

# Cree® XLamp® CXA1520 LED



## PRODUCT DESCRIPTION

The XLamp® CXA1520 is Cree's first High Density (HD) LED array, featuring a 9-mm optical source and enabling lighting manufacturers to create a new generation of products that delivers the same intensity and light quality as 39-W ceramic metal halide (CMH) at up to 50 percent lower power. The new HD class of CXA arrays provide unrivaled lumen density that can reduce system cost for the next generation of LED spotlights.

The [CXA LED Design Guide](#) provides basic information on the requirements to use the CXA1520 LED successfully in luminaire designs.

## FEATURES

- Available in 4-step and 2-step EasyWhite® bins at 2700 K, 3000 K, 3500 K, 4000 K and 5000 K CCT
- Available in ANSI white bins at 4000 K and 5000 K CCT
- Available in 70-, 80-, 90- and 93-minimum CRI options
- Forward voltage: 35 V
- 85 °C binning and characterization
- Maximum drive current: 900 mA
- 115° viewing angle, uniform chromaticity profile
- Top-side solder connections
- Thermocouple attach point
- NEMA SSL-3 2011 standard flux bins
- RoHS-compliant
- UL-recognized component (E349212)

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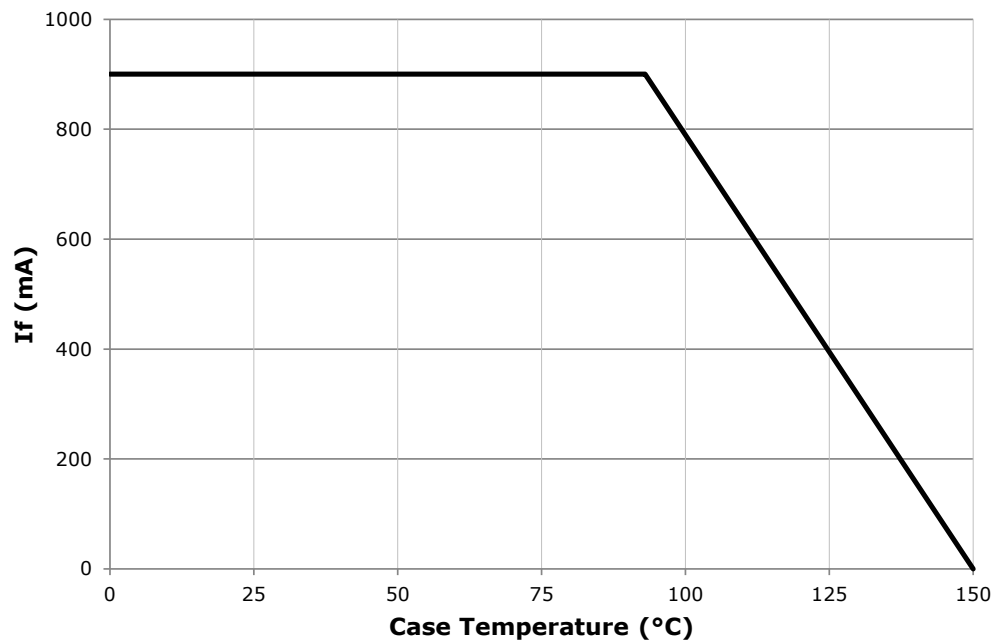
## CHARACTERISTICS

| Characteristics                              | Unit    | Minimum | Typical | Maximum |
|----------------------------------------------|---------|---------|---------|---------|
| Viewing angle (FWHM)                         | degrees |         | 115     |         |
| ESD withstand voltage (HBM per Mil-Std-883D) | V       |         |         | 8000    |
| DC forward current                           | mA      |         |         | 900*    |
| Reverse current                              | mA      |         |         | 0.1     |
| Forward voltage (@ 500 mA, 85 °C)            | V       |         | 35      |         |
| Forward voltage (@ 500 mA, 25 °C)            | V       |         |         | 42      |

\* Refer to the Operating Limits section.

## OPERATING LIMITS

The maximum current rating of the CXA1520 is dependent on the case temperature ( $T_c$ ) when the LED has reached thermal equilibrium under steady-state operation. Please refer to the Mechanical Dimensions section on page 12 for the location of the  $T_c$  measurement point.



## FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ( $I_f = 500 \text{ mA}$ , $T_j = 85 \text{ °C}$ )

The following tables provide order codes for XLamp CXA1520 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 12).

| CCT Range | CRI |     | Base Order Codes<br>Min. Luminous Flux<br>@ 500 mA |                   |                    | 2-Step Order Code   |                          | 4-Step Order Code   |                          |
|-----------|-----|-----|----------------------------------------------------|-------------------|--------------------|---------------------|--------------------------|---------------------|--------------------------|
|           | Min | Typ | Group                                              | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C* | Chromaticity Region |                          | Chromaticity Region |                          |
| 5000 K    | 70  | 75  | P2                                                 | 1830              | 2028               | 50H                 | CXA1520-0000-000N00P250H | 50F                 | CXA1520-0000-000N00P250F |
|           |     |     | P4                                                 | 1965              | 2177               |                     | CXA1520-0000-000N00P450H |                     | CXA1520-0000-000N00P450F |
|           |     |     | Q2                                                 | 2100              | 2327               |                     | CXA1520-0000-000N00Q250H |                     | CXA1520-0000-000N00Q250F |
|           | 80  | --- | N4                                                 | 1710              | 1895               | 50H                 | CXA1520-0000-000N0HN450H | 50F                 | CXA1520-0000-000N0HN450F |
|           |     |     | P2                                                 | 1830              | 2028               |                     | CXA1520-0000-000N0HP250H |                     | CXA1520-0000-000N0HP250F |
|           |     |     | P4                                                 | 1965              | 2177               |                     | CXA1520-0000-000N0HP450H |                     | CXA1520-0000-000N0HP450F |
|           | 90  | 95  | M4                                                 | 1485              | 1645               | 50H                 | CXA1520-0000-000N0UM450H | 50F                 | CXA1520-0000-000N0UM450F |
|           |     |     | N2                                                 | 1590              | 1762               |                     | CXA1520-0000-000N0UN250H |                     | CXA1520-0000-000N0UN250F |
|           |     |     |                                                    |                   |                    |                     |                          |                     |                          |
| 4000 K    | 70  | 75  | N4                                                 | 1710              | 1895               | 40H                 | CXA1520-0000-000N00N440H | 40F                 | CXA1520-0000-000N00N440F |
|           |     |     | P2                                                 | 1830              | 2028               |                     | CXA1520-0000-000N00P240H |                     | CXA1520-0000-000N00P240F |
|           |     |     | P4                                                 | 1965              | 2177               |                     | CXA1520-0000-000N00P440H |                     | CXA1520-0000-000N00P440F |
|           | 80  | --- | N2                                                 | 1590              | 1762               | 40H                 | CXA1520-0000-000N0HN240H | 40F                 | CXA1520-0000-000N0HN240F |
|           |     |     | N4                                                 | 1710              | 1895               |                     | CXA1520-0000-000N0HN440H |                     | CXA1520-0000-000N0HN440F |
|           |     |     | P2                                                 | 1830              | 2028               |                     | CXA1520-0000-000N0HP240H |                     | CXA1520-0000-000N0HP240F |
|           | 90  | 95  | M2                                                 | 1380              | 1587               | 40H                 | CXA1520-0000-000N0UM240H | 40F                 | CXA1520-0000-000N0UM240F |
|           |     |     | M4                                                 | 1485              | 1645               |                     | CXA1520-0000-000N0UM440H |                     | CXA1520-0000-000N0UM440F |
|           |     |     |                                                    |                   |                    |                     |                          |                     |                          |
| 3500 K    | 80  | --- | N4                                                 | 1710              | 1895               | 35H                 | CXA1520-0000-000N00N435H | 35F                 | CXA1520-0000-000N00N435F |
|           |     |     | P2                                                 | 1830              | 2028               |                     | CXA1520-0000-000N00P235H |                     | CXA1520-0000-000N00P235F |
|           | 93  | 95  | K2                                                 | 1200              | 1380               | 35H                 | CXA1520-0000-000N0YK235H | 35F                 | CXA1520-0000-000N0YK235F |
|           |     |     | K4                                                 | 1290              | 1484               |                     | CXA1520-0000-000N0YK435H |                     | CXA1520-0000-000N0YK435F |
|           |     |     | M2                                                 | 1380              | 1587               |                     | CXA1520-0000-000N0YM235H |                     | CXA1520-0000-000N0YM235F |
| 3000 K    | 80  | --- | N2                                                 | 1590              | 1762               | 30H                 | CXA1520-0000-000N00N230H | 30F                 | CXA1520-0000-000N00N230F |
|           |     |     | N4                                                 | 1710              | 1895               |                     | CXA1520-0000-000N00N430H |                     | CXA1520-0000-000N00N430F |
|           | 93  | 95  | K2                                                 | 1200              | 1380               | 30H                 | CXA1520-0000-000N0YK230H | 30H                 | CXA1520-0000-000N0YK230F |
|           |     |     | K4                                                 | 1290              | 1484               |                     | CXA1520-0000-000N0YK430H |                     | CXA1520-0000-000N0YK430F |
|           |     |     | M2                                                 | 1380              | 1587               |                     | CXA1520-0000-000N0YM230H |                     | CXA1520-0000-000N0YM230F |

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements.
- \* Flux values @ 25 °C are calculated and for reference only.

# **FLUX CHARACTERISTICS, EASYWHITE ORDER CODES AND BINS ( $I_f = 500 \text{ mA}$ , $T_j = 85 \text{ °C}$ ) - CONTINUED**

| CCT Range | CRI |     | Base Order Codes<br>Min. Luminous Flux<br>@ 500 mA |                   |                    | 2-Step Order Code   |                          | 4-Step Order Code   |                          |
|-----------|-----|-----|----------------------------------------------------|-------------------|--------------------|---------------------|--------------------------|---------------------|--------------------------|
|           | Min | Typ | Group                                              | Flux (lm) @ 85 °C | Flux (lm) @ 25 °C* | Chromaticity Region |                          | Chromaticity Region |                          |
| 2700 K    | 80  | --- | M4                                                 | 1485              | 1645               | 27H                 | CXA1520-0000-000N00M427H | 27F                 | CXA1520-0000-000N00M427F |
|           |     |     | N2                                                 | 1590              | 1762               |                     | CXA1520-0000-000N00N227H |                     | CXA1520-0000-000N00N227F |
|           |     |     | N4                                                 | 1710              | 1895               |                     | CXA1520-0000-000N00N427H |                     | CXA1520-0000-000N00N427F |
|           | 93  | 95  | J4                                                 | 1120              | 1288               | 27H                 | CXA1520-0000-000N0YJ427H | 27F                 | CXA1520-0000-000N0YJ427F |
|           |     |     | K2                                                 | 1200              | 1380               |                     | CXA1520-0000-000N0YK227H |                     | CXA1520-0000-000N0YK227F |
|           |     |     |                                                    |                   |                    |                     |                          |                     |                          |

## **Notes**

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements.
- \* Flux values @ 25 °C are calculated and for reference only.

## FLUX CHARACTERISTICS, ANSI WHITE ORDER CODES AND BINS ( $I_F = 500 \text{ mA}$ , $T_J = 85 \text{ °C}$ )

The following tables provide order codes for XLamp CXA1520 LEDs. For a complete description of the order code nomenclature, please reference Bin and Order Code Formats (page 13).

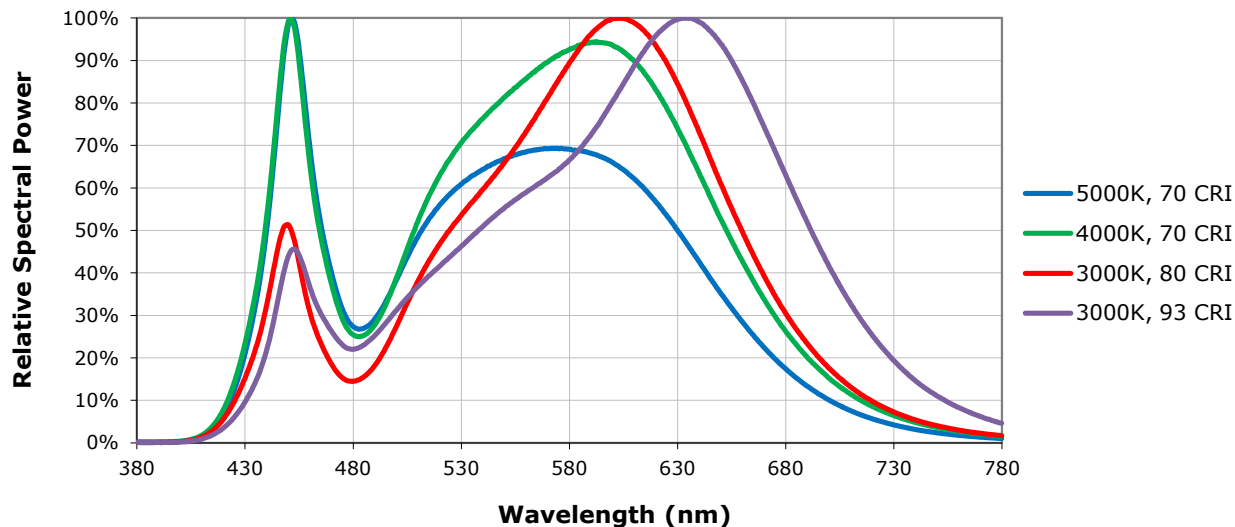
| CCT Range | CRI |     | Base Order Codes<br>Min. Luminous Flux<br>@ 500 mA |                      |                       | Chromaticity Regions | Order Code               |
|-----------|-----|-----|----------------------------------------------------|----------------------|-----------------------|----------------------|--------------------------|
|           | Min | Typ | Group                                              | Flux (lm)<br>@ 85 °C | Flux (lm)<br>@ 25 °C* |                      |                          |
| 5000 K    | 70  | 75  | P2                                                 | 1830                 | 2028                  | 3A0, 3B0, 3C0, 3D0   | CXA1520-0000-000N00P20E3 |
|           |     |     | P4                                                 | 1965                 | 2177                  |                      | CXA1520-0000-000N00P40E3 |
|           |     |     | Q2                                                 | 2100                 | 2327                  |                      | CXA1520-0000-000N00Q20E3 |
|           | 80  | --- | N4                                                 | 1710                 | 1895                  | 3A0, 3B0, 3C0, 3D0   | CXA1520-0000-000N0HN40E3 |
|           |     |     | P2                                                 | 1830                 | 2028                  |                      | CXA1520-0000-000N0HP20E3 |
|           |     |     | P4                                                 | 1965                 | 2177                  |                      | CXA1520-0000-000N0HP40E3 |
|           | 90  | 95  | M4                                                 | 1485                 | 1645                  | 3A0, 3B0, 3C0, 3D0   | CXA1520-0000-000N0UM40E3 |
|           |     |     | N2                                                 | 1590                 | 1762                  |                      | CXA1520-0000-000N0UN20E3 |
| 4000 K    | 70  | 75  | N4                                                 | 1710                 | 1895                  | 5A0, 5B0, 5C0, 5D0   | CXA1520-0000-000N00N40E5 |
|           |     |     | P2                                                 | 1830                 | 2028                  |                      | CXA1520-0000-000N00P20E5 |
|           |     |     | P4                                                 | 1965                 | 2177                  |                      | CXA1520-0000-000N00P40E5 |
|           | 80  | --- | N2                                                 | 1590                 | 1762                  | 5A0, 5B0, 5C0, 5D0   | CXA1520-0000-000N0HN20E5 |
|           |     |     | N4                                                 | 1710                 | 1895                  |                      | CXA1520-0000-000N0HN40E5 |
|           |     |     | P2                                                 | 1830                 | 2028                  |                      | CXA1520-0000-000N0HP20E5 |
|           | 90  | 95  | M2                                                 | 1380                 | 1587                  | 5A0, 5B0, 5C0, 5D0   | CXA1520-0000-000N0UM20E5 |
|           |     |     | M4                                                 | 1485                 | 1645                  |                      | CXA1520-0000-000N0UM40E5 |

### Notes

- Cree maintains a tolerance of  $\pm 7\%$  on flux and power measurements,  $\pm 0.005$  on chromaticity (CCx, CCy) measurements and a tolerance of  $\pm 2$  on CRI measurements.
- \* Flux values @ 25 °C are calculated and for reference only.

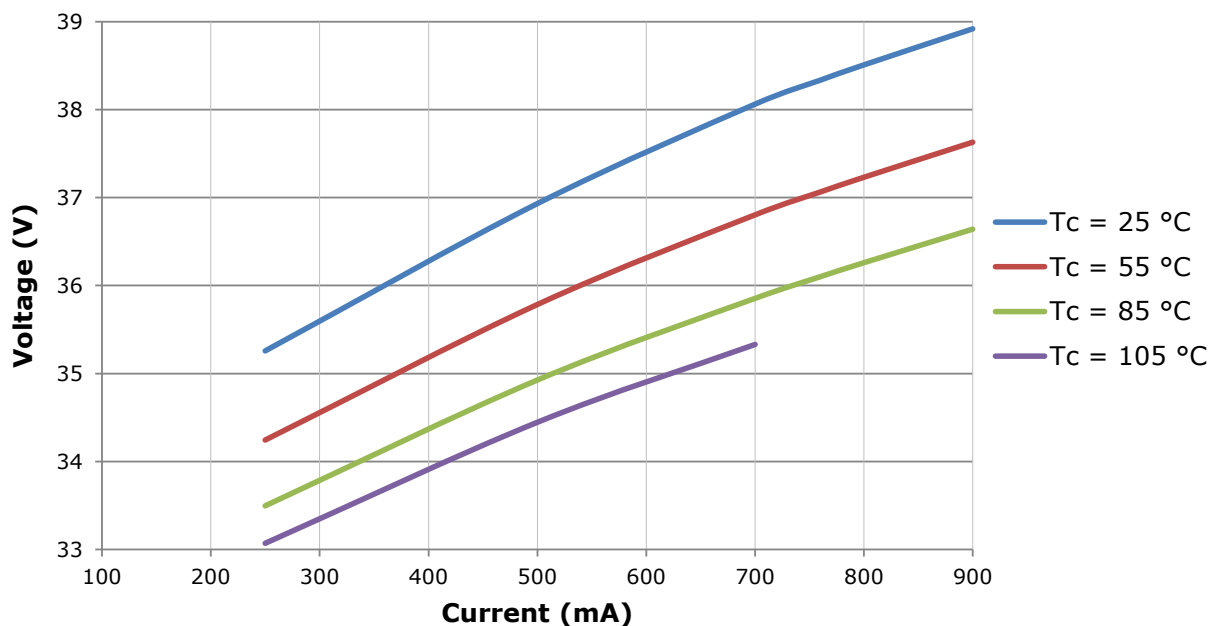
## RELATIVE SPECTRAL POWER DISTRIBUTION ( $I_F = 500 \text{ mA}$ , $T_J = 85^\circ\text{C}$ )

The following graph is the result of a series of pulsed measurements at 500 mA and  $T_J = 85^\circ\text{C}$ .



## ELECTRICAL CHARACTERISTICS

The following graph is the result of a series of steady-state measurements.

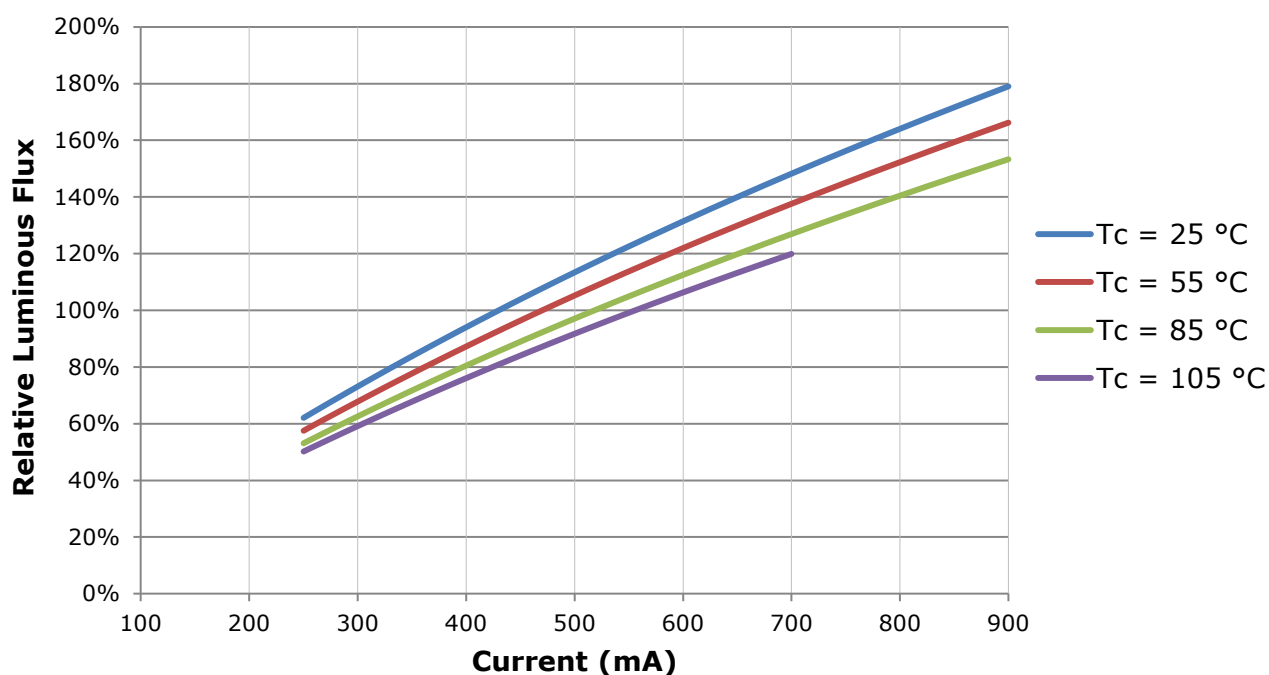


## RELATIVE LUMINOUS FLUX

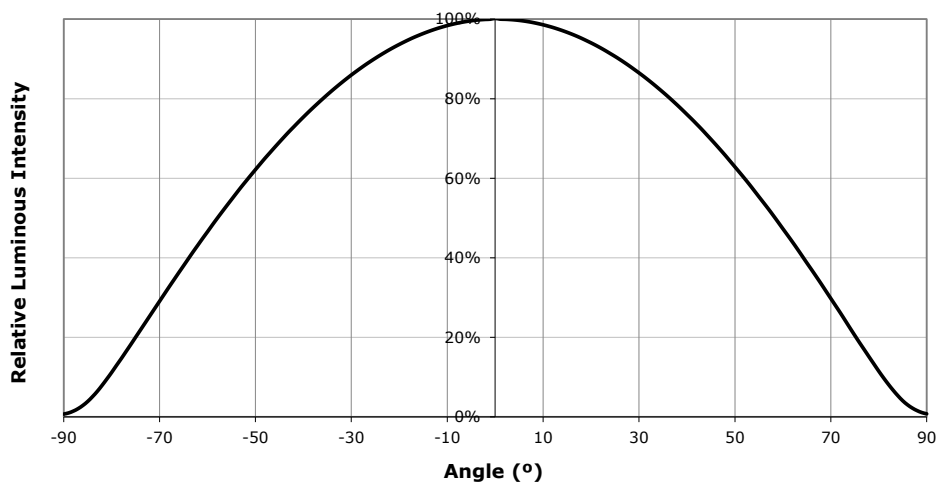
The relative luminous flux values provided below are the ratio of:

- Measurements of CXA1520 at steady-state operation at the given conditions, divided by
- Flux measured during binning, which is a pulsed measurement at 500 mA at  $T_j = 85\text{ °C}$ .

For example, at steady-state operation of  $T_c = 105\text{ °C}$ ,  $I_f = 700\text{ mA}$ , the relative luminous flux ratio is 120% in the chart below. A CXA1520 LED that measures 2100 lm during binning will deliver 2520 lm ( $2100 \times 1.2$ ) at steady-state operation of  $T_c = 105\text{ °C}$ ,  $I_f = 700\text{ mA}$ .



## TYPICAL SPATIAL DISTRIBUTION



## PERFORMANCE GROUPS - BRIGHTNESS ( $I_F = 500\text{ mA}$ , $T_J = 85\text{ °C}$ )

XLamp CXA1520 LEDs are tested for luminous flux and placed into one of the following bins.

| Group Code | Min. Luminous Flux<br>@ 500 mA | Max. Luminous Flux<br>@ 500 mA |
|------------|--------------------------------|--------------------------------|
| J2         | 1040                           | 1120                           |
| J4         | 1120                           | 1200                           |
| K2         | 1200                           | 1290                           |
| K4         | 1290                           | 1380                           |
| M2         | 1380                           | 1485                           |
| M4         | 1485                           | 1590                           |
| N2         | 1590                           | 1710                           |
| N4         | 1710                           | 1830                           |
| P2         | 1830                           | 1965                           |
| P4         | 1965                           | 2100                           |
| Q2         | 2100                           | 2260                           |
| Q4         | 2260                           | 2420                           |

## PERFORMANCE GROUPS - CHROMATICITY ( $T_c = 85^\circ\text{C}$ )

XLamp CXA1520 LEDs are tested for chromaticity and placed into one of the regions defined by the following bounding coordinates.

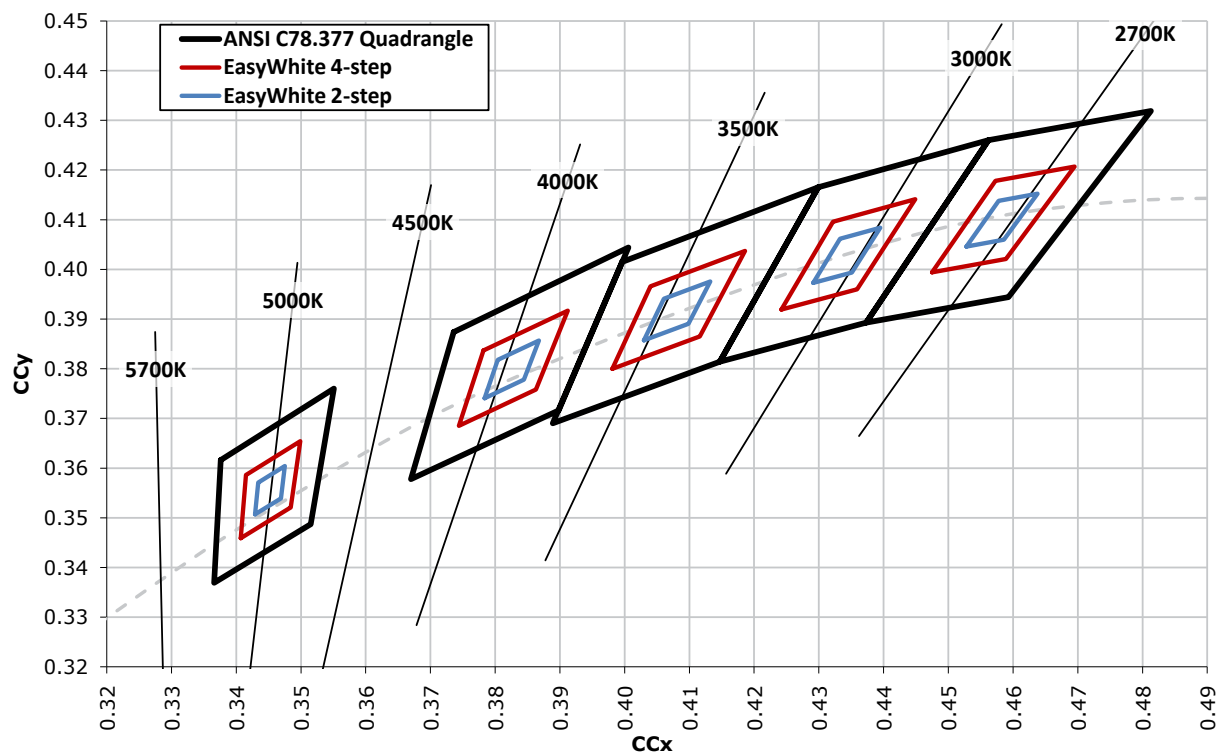
| EasyWhite Color Temperatures – 4-Step |       |         |        |
|---------------------------------------|-------|---------|--------|
| Code                                  | CCT   | x       | y      |
| 50F                                   | 5000K | 0.3407  | 0.3459 |
|                                       |       | 0.3415  | 0.3586 |
|                                       |       | 0.3499  | 0.3654 |
|                                       |       | 0.3484  | 0.3521 |
| 40F                                   | 4000K | 0.3744  | 0.3685 |
|                                       |       | 0.3782  | 0.3837 |
|                                       |       | 0.3912  | 0.3917 |
|                                       |       | 0.3863  | 0.3758 |
| 35F                                   | 3500K | 0.3981  | 0.3800 |
|                                       |       | 0.4040  | 0.3966 |
|                                       |       | 0.4186  | 0.4037 |
|                                       |       | 0.4116  | 0.3865 |
| 30F                                   | 3000K | 0.4242  | 0.3919 |
|                                       |       | 0.4322  | 0.4096 |
|                                       |       | 0.4449  | 0.4141 |
|                                       |       | 0.4359  | 0.3960 |
| 27F                                   | 2700K | 0.4475  | 0.3994 |
|                                       |       | 0.4573  | 0.4178 |
|                                       |       | 0.4695  | 0.4207 |
|                                       |       | 0.4589C | 0.4021 |

| EasyWhite Color Temperatures – 2-Step |       |        |        |
|---------------------------------------|-------|--------|--------|
| Code                                  | CCT   | x      | y      |
| 50H                                   | 5000K | 0.3429 | 0.3507 |
|                                       |       | 0.3434 | 0.3571 |
|                                       |       | 0.3475 | 0.3604 |
|                                       |       | 0.3469 | 0.3539 |
| 40H                                   | 4000K | 0.3784 | 0.3741 |
|                                       |       | 0.3804 | 0.3818 |
|                                       |       | 0.3867 | 0.3857 |
|                                       |       | 0.3844 | 0.3778 |
| 35H                                   | 3500K | 0.4030 | 0.3857 |
|                                       |       | 0.4061 | 0.3941 |
|                                       |       | 0.4132 | 0.3976 |
|                                       |       | 0.4099 | 0.3890 |
| 30H                                   | 3000K | 0.4291 | 0.3973 |
|                                       |       | 0.4333 | 0.4062 |
|                                       |       | 0.4395 | 0.4084 |
|                                       |       | 0.4351 | 0.3994 |
| 27H                                   | 2700K | 0.4528 | 0.4046 |
|                                       |       | 0.4578 | 0.4138 |
|                                       |       | 0.4638 | 0.4152 |
|                                       |       | 0.4586 | 0.4060 |

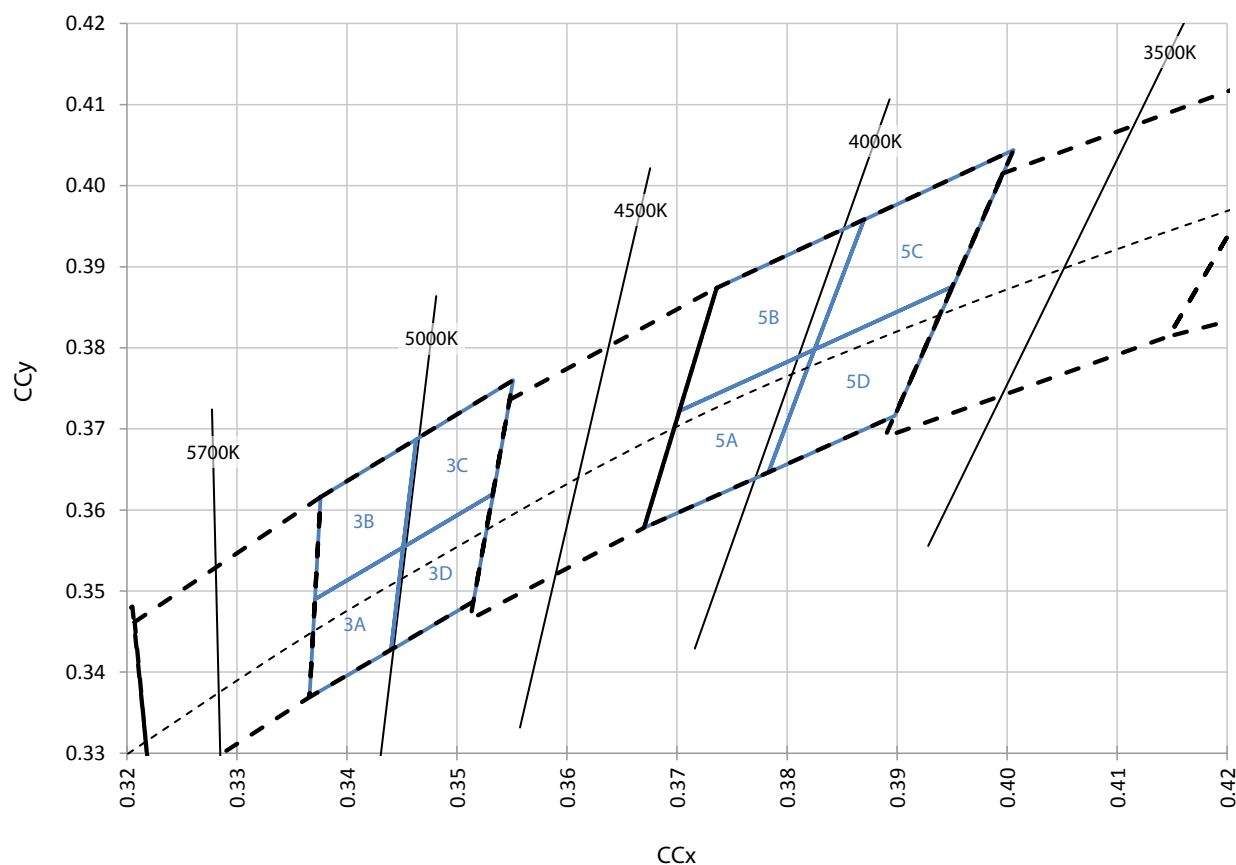
| ANSI White Bins |       |          |       |       |
|-----------------|-------|----------|-------|-------|
| Code            | CCT   | Bin Code | x     | y     |
| 0E3             | 5000K | 3A0      | .3371 | .3490 |
|                 |       |          | .3451 | .3554 |
|                 |       |          | .3440 | .3427 |
|                 |       |          | .3366 | .3369 |
|                 |       | 3B0      | .3376 | .3616 |
|                 |       |          | .3463 | .3687 |
|                 |       |          | .3451 | .3554 |
|                 |       |          | .3371 | .3490 |
|                 |       | 3C0      | .3463 | .3687 |
|                 |       |          | .3551 | .3760 |
|                 |       |          | .3533 | .3620 |
|                 |       |          | .3451 | .3554 |
|                 |       | 3D0      | .3451 | .3554 |
|                 |       |          | .3533 | .3620 |
|                 |       |          | .3515 | .3487 |
|                 |       |          | .3440 | .3427 |

| ANSI White Bins |       |          |       |       |
|-----------------|-------|----------|-------|-------|
| Code            | CCT   | Bin Code | x     | y     |
| 0E5             | 4000K | 5A0      | .3670 | .3578 |
|                 |       |          | .3702 | .3722 |
|                 |       |          | .3825 | .3798 |
|                 |       |          | .3783 | .3646 |
|                 |       | 5B0      | .3702 | .3722 |
|                 |       |          | .3736 | .3874 |
|                 |       |          | .3869 | .3958 |
|                 |       |          | .3825 | .3798 |
|                 |       | 5C0      | .3825 | .3798 |
|                 |       |          | .3869 | .3958 |
|                 |       |          | .4006 | .4044 |
|                 |       |          | .3950 | .3875 |
|                 |       | 5D0      | .3783 | .3646 |
|                 |       |          | .3825 | .3798 |
|                 |       |          | .3950 | .3875 |
|                 |       |          | .3898 | .3716 |

**CREE EASYWHITE BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85^\circ\text{C}$ )**



**CREE ANSI WHITE BINS PLOTTED ON THE 1931 CIE COLOR SPACE ( $T_j = 85\text{ }^{\circ}\text{C}$ )**



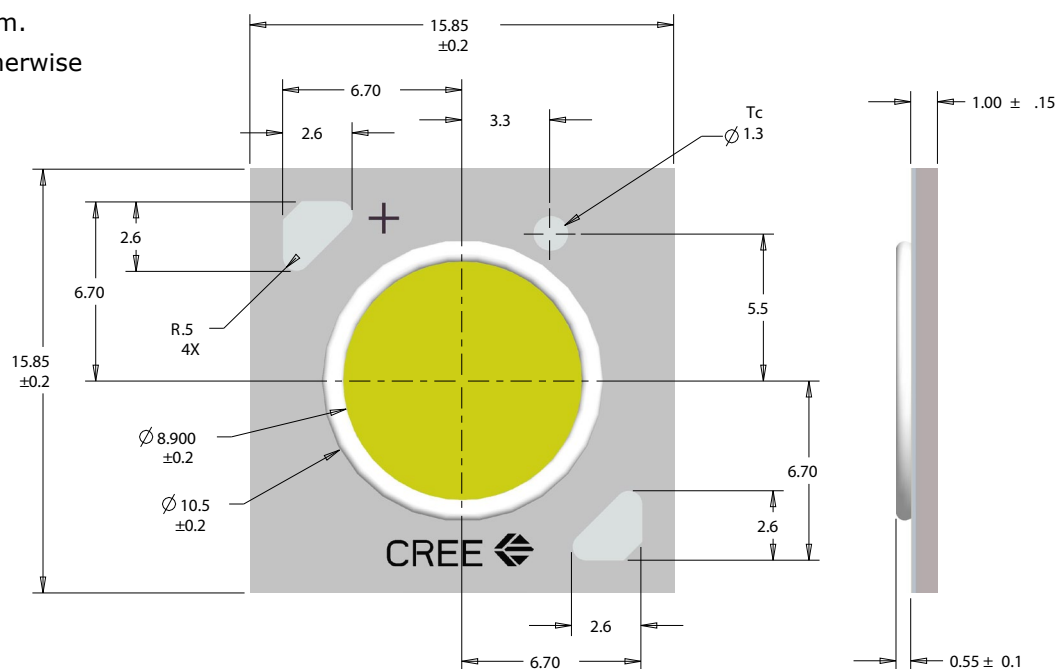
Bin codes and order codes are configured as follows:



Dimensions are in mm.

Tolerances unless otherwise specified:

$.x \pm .10$

$$.xx \pm .03$$
$$.xxx \pm .010$$
$$x^{\circ} \pm 1^{\circ}$$


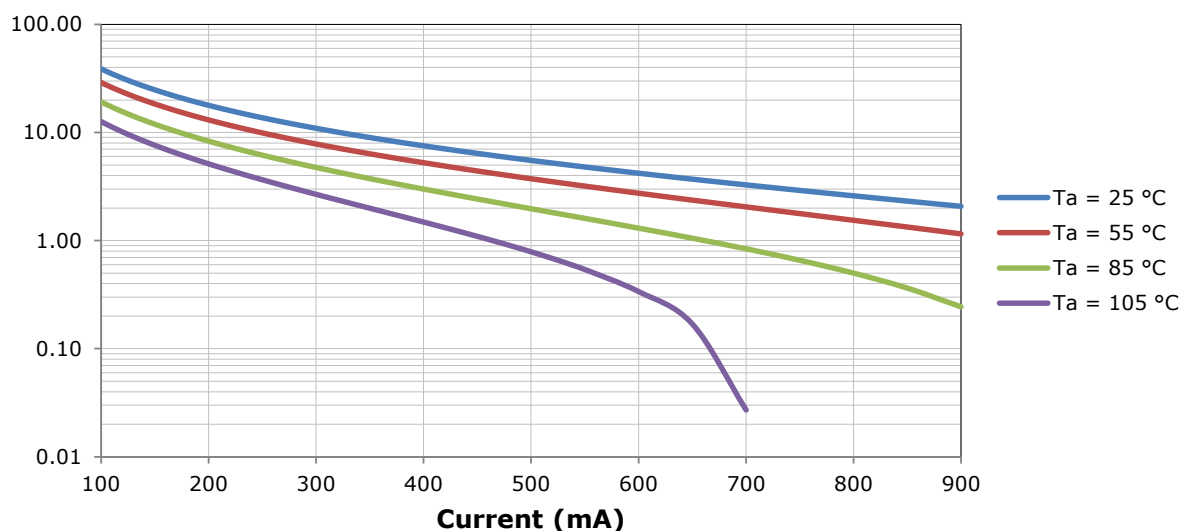
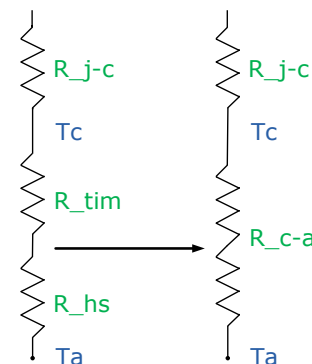
## THERMAL DESIGN

The CXA family of LED arrays can include over a hundred different LED die inside one package, and thus over a hundred different junction temperatures ( $T_j$ ). Cree has intentionally removed junction-temperature-based operating limits and replaced the commonplace maximum  $T_j$  calculations with maximum ratings based on forward current ( $I_f$ ) and case temperature ( $T_c$ ). No additional calculations are required to ensure the CXA LED is being operated within its designed limits. Please refer to page 2 for the Operating Limit specification.

Cree has measured the temperature at the bottom of the package, commonly referred to as the solder point ( $T_{sp}$ ), and found this value to be equivalent to the temperature at the  $T_c$  location at the top of the package once the LED has reached thermal equilibrium. There is no need to calculate for  $T_j$  inside the package, as the thermal management design process, specifically from  $T_{sp}$  to ambient ( $T_a$ ), remains identical to any other LED component. For more information on thermal management of Cree XLamp LEDs, please refer to the [Thermal Management application note](#). For CXA soldering recommendations and more information on thermal interface materials (TIM) and connection methods, please refer to the [Cree XLamp CXA Family LEDs soldering and handling document](#). The [CXA LED Design Guide](#) provides basic information on the requirements to use Cree XLamp CXA LEDs successfully in luminaire designs.

To keep the CXA1520 LED at or below the maximum rated  $T_c$ , the case to ambient thermal resistance ( $R_{c-a}$ ) must be at or below the maximum  $R_{c-a}$  value shown on the following graph, depending on the operating environment. The y-axis in the graph is a base 10 logarithmic scale.

As the figure at right shows, the  $R_{c-a}$  value is the sum of the thermal resistance of the TIM ( $R_{tim}$ ) plus the thermal resistance of the heat sink ( $R_{hs}$ ).



## NOTES

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### **Lumen Maintenance Projections**

Cree now uses standardized IES LM-80-08 and TM-21-11 methods for collecting long-term data and extrapolating LED lumen maintenance. For information on the specific LM-80 data sets available for this LED, refer to the public [LM-80 results document](#).

Please read the [Long-Term Lumen Maintenance application note](#) for more details on Cree's lumen maintenance testing and forecasting. Please read the [Thermal Management application note](#) for details on how thermal design, ambient temperature, and drive current affect the LED junction temperature.

### **RoHS Compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Cree representative or from the Product Documentation sections of [www.cree.com](http://www.cree.com).

### **UL Recognized Component**

Level 4 enclosure consideration. The LED package or a portion thereof has been investigated as a fire and electrical enclosure per ANSI/UL 8750.

### **Vision Advisory Claim**

Users should be cautioned not to stare at the light of this LED product. The bright light can damage the eye.

### PACKAGING

Cree CXA1520 LEDs are packaged in trays of 20. Five trays are sealed in an anti-static bag and placed inside a carton, for a total of 100 LEDs per carton. Each carton contains 100 LEDs from the same performance bin.

Dimensions are in inches.

Tolerances:

.x ± .1

.xx ± .03

.xxx ± .010

x° ± 1°

