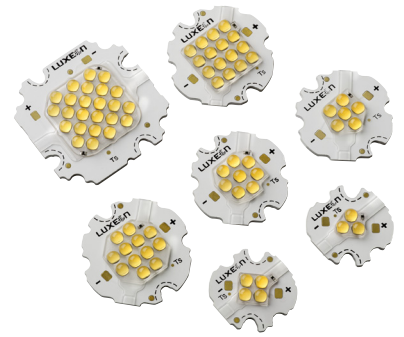


# LUXEON K

High efficacy plug and play array solution  
with precise flux,  $V_f$  and color



## Introduction

The LUXEON® K arrays deliver high flux at high efficacy in a small, easy to use package. The high lumen density enables high light output in thermally and space constrained systems like retrofit lamps and high efficiency in systems like downlights aiming for high energy efficiency. The small size bolt down package enables simple assembly in space constrained systems. With *Freedom from Binning*, every LUXEON K white product falls within a single 3-step MacAdam ellipse positioned around the center point of the ANSI nominal CCT bins to deliver tight Correlated Color Temperature control to ensure consistency in system color point. In addition, these parts deliver the lumen maintenance and reliability that all LUXEON LEDs are renowned for. This document contains the performance data needed to design and engineer LUXEON K based applications.

### Features

- Fully characterized 'light source' with *Freedom from Binning*
- High flux density and lumen offerings of 400-5000+
- CCTs from 2700K to 6500K and Royal Blue
- High flux density for compact lamp solutions
- 3 SDCM color consistency
- Industry's smallest  $V_f$  (+/- 5%) & flux range (+/- 10%)
- LM-80 test reports available
- Comprehensive and enabling ecosystem

### Benefits

- Drop-in solution for cost competitive applications
- Exceptional lamp to lamp consistency (<3MA)
- Single color, flux, or  $V_f$  bin
- Easy mechanical assembly
- Reduction in total cost – no binning or PnP
- Faster time to market – ease of design/assembly

### Key Applications

- Retrofit Lamps
- Downlight

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# General Information

## Product Nomenclature

LUXEON K products are specified and binned “hot” ( $T_j = 85^\circ\text{C}$ ) under conditions comparable to those found in “real-world” lighting products.

The part number designation is explained as follows:

L X K A - P B C D - E F G H J

Where:

- A — designates minimum CRI performance (value 8 = 80 minimum, value 9 = 90 minimum, value 0 for Royal Blue)
- B — designates color (value W = White, value R = Royal Blue)
- C, D — designates nominal ANSI CCT (value 27 = 2700K, 30 = 3000K, 35 = 3500K, 40 = 4000K, 50 = 5000K, and 04 = Royal Blue 447.5nm - 452.5nm peak wavelength)
- E, F — custom spec designation or multi-junction designation (F - Number of strings, H number of emitters, for example 0206, 2 strings of 3 = total emitters of 6)
- G, H — emitter count
- J — denotes a flux upgrade (e.g, A, B, C, etc)

Therefore, 3000K products specified at 350 mA  $85^\circ\text{C}$  follow the part numbering scheme:

- L X K 8 - P W 3 0 - 0 0 0 4 for LUXEON K White 3000K 4-up
- L X K 8 - P W 3 0 - 0 0 0 8 for LUXEON K White 3000K 8-up
- L X K 0 - P R 0 4 - 0 0 0 8 for LUXEON K Royal Blue 8-up

## Average Lumen Maintenance Characteristics

Lumen maintenance for solid-state lighting devices (LEDs) is typically defined in terms of the percentage of initial light output remaining after a specified period of time. Philips Lumileds projects that LUXEON K products will deliver, on average, 70% lumen maintenance (L70) at 50,000 hours of operation at a forward current of up to 700 mA. This projection is based on constant current operation with junction temperature maintained at or below  $125^\circ\text{C}$ . This performance is based on independent test data, Philips Lumileds historical data from tests run on similar material systems, and internal LUXEON reliability testing. Observation of design limits included in this data sheet is required in order to achieve this projected lumen maintenance.

## Environmental Compliance

Philips Lumileds is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON K is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. Philips Lumileds will not intentionally add the following restricted materials to the LUXEON K: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

# Product Selection

## Product Selection Guide for LUXEON K White, Junction Temperature = 85°C

Table I.

| Nominal CCT | Emitter Count | Part Number     | Test Current (mA) | Minimum CRI | Typical CRI | Minimum Flux (lm) | Typical Flux (lm) | Maximum Flux (lm) |
|-------------|---------------|-----------------|-------------------|-------------|-------------|-------------------|-------------------|-------------------|
| 2700        | *3            | LXK8-PW27-0403  | 87.5              | 80          | 83          | 270               | 285               | 320               |
| 2700        | 4             | LXK8-PW27-0004A | 350               | 80          | 83          | 360               | 401               | 430               |
| 2700        | *4            | LXK8-PW27-0404  | 87.5              | 80          | 83          | 340               | 370               | 410               |
| 2700        | *6            | LXK8-PW27-0206  | 175               | 80          | 83          | 530               | 555               | 640               |
| 2700        | 8             | LXK8-PW27-0008A | 350               | 80          | 83          | 730               | 765               | 870               |
| 2700        | 12            | LXK8-PW27-0012A | 350               | 80          | 83          | 1100              | 1148              | 1320              |
| 2700        | 16            | LXK8-PW27-0016A | 350               | 80          | 83          | 1480              | 1530              | 1770              |
| 2700        | 24            | LXK8-PW27-0024A | 350               | 80          | 83          | 2230              | 2378              | 2670              |
| 3000        | *3            | LXK8-PW30-0403  | 87.5              | 80          | 83          | 270               | 285               | 320               |
| 3000        | 4             | LXK8-PW30-0004A | 350               | 80          | 83          | 380               | 426               | 450               |
| 3000        | *4            | LXK8-PW30-0404  | 87.5              | 80          | 83          | 355               | 385               | 420               |
| 3000        | *6            | LXK8-PW30-0206  | 175               | 80          | 83          | 540               | 575               | 650               |
| 3000        | 8             | LXK8-PW30-0008A | 350               | 80          | 83          | 760               | 783               | 910               |
| 3000        | 12            | LXK8-PW30-0012A | 350               | 80          | 83          | 1140              | 1200              | 1360              |
| 3000        | 16            | LXK8-PW30-0016A | 350               | 80          | 83          | 1520              | 1568              | 1820              |
| 3000        | 24            | LXK8-PW30-0024A | 350               | 80          | 83          | 2280              | 2445              | 2730              |
| 3500        | 4             | LXK8-PW35-0004  | 350               | 80          | 83          | 400               | 423               | 480               |
| 3500        | 8             | LXK8-PW35-0008  | 350               | 80          | 83          | 820               | 845               | 980               |
| 3500        | 12            | LXK8-PW35-0012  | 350               | 80          | 83          | 1200              | 1265              | 1440              |
| 3500        | 16            | LXK8-PW35-0016  | 350               | 80          | 83          | 1590              | 1703              | 1900              |
| 3500        | 24            | LXK8-PW35-0024  | 350               | 80          | 83          | 2420              | 2570              | 2900              |
| 4000        | *3            | LXK8-PW40-0403  | 87.5              | 80          | 83          | 310               | 330               | 370               |
| 4000        | 4             | LXK8-PW40-0004A | 350               | 80          | 83          | 420               | 445               | 500               |
| 4000        | *4            | LXK8-PW40-0404  | 87.5              | 80          | 83          | 410               | 430               | 490               |
| 4000        | *6            | LXK8-PW40-0206  | 175               | 80          | 83          | 625               | 660               | 750               |
| 4000        | 8             | LXK8-PW40-0008A | 350               | 80          | 83          | 820               | 886               | 980               |
| 4000        | 12            | LXK8-PW40-0012A | 350               | 80          | 83          | 1250              | 1329              | 1500              |
| 4000        | 16            | LXK8-PW40-0016A | 350               | 80          | 83          | 1680              | 1860              | 2010              |
| 4000        | 24            | LXK8-PW40-0024A | 350               | 80          | 83          | 2530              | 2660              | 3030              |
| 5000K       | 4             | LXK8-PW50-0004  | 350               | 80          | 83          | 440               | 463               | 530               |
| 5000K       | 8             | LXK8-PW50-0008  | 350               | 80          | 83          | 890               | 933               | 1070              |
| 5000K       | 8             | LXK8-PW50-0012  | 350               | 80          | 83          | 1310              | 1389              | 1570              |
| 5000K       | 16            | LXK8-PW50-0016  | 350               | 80          | 83          | 1760              | 1850              | 2110              |
| 5000K       | 24            | LXK8-PW50-0024  | 350               | 80          | 83          | 2650              | 2767              | 3180              |
| 2700        | 4             | LXK9-PW27-0004  | 350               | 90          | 93          | 300               | 320               | 360               |
| 2700        | 8             | LXK9-PW27-0008  | 350               | 90          | 93          | 610               | 640               | 730               |
| 2700        | 12            | LXK9-PW27-0012  | 350               | 90          | 93          | 940               | 960               | 1120              |
| 2700        | 16            | LXK9-PW27-0016  | 350               | 90          | 93          | 1265              | 1280              | 1510              |
| 2700        | 24            | LXK9-PW27-0024  | 350               | 90          | 93          | 1880              | 1925              | 2250              |

Table I continued on page 4.

**Table I Continued.**

| Nominal CCT | Emitter Count | Part Number    | Test Current (mA) | Minimum CRI | Typical CRI | Minimum Flux (lm) | Typical Flux (lm) | Maximum Flux (lm) |
|-------------|---------------|----------------|-------------------|-------------|-------------|-------------------|-------------------|-------------------|
| 3000        | 4             | LXK9-PW30-0004 | 350               | 90          | 93          | 320               | 350               | 380               |
| 3000        | 8             | LXK9-PW30-0008 | 350               | 90          | 93          | 660               | 695               | 790               |
| 3000        | 12            | LXK9-PW30-0012 | 350               | 90          | 93          | 1010              | 1050              | 1210              |
| 3000        | 16            | LXK9-PW30-0016 | 350               | 90          | 93          | 1350              | 1400              | 1620              |
| 3000        | 24            | LXK9-PW30-0024 | 350               | 90          | 93          | 2045              | 2110              | 2450              |
| 2700**      | 4             | LXK8-PW27-0004 | 350               | 80          | 83          | 310               | 345               | 370               |
| 2700**      | 8             | LXK8-PW27-0008 | 350               | 80          | 83          | 680               | 690               | 810               |
| 2700**      | 12            | LXK8-PW27-0012 | 350               | 80          | 83          | 990               | 1045              | 1180              |
| 2700**      | 16            | LXK8-PW27-0016 | 350               | 80          | 83          | 1380              | 1395              | 1650              |
| 2700**      | 24            | LXK8-PW27-0024 | 350               | 80          | 83          | 1960              | 2090              | 2350              |
| 3000**      | 4             | LXK8-PW30-0004 | 350               | 80          | 83          | 330               | 370               | 390               |
| 3000**      | 8             | LXK8-PW30-0008 | 350               | 80          | 83          | 730               | 740               | 870               |
| 3000**      | 12            | LXK8-PW30-0012 | 350               | 80          | 83          | 1070              | 1125              | 1280              |
| 3000**      | 16            | LXK8-PW30-0016 | 350               | 80          | 83          | 1475              | 1500              | 1770              |
| 3000**      | 24            | LXK8-PW30-0024 | 350               | 80          | 83          | 2100              | 2250              | 2520              |
| 4000**      | 4             | LXK8-PW40-0004 | 350               | 80          | 83          | 380               | 410               | 450               |
| 4000**      | 8             | LXK8-PW40-0008 | 350               | 80          | 83          | 780               | 815               | 930               |
| 4000**      | 12            | LXK8-PW40-0012 | 350               | 80          | 83          | 1120              | 1240              | 1340              |
| 4000**      | 16            | LXK8-PW40-0016 | 350               | 80          | 83          | 1590              | 1650              | 1900              |
| 4000**      | 24            | LXK8-PW40-0024 | 350               | 80          | 83          | 2260              | 2475              | 2710              |

**Notes for Table I:**

1. Philips Lumileds maintains a tolerance of  $\pm 6.5\%$  on luminous flux and  $\pm 2$  on CRI measurements.
2. \* = High voltage multi-junction.
3. \*\* = Parts with original flux performance (before flux upgrade).

## Product Selection Guide for LUXEON K Royal Blue, Junction Temperature = 85°C, Test Current = 350 mA

**Table 2.**

| Color      | Emitter Count | Part Number    | Minimum Radiometric Power (mW) | Typical Radiometric Power (mW) | Maximum Radiometric Power (mW) | Typical Radiant Efficiency (%) |
|------------|---------------|----------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Royal Blue | 8             | LXK0-PR04-0008 | 4500                           | 4670                           | 5400                           | 62%                            |
| Royal Blue | 16            | LXK0-PR04-0016 | 9000                           | 9350                           | 10800                          | 62%                            |

# Optical Characteristics

## LUXEON K White at Test Current, Junction Temperature = 85°C

**Table 3.**

| Part Number       | Nominal CCT | Color Temperature CCT | Typical Total Included Angle <sup>[2]</sup><br>(degrees) $\theta_{90V}$ | Typical Viewing Angle <sup>[2]</sup><br>(degrees) $2\theta_{1/2}$ |
|-------------------|-------------|-----------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|                   |             | Typical               |                                                                         |                                                                   |
| LXKx-PW27-xxxx(A) | 2700K       | 2725K                 | 125                                                                     | 100                                                               |
| LXKx-PW30-xxxx(A) | 3000K       | 3045K                 | 125                                                                     | 100                                                               |
| LXKx-PW35-xxxx    | 3500K       | 3465K                 | 125                                                                     | 100                                                               |
| LXKx-PW40-xxxx(A) | 4000K       | 3985K                 | 125                                                                     | 100                                                               |
| LXKx-PW50-xxxx    | 5000K       | 5028K                 | 125                                                                     | 100                                                               |

**Notes for Table 3:**

1. Total angle at which 90% of total luminous flux is captured.
2. Viewing angle is the off axis angle from lamp centerline where the luminous intensity is  $\frac{1}{2}$  of the peak value.

## LUXEON K Royal Blue (LXK0-PRxx) at Test Current <sup>[1]</sup>, Junction Temperature = 85°C

**Table 4.**

| Part Color | Peak Wavelength, $\lambda_p$ <sup>[2]</sup> |       |         | Typical Spectral Half-width (nm) <sup>[3]</sup><br>$\Delta\lambda_{1/2}$ | Typical Temp Coefficient of Peak Wavelength (nm/°C) <sup>[4]</sup><br>$\Delta\lambda_{1/2}$ | Typical Total Included Angle <sup>[4]</sup><br>(degrees) $\theta_{90V}$ | Typical Viewing Angle <sup>[5]</sup><br>(degrees) $2\theta_{1/2}$ |
|------------|---------------------------------------------|-------|---------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------|
|            | Min                                         | Typ   | Max     |                                                                          |                                                                                             |                                                                         |                                                                   |
| Royal Blue | 447.5nm                                     | 450nm | 452.5nm | 20                                                                       | 0.05                                                                                        | 140                                                                     | 116                                                               |

**Notes for Table 4:**

1. Test current is 350 mA for all LXK0-PRxx products.
2. Royal Blue product has single peak wavelength bin.
3. Spectral half-width is 1/2 of the peak intensity.
4. Total included angle at which 90% of total radiometric power is captured.
5. Viewing angle is the off-axis angle from lamp centerline where the luminous intensity is 1/2 of the peak value.

# Electrical Characteristics

## Electrical Characteristics at Test Current for LUXEON K White and Royal Blue, Junction Temperature = 85°C

**Table 5.**

| Part Number       | Forward Voltage $V_f$ <sup>[1]</sup> (V) |         |         | Typical Temperature Coefficient of Forward Voltage (mV/°C)<br>$\Delta V_f / \Delta T_j$ | Typical Thermal Resistance Junction to Case (°C/W)<br>$R\theta_{j-c}$ |
|-------------------|------------------------------------------|---------|---------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|                   | Minimum                                  | Typical | Maximum |                                                                                         |                                                                       |
| LXKx-Pxxx-0403    | 30                                       | 31.5    | 33      | -21.0                                                                                   | 5.5                                                                   |
| LXKx-Pxxx-xx04(A) | 10                                       | 10.5    | 11      | -6.3                                                                                    | 3.0                                                                   |
| LXKx-Pxxx-x404    | 40                                       | 42      | 44      | -30.1                                                                                   | 3.0                                                                   |
| LXKx-Pxxx-xx08(A) | 20                                       | 21      | 22      | -12.5                                                                                   | 1.5                                                                   |
| LXKx-Pxxx-x206    | 30                                       | 31.5    | 33      | -21.0                                                                                   | 2.3                                                                   |
| LXKx-Pxxx-xx12(A) | 30                                       | 31.5    | 33      | -18.8                                                                                   | 1.0                                                                   |
| LXKx-Pxxx-xx16(A) | 40                                       | 42      | 44      | -25.0                                                                                   | 0.8                                                                   |
| LXKx-Pxxx-xx24(A) | 60                                       | 63      | 66      | -37.5                                                                                   | 0.5                                                                   |

**Notes for Table 5:**

1. Philips Lumileds maintains a tester tolerance of 0.5% on forward voltage measurements.
2. Junction temperature to back of the PCB.

## Typical Electrical Characteristics at Twice the Test Current for LUXEON K White and Royal Blue, Junction Temperature = 85°C

**Table 6.**

| Part Number       | Typical Forward Voltage $V_f$ (V) | Test Current (mA) |
|-------------------|-----------------------------------|-------------------|
| LXKx-Pxxx-x403    | 36                                | 87.5              |
| LXKx-Pxxx-xx04(A) | 11                                | 350               |
| LXKx-Pxxx-x404    | 48                                | 87.5              |
| LXKx-Pxxx-xx08(A) | 22                                | 350               |
| LXKx-Pxxx-x206    | 36                                | 175               |
| LXKx-Pxxx-xx12(A) | 33                                | 350               |
| LXKx-Pxxx-xx16(A) | 44                                | 350               |
| LXKx-Pxxx-xx24(A) | 66                                | 350               |

## Absolute Maximum Ratings

**Table 7.**

| Parameter                               | Maximum Performance                                                                                      |                     |                |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------|----------------|
|                                         | LXKx-Pxxx-x004/x006/x008/<br>x012/x016/x024                                                              | LXKx-Pxxx-x403/x404 | LXKx-Pxxx-x206 |
| DC Forward Current (mA)                 | 1050                                                                                                     | 300                 | 600            |
| Peak Pulsed Forward Current (mA)        | 1050                                                                                                     | 300                 | 600            |
| ESD Sensitivity                         | < 8000V Human Body Model (HBM) Class 3A JESD22-A114-E<br>< 400V Machine Model (MM) Class B JESD22-A115-B |                     |                |
| LED Junction Temperature <sup>[1]</sup> | 125°C                                                                                                    |                     |                |
| Operating Case Temperature              | -40°C - 125°C                                                                                            |                     |                |
| Storage Temperature                     | -40°C - 125°C                                                                                            |                     |                |
| Reverse Voltage (V <sub>r</sub> )       | See Note 2                                                                                               |                     |                |

**Notes for Table 7:**

1. Proper current derating must be observed to maintain junction temperature below the maximum.
2. LUXEON Power LEDs are not designed to be driven in reverse bias.

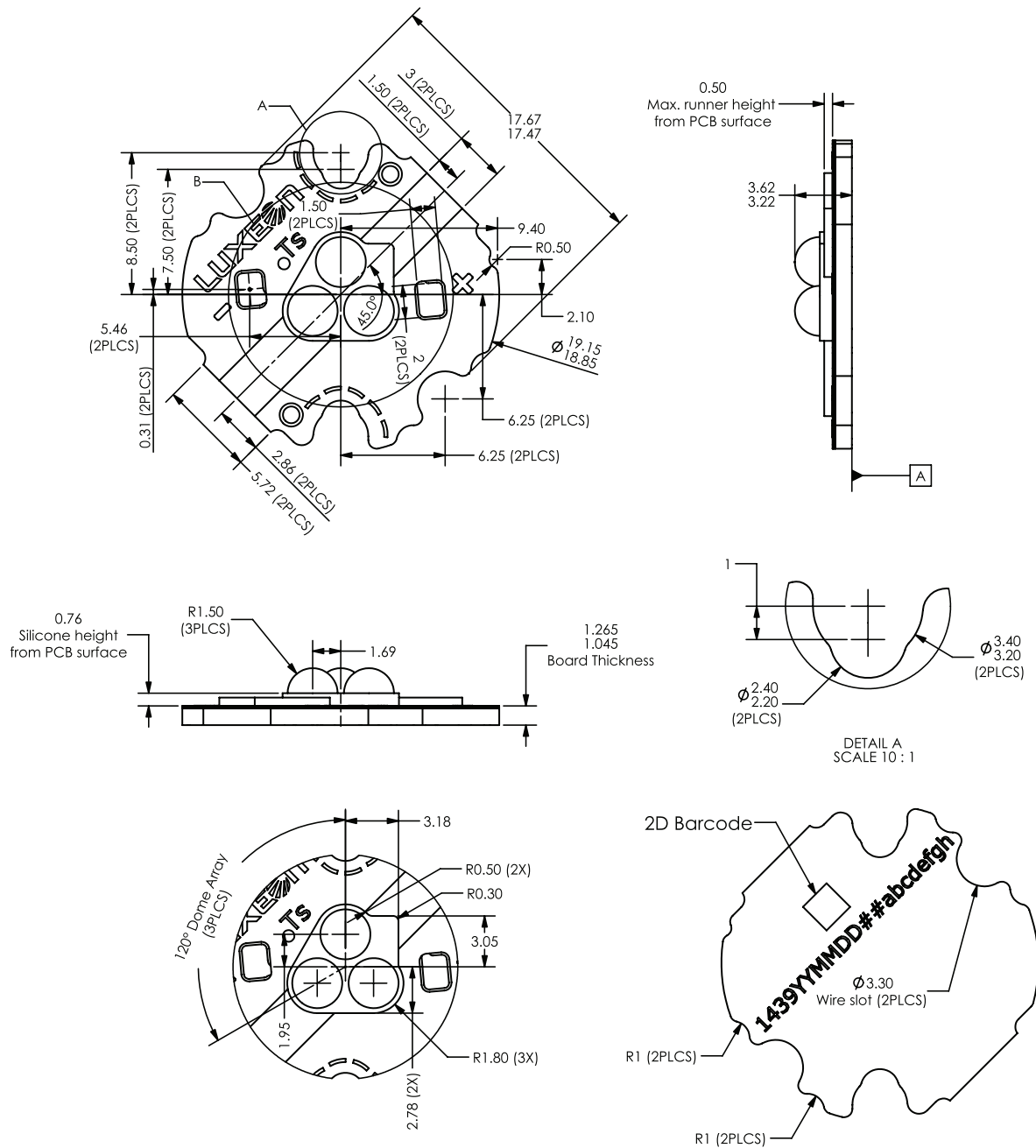
## Electrical Lead Soldering Characteristics

Please refer to Application Brief ABI02 for LUXEON K.



# Mechanical Dimensions

## LXKx-Pxxx-xxx3



**Figure 1. Dimensions for LXKx-Pxxx-xxx3.**

### Notes for Figure 1:

I. All dimensions are in millimeters.

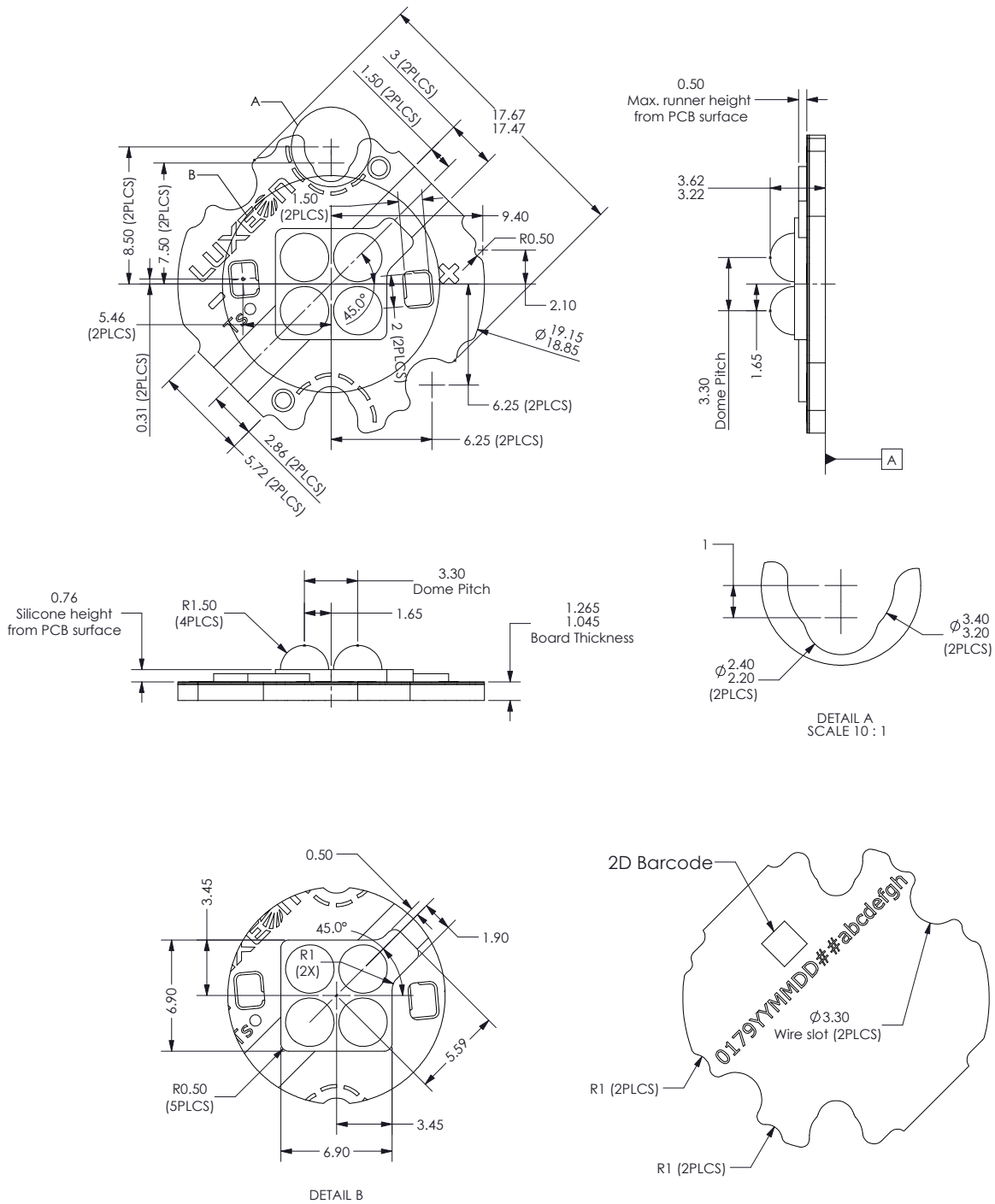


Figure 2. Dimensions for LXKx-Pxxx-xxx4(A).

Notes for Figure 2:

I. All dimensions are in millimeters.

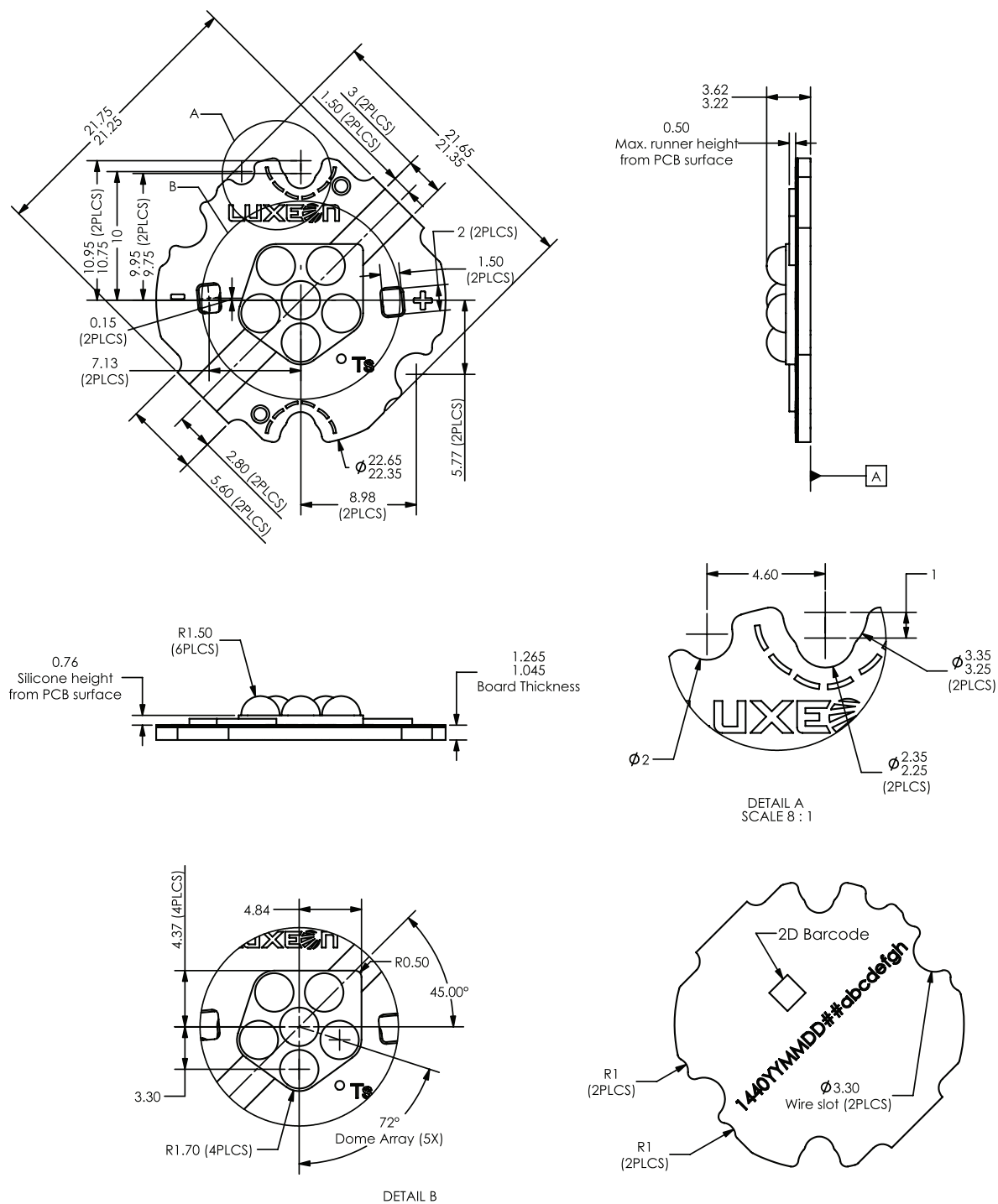


Figure 3. Dimensions for LXKx-Pxxx-xxx6.

Notes for Figure 3:

I. All dimensions are in millimeters.

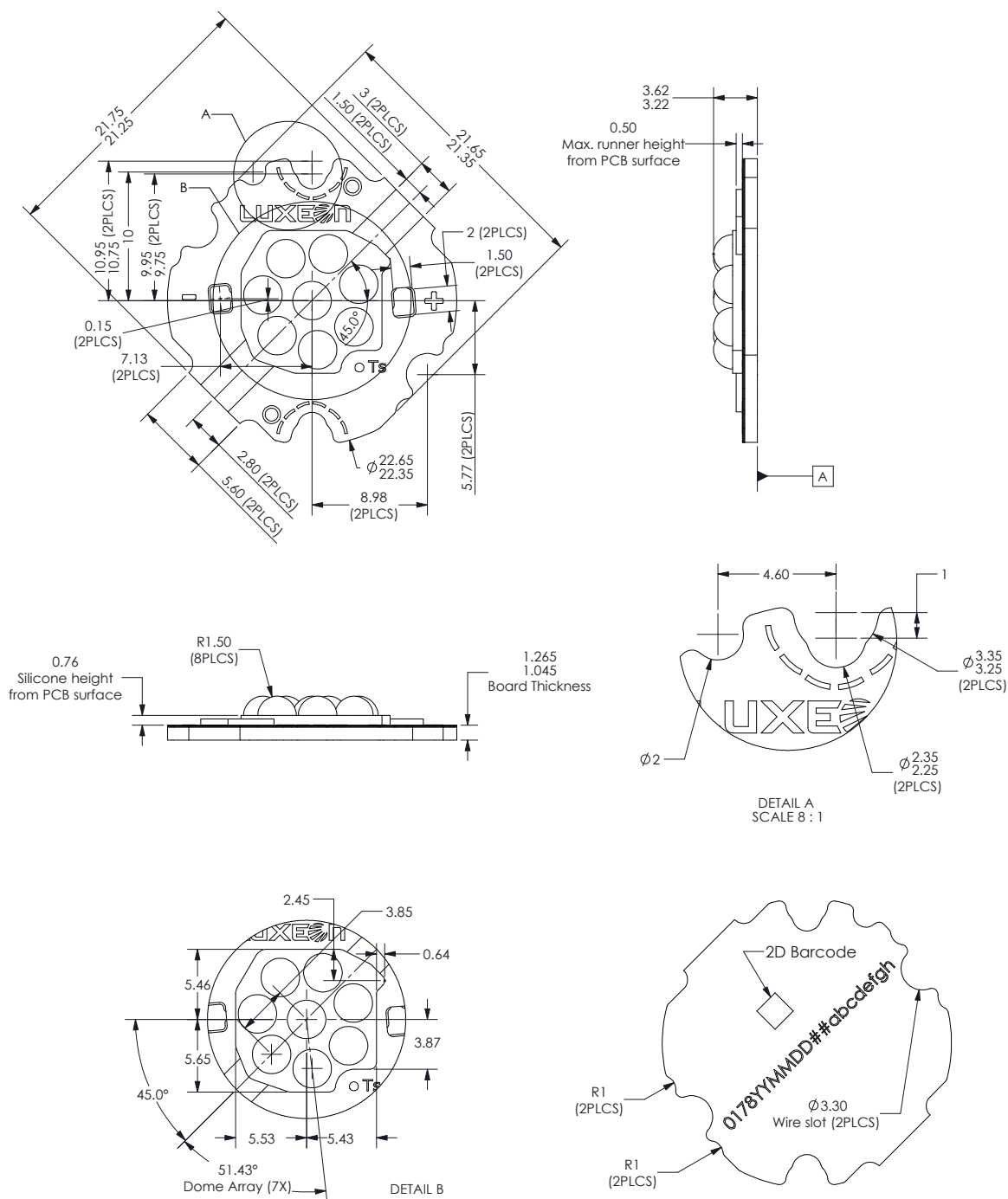


Figure 4. Dimensions for LXKx-Pxxx-xx08(A).

Notes for Figure 4:

I. All dimensions are in millimeters.

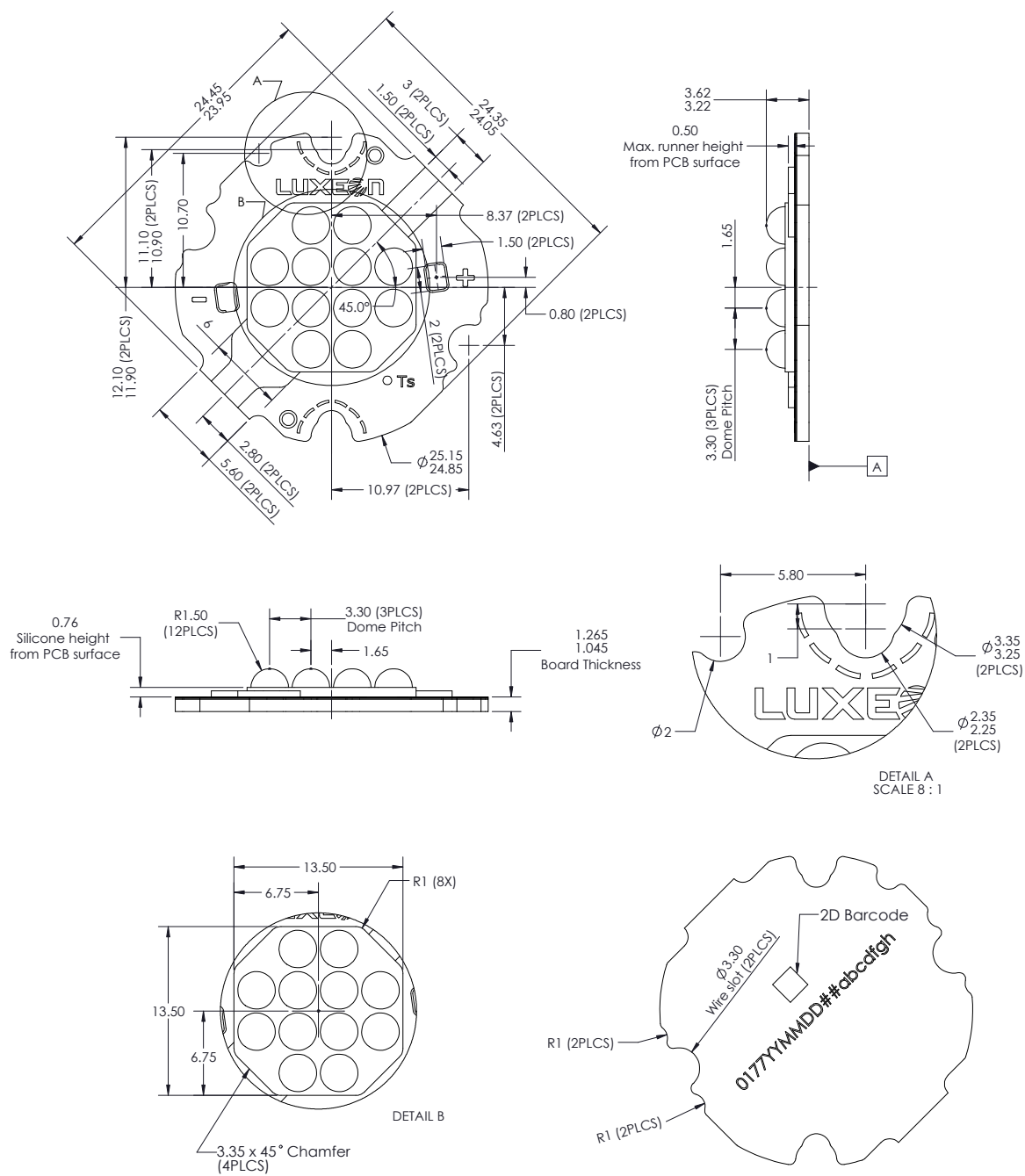


Figure 5. Dimensions for LXKx-Pxxx-xx12(A).

Notes for Figure 5:

I. All dimensions are in millimeters.

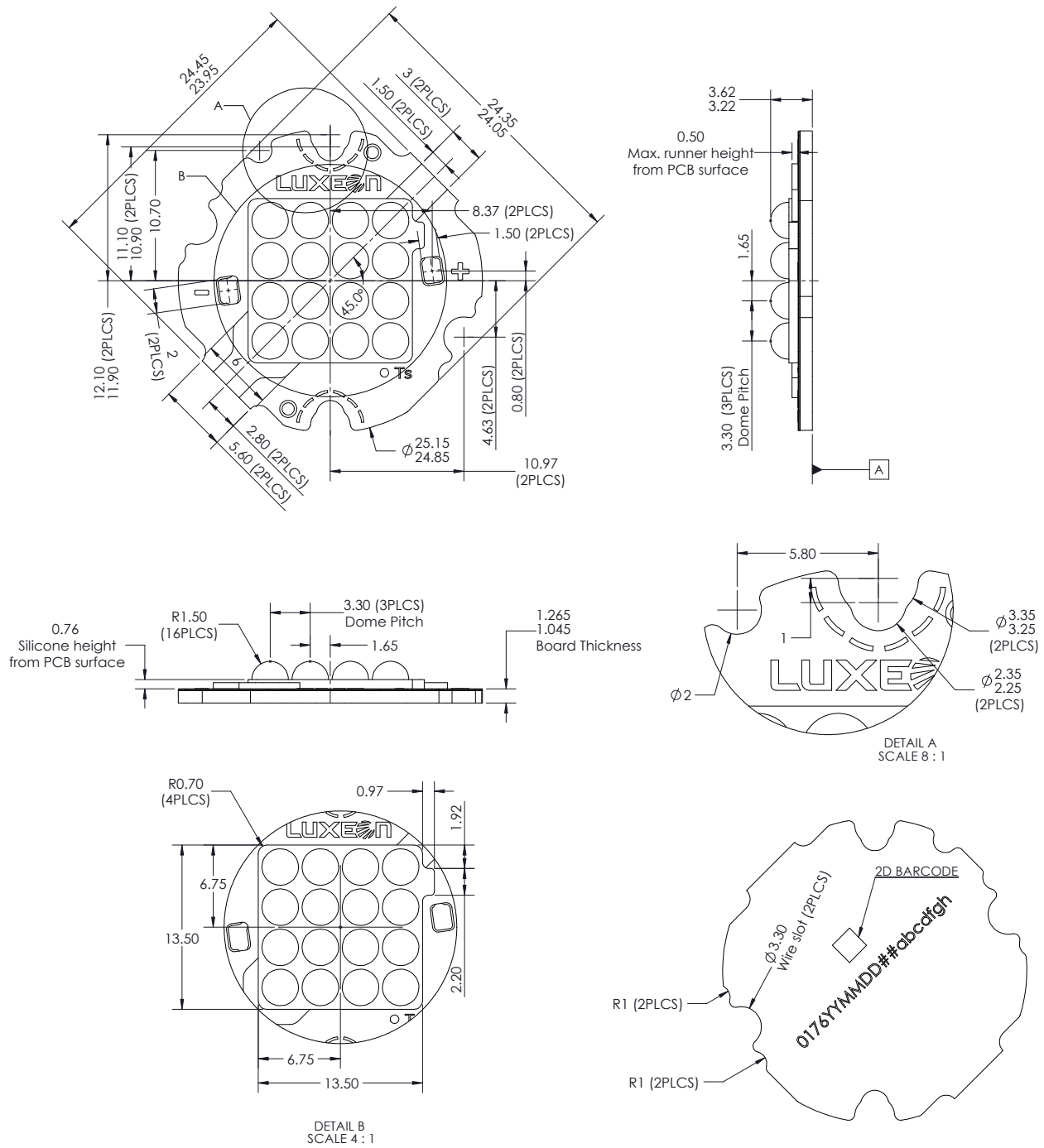


Figure 6. Dimensions for LXKx-Pxxx-xx16(A).

Notes for Figure 6:

I. All dimensions are in millimeters.

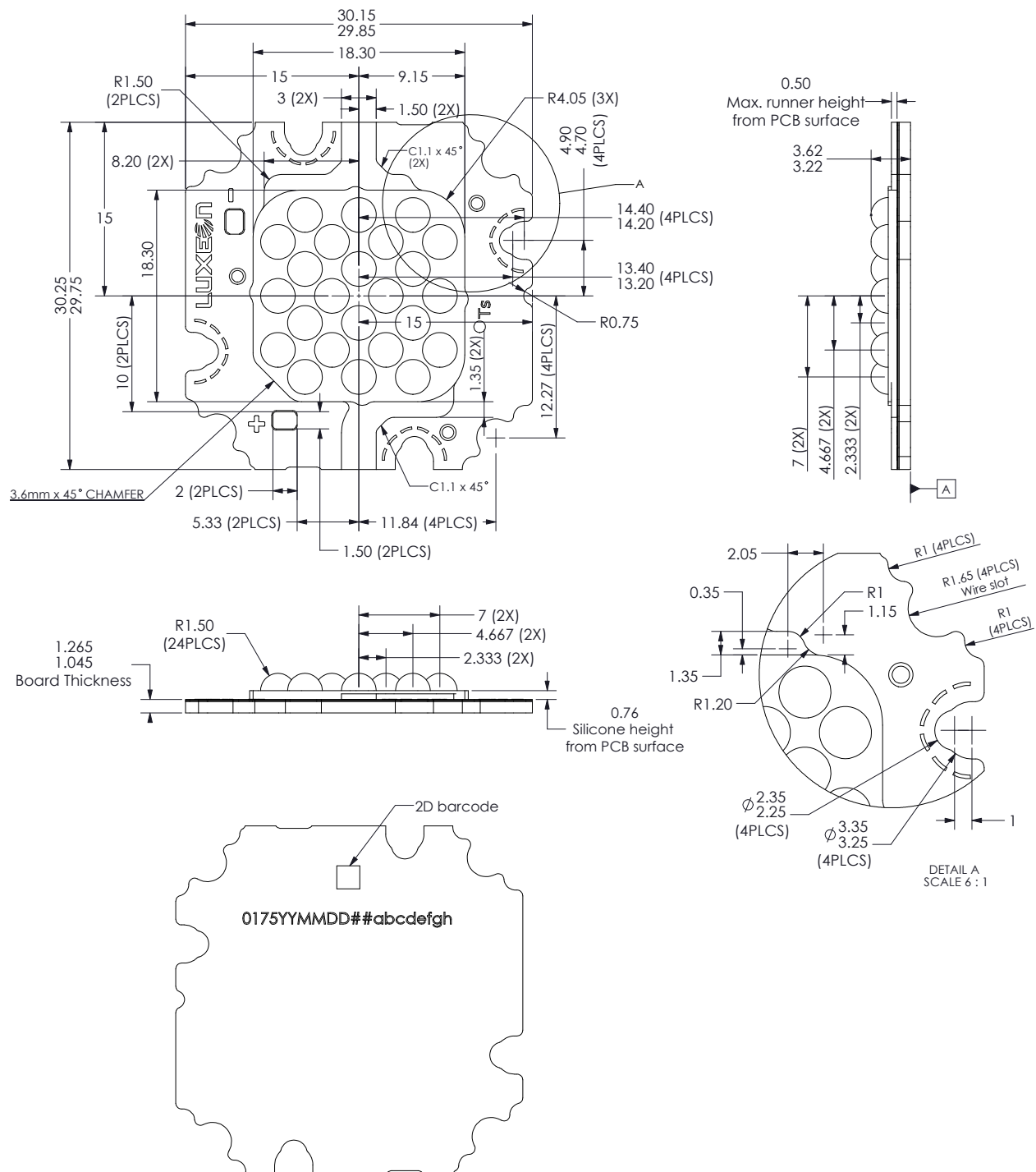


Figure 7. Dimensions for LXKx-Pxxx-xx24(A).

Notes for Figure 7:

I. All dimensions are in millimeters.

# Relative Spectral Distribution vs. Wavelength Characteristics

LXK8-PWxx-xxxx at Test Current, Junction Temperature = 85°C

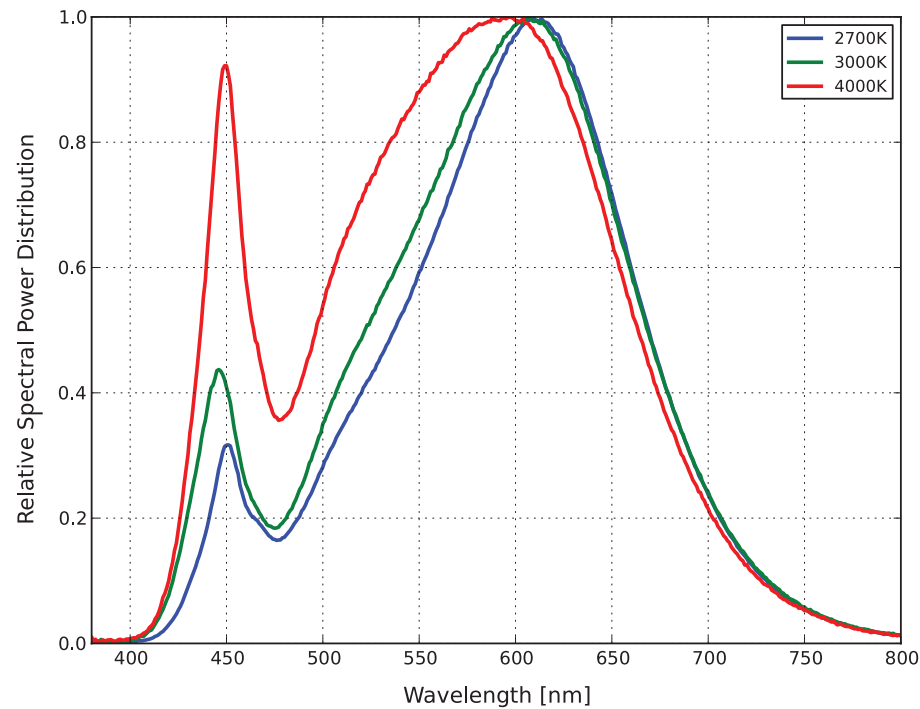


Figure 8. Color spectrum of LXK8-PWxx-xxxx product, integrated measurement.

LXK0-PR04-xxxx (Royal Blue) at Test Current, Junction Temperature = 85°C

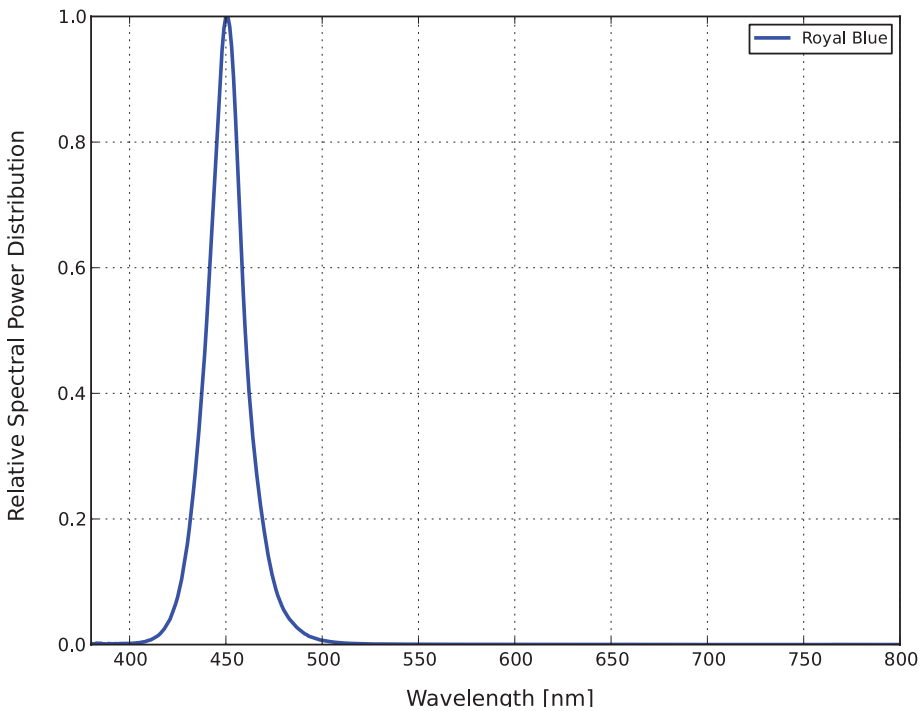


Figure 9. Color spectrum of LXK0-PR04-xxxx product, integrated measurement.



# Light Output Characteristics over Temperature

All LUXEON K Products at Test Current, Normalized at Test Current,  
Junction Temperature = 85°C

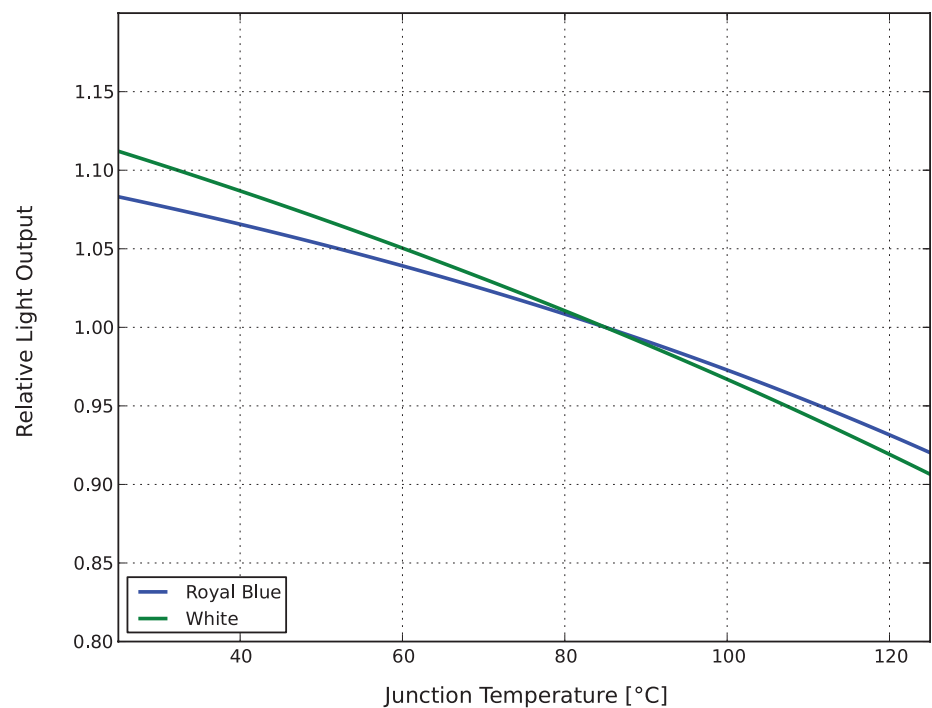


Figure 10. Typical relative flux vs. junction temperature at test current.

## Typical Forward Current Characteristics

Typical Forward Current vs. Forward Voltage LUXEON K 3-up Products,  
Junction Temperature = 85°C

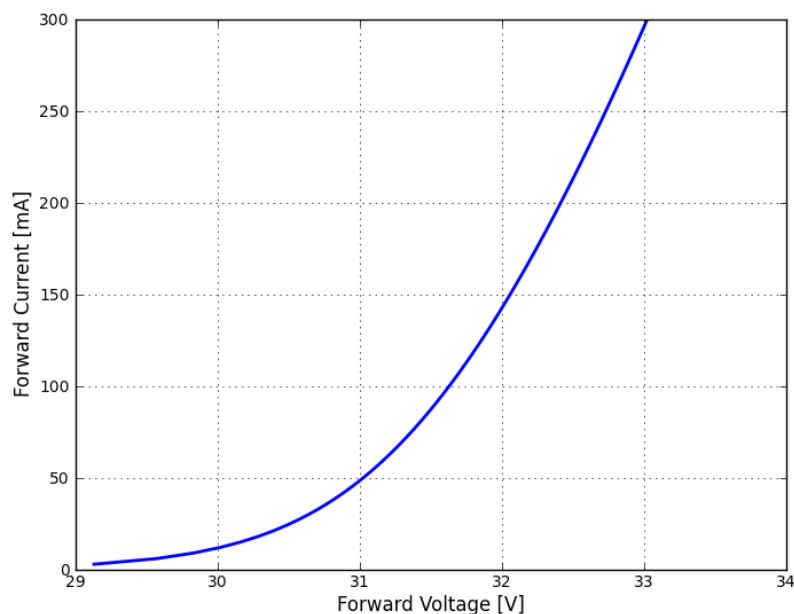


Figure 11. Forward current vs. forward voltage for LXXKx-Pxxx-x403 products.

Typical Forward Current vs. Forward Voltage LUXEON K 4-up Products,  
Junction Temperature = 85°C

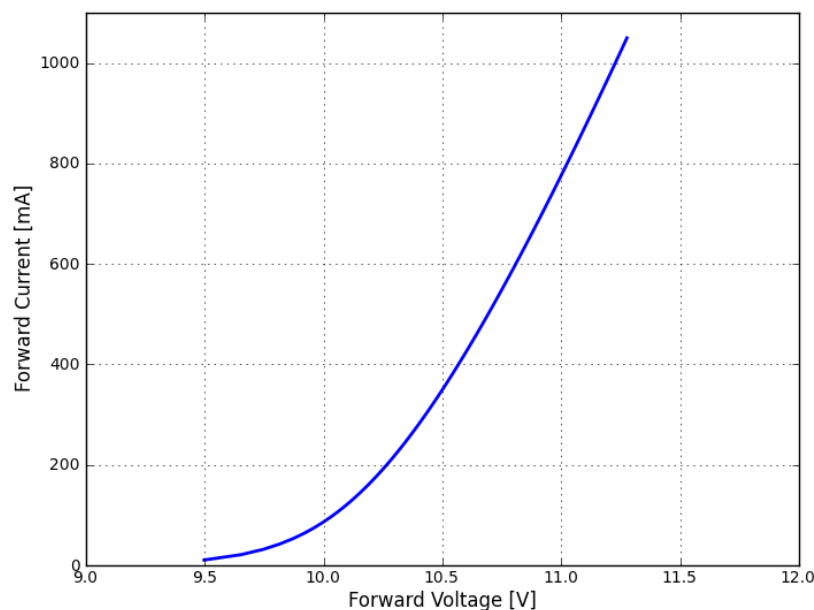


Figure 12. Forward current vs. forward voltage for LXXKx-Pxxx-0004(A) products.

Note for Figure 12:

1. LUXEON LXXKx-Pxxx-0004(A) is single junction product.

Typical Forward Current vs. Forward Voltage LUXEON K 4-up High-Voltage Products,  
Junction Temperature = 85°C

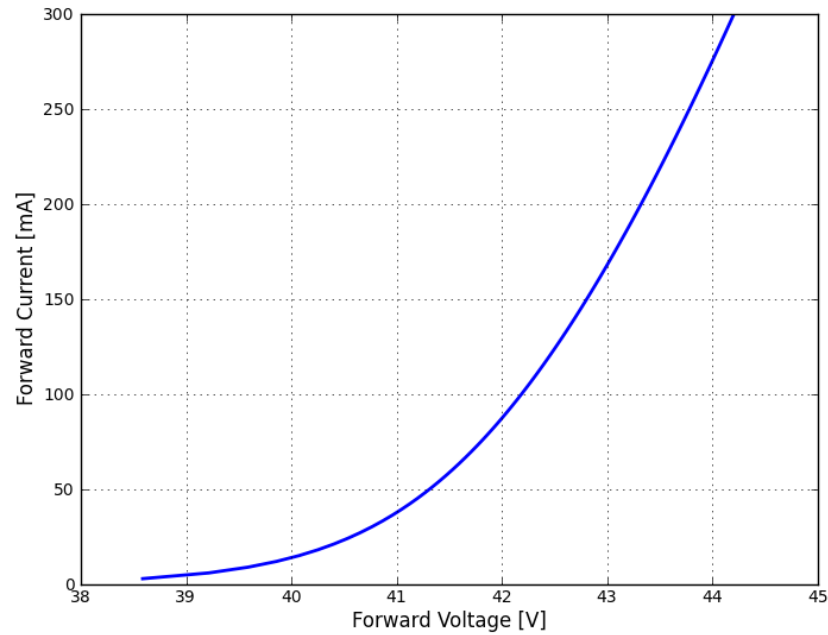


Figure 13. Forward current vs. forward voltage for LXXKx-Pxxx-x404 products.

Typical Forward Current vs. Forward Voltage LUXEON K 6-up High-Voltage Products,  
Junction Temperature = 85°C

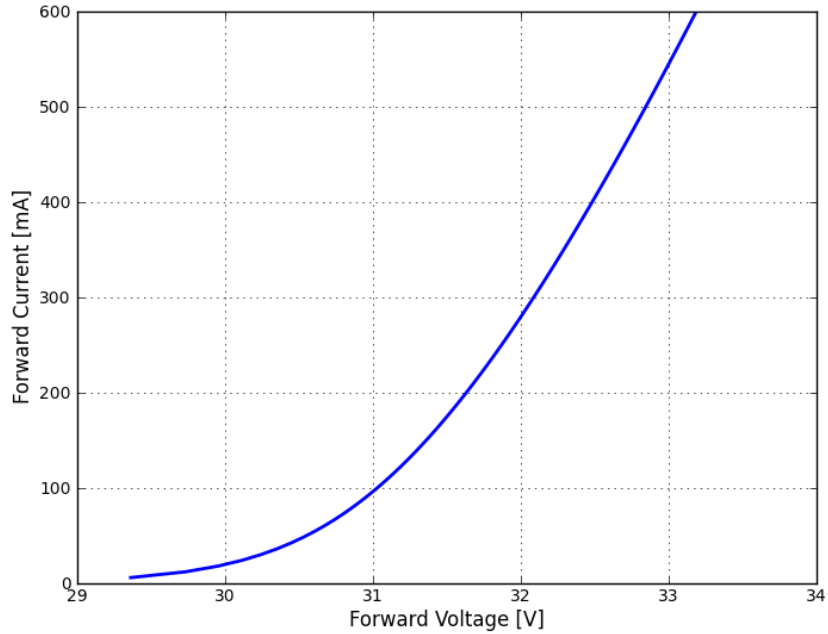


Figure 14. Forward current vs. forward voltage for LXXKx-Pxxx-x206 products.

Typical Forward Current vs. Forward Voltage LUXEON K 8-up Products,  
Junction Temperature = 85°C

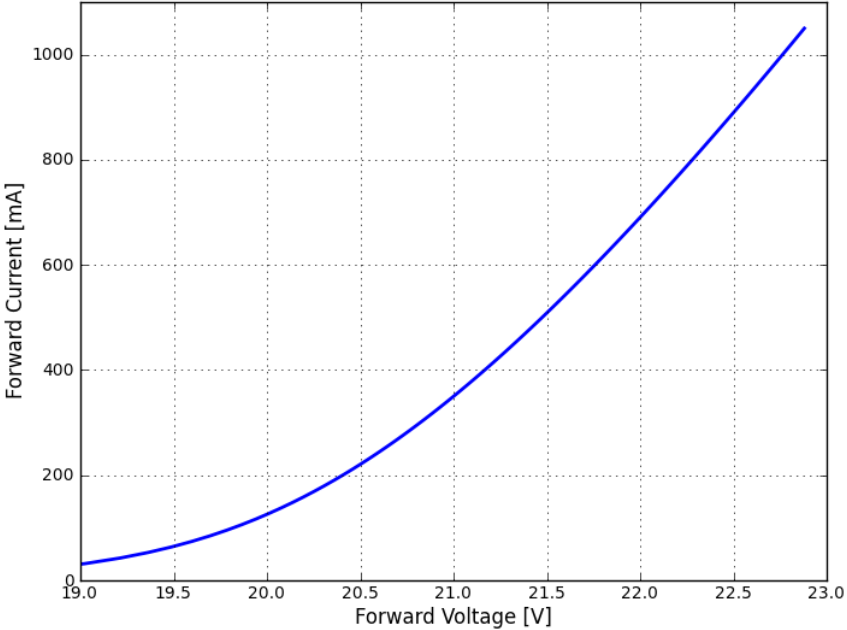


Figure 15. Forward current vs. forward voltage for LXXx-Pxxx-xxx8(A) products.

Typical Forward Current vs. Forward Voltage LUXEON K 12-up Products,  
Junction Temperature = 85°C

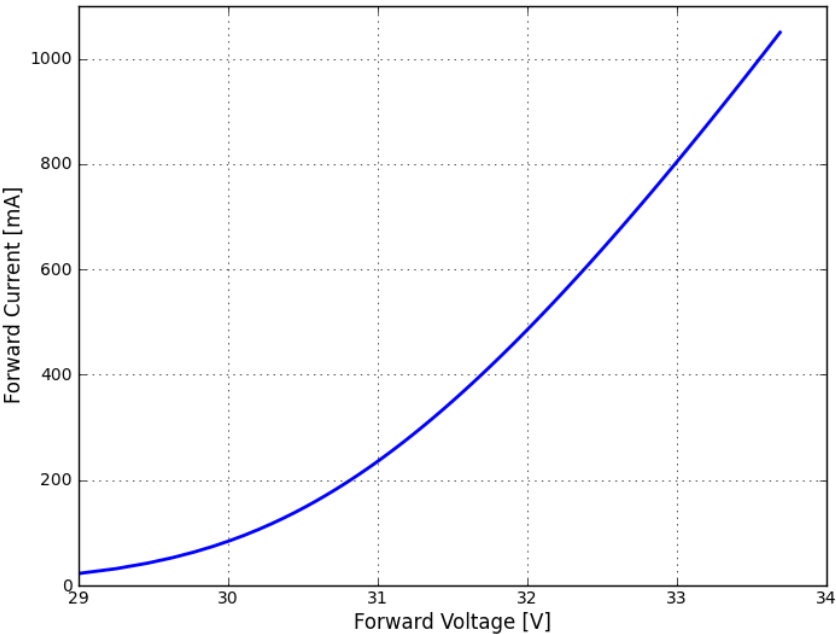


Figure 16. Forward current vs. forward voltage for LXXx-Pxxx-xx12(A) products.

Typical Forward Current vs. Forward Voltage LUXEON K 16-up Products,  
Junction Temperature = 85°C

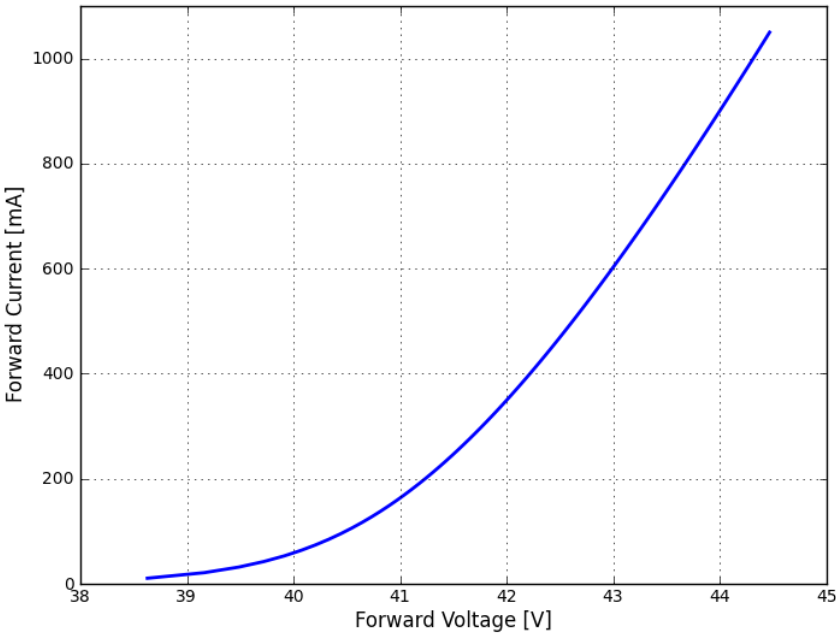


Figure 17. Forward current vs. forward voltage for LXXx-Pxxx-xx16(A) products.

Typical Forward Current vs. Forward Voltage LUXEON K 24-up Products,  
Junction Temperature = 85°C

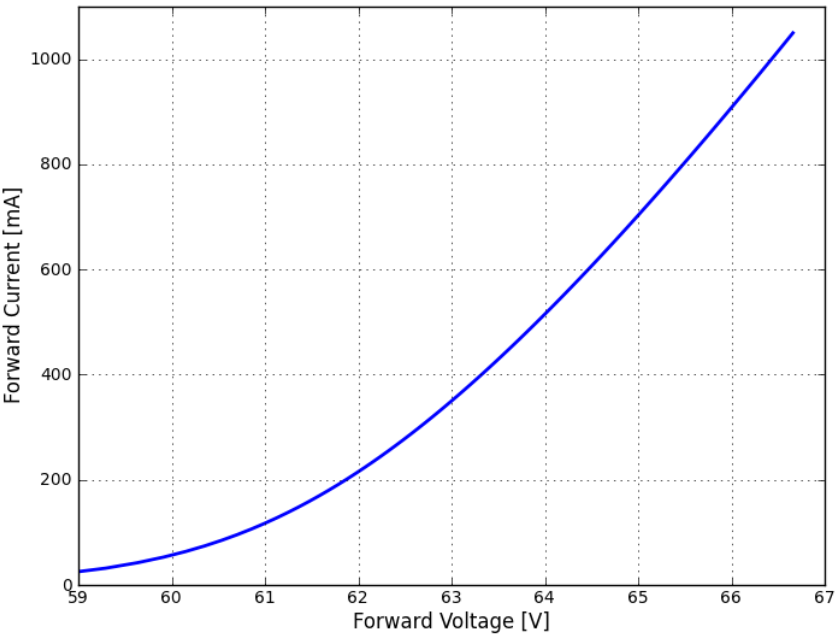


Figure 18. Forward current vs. forward voltage for LXXx-Pxxx-xx24(A) products.

Typical Relative Luminous Flus vs. Forward Current for ALL LUXEON K Product Configurations Without Multi-Junction Die, Junction Temperature 85°C

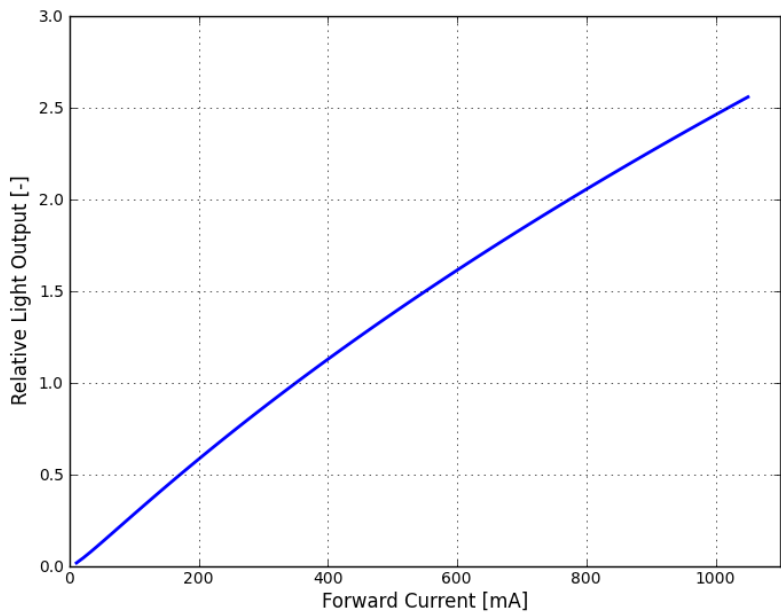


Figure 19. Typical relative luminous flux vs. forward current.

Typical Relative Luminous Flus vs. Forward Current for ALL LUXEON K Product Configurations With Multi-Junction Die, Junction Temperature 85°C

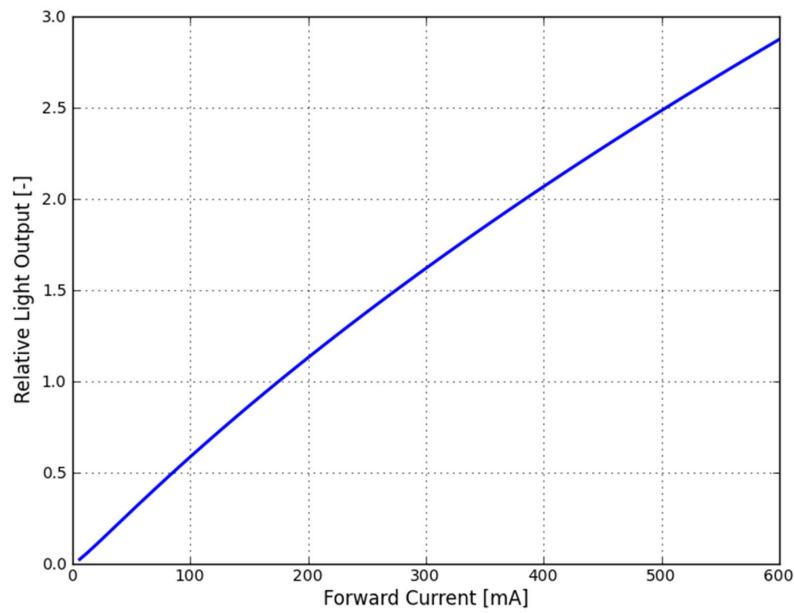
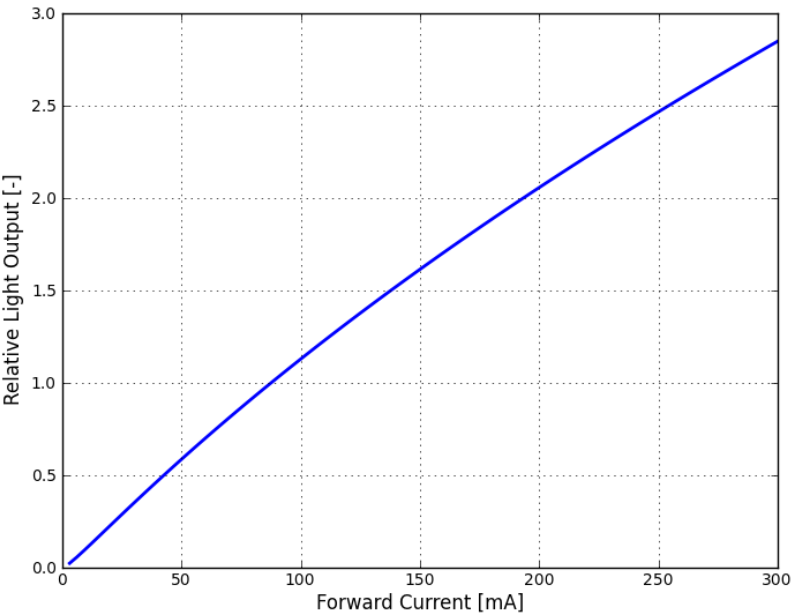


Figure 20. Typical relative luminous flux vs. forward current for LUXEON K (LXXx-PWxx-0206) with multi-junction die.

Typical Relative Luminous Flux vs. Forward Current for LUXEON K LXXx-PWxx-0403/  
LXXx-PWxx-0404 Product Configurations With Multi-Junction Die, Junction Temperature 85°C



**Figure 21. Typical relative luminous flux vs. forward current  
for LUXEON K (LXXx-PWxx-0403/LXXx-PWxx-0404) with multi-junction die.**

# Typical Radiation Patterns

## Typical Spatial Radiation Pattern for LUXEON K

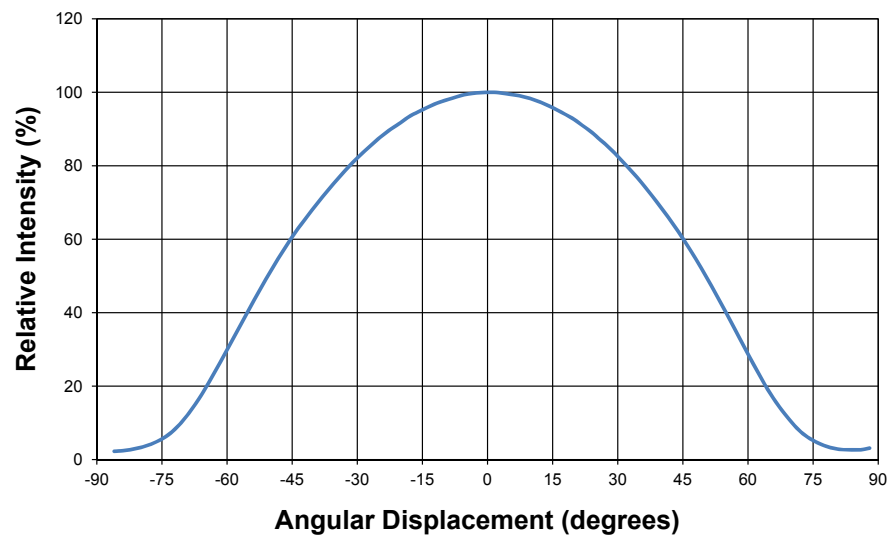


Figure 22. Typical representative spatial radiation pattern for LUXEON K.

## Packaging on Trays

LUXEON K products will be securely packaged in trays.

Table 8.

| Part Number                            | Tray Dimensions                              | Quantity per Tray | Number of Trays per Box |
|----------------------------------------|----------------------------------------------|-------------------|-------------------------|
| LXKx-Pxxx-xxx3<br>LXKx-Pxxx-xxx4(A)    | 315mm width x 135.9mm length x 12.11mm depth | 40                | 10                      |
| LXKx-Pxxx-xxx6<br>LXKx-Pxxx-xxx8(A)    | 315mm width x 135.9mm length x 12.11mm depth | 27                | 10                      |
| LXKx-Pxxx-xx12(A)<br>LXKx-Pxxx-xx16(A) | 315mm width x 135.9mm length x 12.11mm depth | 24                | 10                      |
| LXKx-Pxxx-xx24                         | 315mm width x 135.9mm length x 12.11mm depth | 21                | 10                      |



Tray Dimensions – LXXKx-Pxxx-xxx3 and LXXKx-Pxxx-xxx4(A)

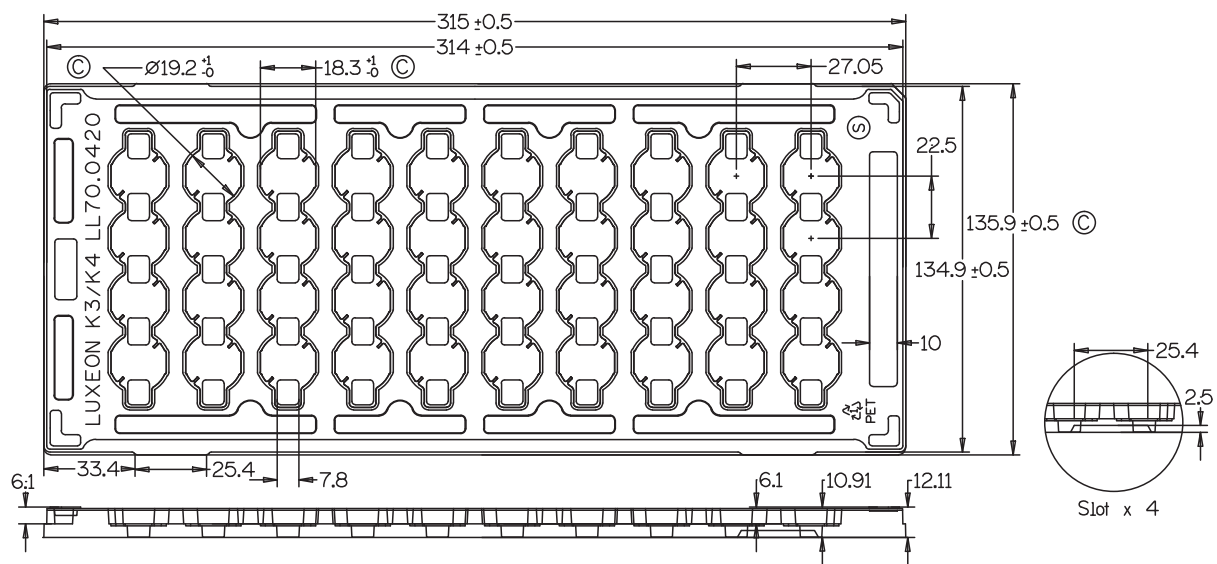


Figure 23.

Tray Dimensions – LXXKx-Pxxx-xxx6 and LXXKx-Pxxx-xxx8(A)

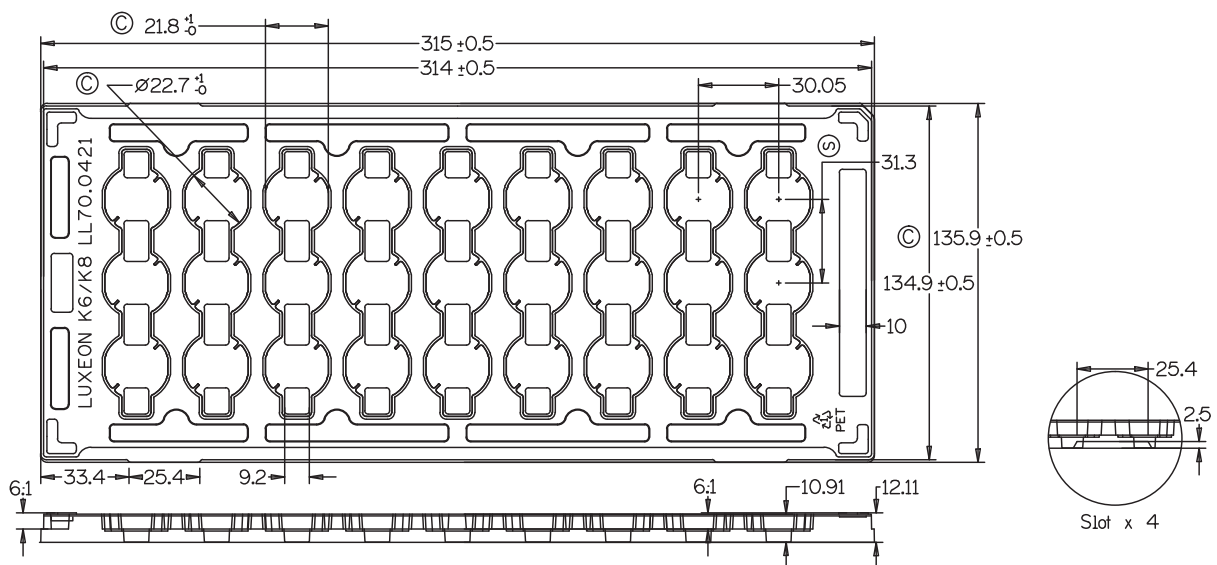
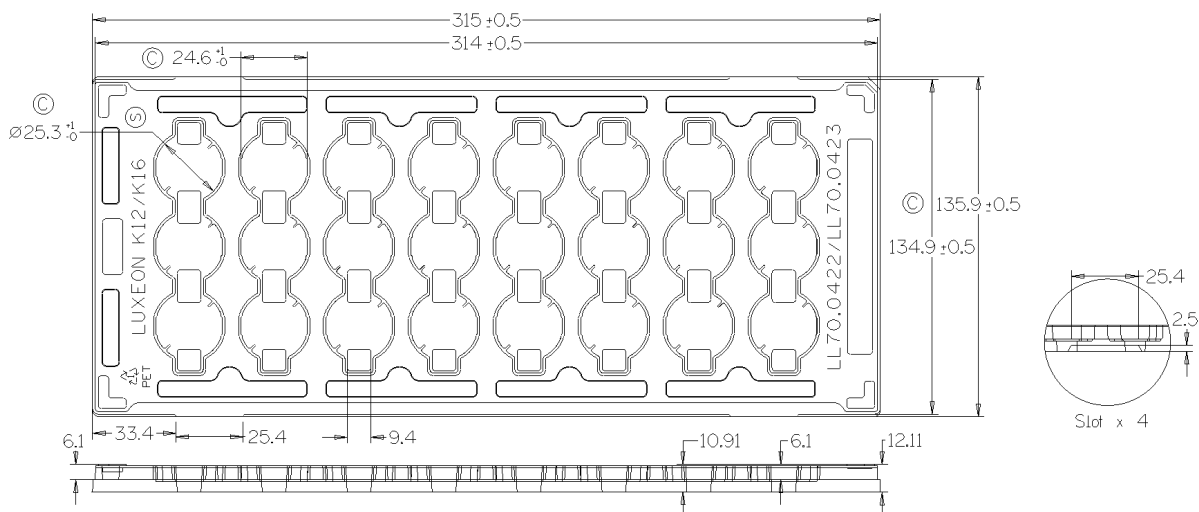


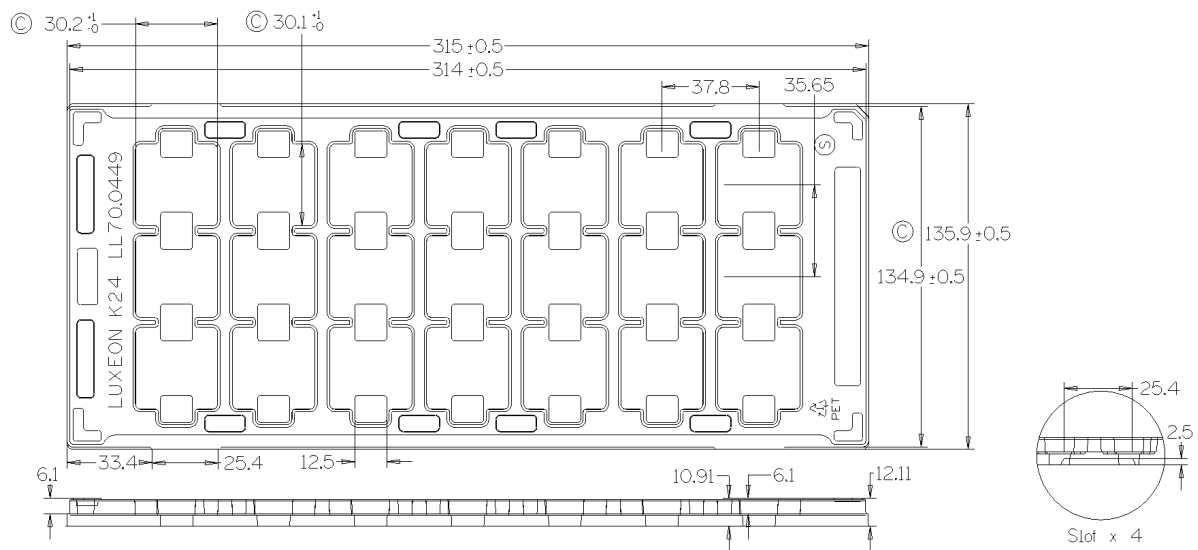
Figure 24.

### Tray Dimensions – LKx-Pxxx-xx|2(A) and LKx-Pxxx-xx|6(A)



**Figure 25.**

## Tray Dimensions – LXKx-Pxxx-xx24(A)



**Figure 26.**

# LUXEON K White ANSI Color Bin Definition

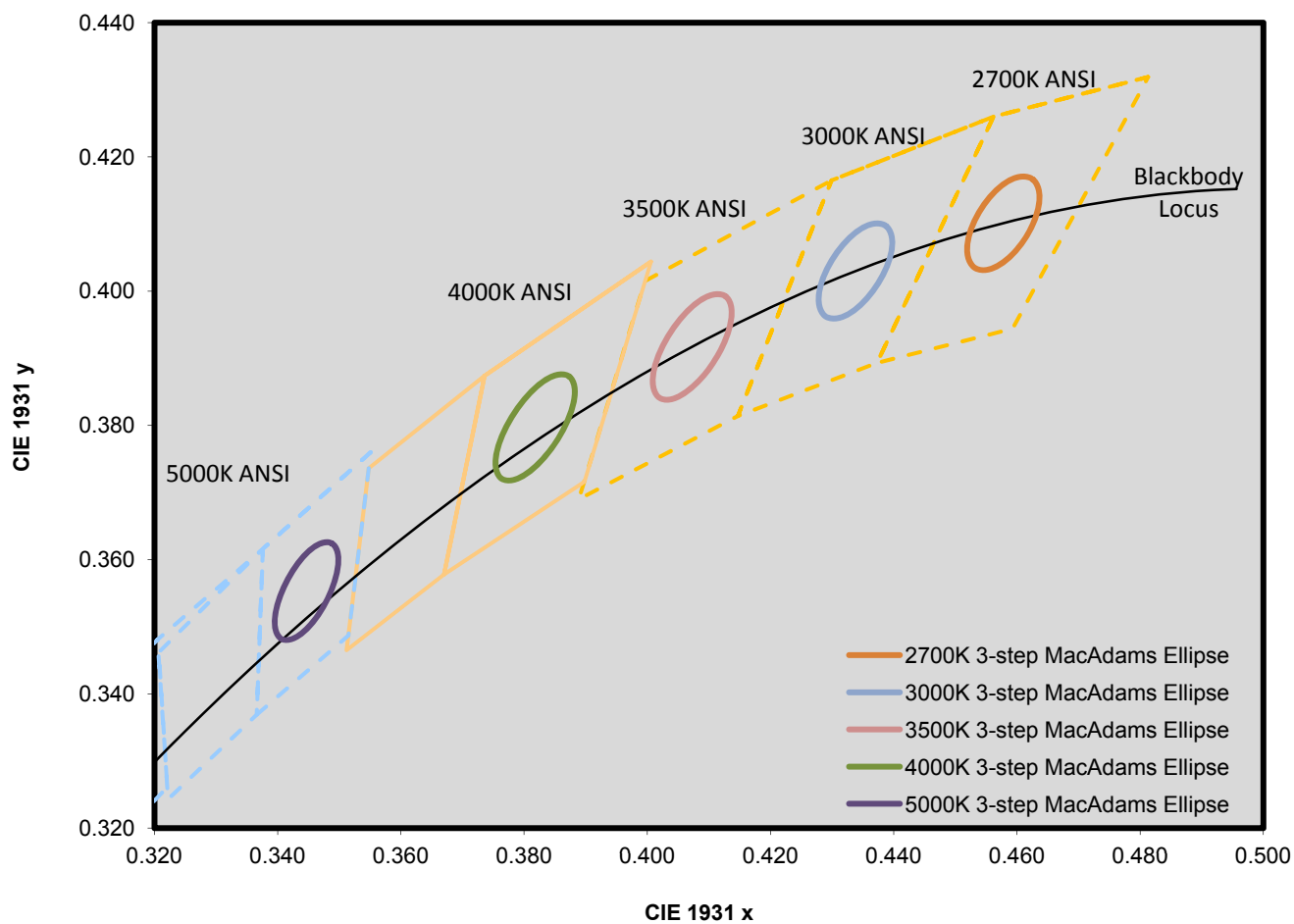


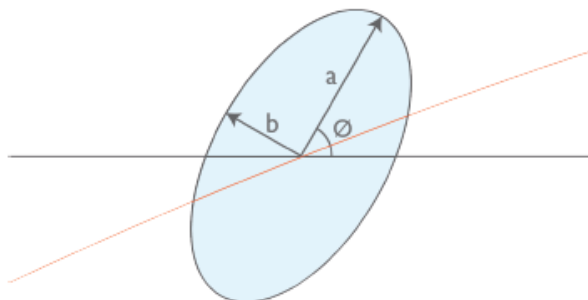
Figure 27. Graph of LUXEON K ANSI bin color definition.

Table 9. LUXEON K 3-step MacAdams Ellipse Color Definition

| Nominal ANSI CCT                     | 2700K                         | 3000K                         | 3500K                         | 4000K                         | 5000K                         |
|--------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
|                                      | Single 3-step MacAdam ellipse | Single 3-step MacAdam ellipse | Single 3-step MacAdam ellipse | Single 3-step MacAdam ellipse | Single 3-step MacAdam ellipse |
| Center Point (cx, cy) <sup>[1]</sup> | (0.4578, 0.4101 )             | (0.4338, 0.4030)              | (0.4073, 0.3917)              | (0.3818, 0.3797)              | (0.3447, 0.3553)              |
| Major Axis, a                        | 0.0081                        | 0.00834                       | 0.00927                       | 0.00939                       | 0.00822                       |
| Minor Axis, b                        | 0.0042                        | 0.00408                       | 0.00414                       | 0.00402                       | 0.00354                       |
| Ellipse rotation angle               | 53.7°                         | 53.22°                        | 54.00°                        | 53.72°                        | 59.62°                        |

Note for Table 9:

1. Philips Lumileds maintains a tester tolerance of  $\pm 0.005$  on x, y color coordinates.



## Company Information

Philips Lumileds is a leading provider of LEDs for everyday lighting applications. The company's records for light output, efficacy and thermal management are direct results of the ongoing commitment to advancing solid-state lighting technology and enabling lighting solutions that are more environmentally friendly, help reduce CO<sub>2</sub> emissions and reduce the need for power plant expansion. Philips Lumileds LUXEON® LEDs are enabling never before possible applications in outdoor lighting, shop lighting, home lighting, digital imaging, display and automotive lighting.

Philips Lumileds is a fully integrated supplier, producing core LED material in all three base colors, (Red, Green, Blue) and white. Philips Lumileds has R&D centers in San Jose, California and in the Netherlands, and production capabilities in San Jose, Singapore and Penang, Malaysia. Founded in 1999, Philips Lumileds is the high flux LED technology leader and is dedicated to bridging the gap between solid-state technology and the lighting world. More information about the company's LUXEON LED products and solid-state lighting technologies can be found at [www.philipslumileds.com](http://www.philipslumileds.com).

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