Ordering Information

| Ordering Part Number <sup>1,2</sup> | Color                      | Description                                                                                                             |
|-------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| SST-90-WDLS-F11-GL150               | 6500K White<br>5700K White | White PhlatLight SST-90 surface mount device consisting of a domed 9mm <sup>2</sup> LED mounted on a ceramic substrate. |
| SST-90-WCLS-F11-GL350               | 5000K White<br>4500K White | White PhlatLight SST-90 surface mount device consisting of a domed 9mm <sup>2</sup> LED mounted on a ceramic substrate. |
| SST-90-WWTS-F11-GJ550               | 4000K White<br>3500K White | White PhlatLight SST-90 surface mount device consisting of a domed 9mm <sup>2</sup> LED mounted on a ceramic substrate. |
| SST-90-WWRM-F11-GJ750               | 3000K White<br>2700K White | White PhlatLight SST-90 surface mount device consisting of a domed 9mm <sup>2</sup> LED mounted on a ceramic substrate. |
| SSR-90-WDLS-R11-GL150               | 6500K White<br>5700K White | PhlatLight SSR-90 evaluation module consisting of a SST-90 surface mount device mounted on an aluminum star board.      |
| SSR-90-WCLS-R11-GL350               | 5000K White<br>4500K White | PhlatLight SSR-90 evaluation module consisting of a SST-90 surface mount device mounted on an aluminum star board.      |
| SSR-90-WWTS-R11-GJ550               | 4000K White<br>3500K White | PhlatLight SSR-90 evaluation module consisting of a SST-90 surface mount device mounted on an aluminum star board.      |
| SSR-90-WWRM-R11-GJ750               | 3000K White<br>2700K White | PhlatLight SSR-90 evaluation module consisting of a SST-90 surface mount device mounted on an aluminum star board.      |

Note 1: GL150 - denotes a bin kit comprising of all flux and chromaticity bins at the 6500K and 5700K color points  
 GL350 - denotes a bin kit comprising of all flux and chromaticity bins at the 5000K and 4500K color points  
 GJ550 - denotes a bin kit comprising of all flux and chromaticity bins at the 4000K and 3500K color points  
 GJ750 - denotes a bin kit comprising of all flux and chromaticity bins at the 3000K and 2700K color points  
 See PDS-001393: PhlatLight Binning and Labeling document for more information.

Note 2: For ordering information on all available bin kits, please see PDS-001393: PhlatLight Binning and Labeling document.

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