

# LUXEON 5630 Mid-Power LEDs

## Illumination Portfolio



## Introduction

LUXEON® 5630 delivers optimized performance in combination with quality of light needed for distributed light source applications. In addition to delivering specified correlated color temperature and color rendering combinations, these emitters deliver the efficacy and lumen output required by the indoor illumination markets. This document contains the performance data needed to design and engineer applications based on LUXEON 5630 emitters.

### Key Product Attributes:

- High efficacy for sustainable design
- Widely adopted 5630 package
- Minimum 80 CRI for quality indoor lighting
- ANSI compliant 1/6th color binning

### Key Applications

- Indoor Area Lighting
- Downlight
- Outdoor
- Architecture
- High bay & Low bay

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# General Information

## Product Nomenclature

LUXEON Mid-Power emitters are tested and binned at 100 mA, with current pulse duration of 20 ms. All characteristic charts where the thermal pad is kept at constant temperature (25°C typically) are measured with current pulse duration of 20 ms.

The part number designations for the MXL8 series is explained as follows:

M X L A - B C D E - I J K L

Where:

A — designates minimum CRI performance (value 7 = 70 minimum and 8 = 80 minimum)

B — designates radiation pattern (value P = Lambertian)

C — designates color (value W = White)

D & E — designates nominal ANSI CCT (for example, 30 = 3000K and 40 = 4000K)

I, J, K & L — designates additional part numbers

Therefore products in this series with minimum CRI value of 80, CCT of 4000K will have the part numbering scheme:

M X L 8 - P W 4 0

## 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.

## Environmental Compliance

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

# Product Selection

## Product Selection for Mid-Power LEDs

Thermal Pad Temperature = 25°C, Test Current = 100 mA

**Table 1.**

| Nominal CCT | Part Number    | Minimum CRI | Typical CRI | Typical R9 | Minimum Luminous Flux (lm) $\Phi_v$ | Typical Luminous Flux (lm) $\Phi_v$ |
|-------------|----------------|-------------|-------------|------------|-------------------------------------|-------------------------------------|
| 2700K       | MXL8-PW27-0000 | 80          | 82          | 20         | 28                                  | 32                                  |
| 3000K       | MXL8-PW30-0000 | 80          | 82          | 20         | 30                                  | 33                                  |
| 3500K       | MXL8-PW35-0000 | 80          | 82          | 20         | 30                                  | 34                                  |
| 4000K       | MXL8-PW40-0000 | 80          | 82          | 20         | 32                                  | 34                                  |
| 5000K       | MXL8-PW50-0000 | 80          | 82          | 20         | 32                                  | 35                                  |
| 5700K       | MXL8-PW57-0000 | 80          | 82          | 20         | 32                                  | 35                                  |
| 6500K       | MXL8-PW65-0000 | 80          | 82          | 20         | 32                                  | 36                                  |

**Note for Table 1:**

1. Philips Lumileds maintains a tolerance of  $\pm 7.5\%$  on luminous flux and  $\pm 2$  on CRI measurements.

## Optical Characteristics

### Optical Characteristics of Mid-Power LEDs

Thermal Pad Temperature = 25°C, Test Current = 100 mA

**Table 2.**

| Nominal CCT | Color Temperature CCT |         |         | Typ Total Included Angle <sup>[1]</sup><br>(degrees) $\theta_{0.90V}$ | Typ Viewing Angle <sup>[2]</sup><br>(degrees) $2\theta_{1/2}$ |
|-------------|-----------------------|---------|---------|-----------------------------------------------------------------------|---------------------------------------------------------------|
|             | Minimum               | Typical | Maximum |                                                                       |                                                               |
| 2700K       | 2550K                 | 2700K   | 2850K   | 160                                                                   | 120                                                           |
| 3000K       | 2850K                 | 3000K   | 3200K   | 160                                                                   | 120                                                           |
| 3500K       | 3200K                 | 3500K   | 3750K   | 160                                                                   | 120                                                           |
| 4000K       | 3750K                 | 4000K   | 4250K   | 160                                                                   | 120                                                           |
| 5000K       | 4700K                 | 5000K   | 5300K   | 160                                                                   | 120                                                           |
| 5700K       | 5300K                 | 5700K   | 6000K   | 160                                                                   | 120                                                           |
| 6500K       | 6000K                 | 6500K   | 7000K   | 160                                                                   | 120                                                           |

**Notes for Table 2:**

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.

# Electrical Characteristics

## Electrical Characteristics of Mid-Power LEDs

Thermal Pad Temperature = 25°C, Test Current = 100 mA

**Table 3.**

| Part Number                                                                                                                | Forward Voltage $V_f$ <sup>[1]</sup> (V) |         |         | Typ. Temperature Coefficient of Forward Voltage <sup>[2]</sup> (mV/°C)<br>$\Delta V_f / \Delta T_j$ | Typical Thermal Resistance Junction to Thermal Pad (°C/W)<br>$R\theta_{j-c}$ |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------|---------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                                                                                                            | Minimum                                  | Typical | Maximum |                                                                                                     |                                                                              |
| MXL8-PW27-0000<br>MXL8-PW30-0000<br>MXL8-PW35-0000<br>MXL8-PW40-0000<br>MXL8-PW50-0000<br>MXL8-PW57-0000<br>MXL8-PW65-0000 | 2.90                                     | 3.10    | 3.40    | -2.0 to -4.0                                                                                        | 24                                                                           |

**Notes for Table 3:**

- Philips Lumileds maintains a tolerance of  $\pm 0.10V$  on forward voltage measurements.
- Measured at  $T_j$  between 25°C and 110°C.

## Absolute Maximum Ratings

**Table 4.**

| Parameter                                | Maximum Performance                             |
|------------------------------------------|-------------------------------------------------|
| DC Forward Current (mA)                  | 150                                             |
| Peak Pulsed Forward Current (mA)         | 150                                             |
| ESD Sensitivity                          | Class 3A Human Body Model Class C Machine Model |
| LED Junction Temperature <sup>[1]</sup>  | 115°C                                           |
| Operating Case Temperature at 100 mA     | -40°C - 80°C                                    |
| Storage Temperature                      | -40°C - 100°C                                   |
| Soldering Temperature                    | JEDEC 020b 260°C                                |
| Allowable Reflow Cycles                  | 3                                               |
| Reverse Voltage ( $V_r$ ) <sup>[2]</sup> | -5V                                             |

**Notes for Table 4:**

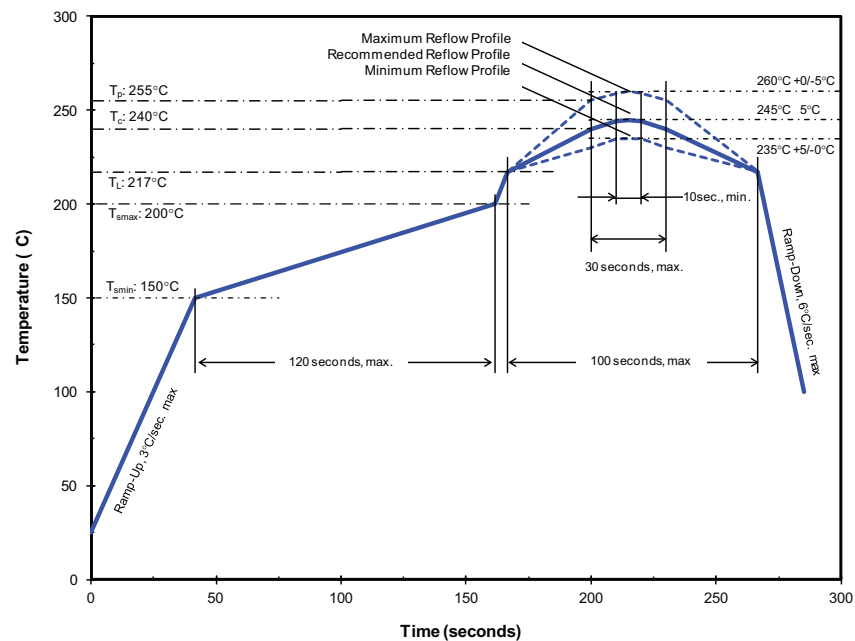
- Proper current derating must be observed to maintain junction temperature below the maximum.
- LUXEON Mid-Power LEDs are not designed to be driven in reverse bias.

## JEDEC Moisture Sensitivity

**Table 5.**

| Level | Floor Life |                                     | Soak Requirements Standard |                                     |
|-------|------------|-------------------------------------|----------------------------|-------------------------------------|
|       | Time       | Conditions                          | Time                       | Conditions                          |
| 3     | 168h       | $\leq 30^\circ\text{C}$ /<br>60% RH | 192h<br>+ 5 / - 0          | $\leq 30^\circ\text{C}$ /<br>60% RH |

# Reflow Soldering Characteristics



Temperature Profile for Table 6.

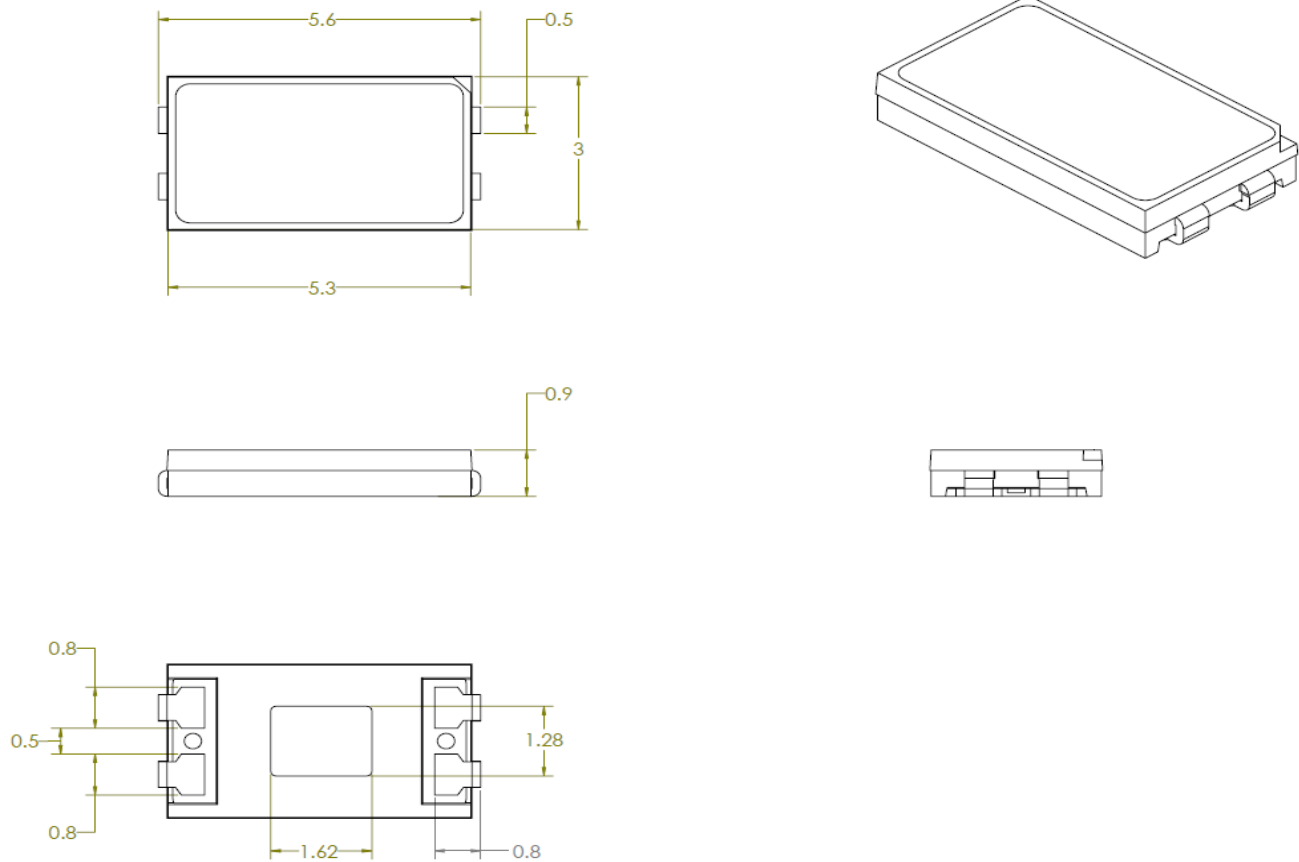
Table 6. Reflow Profile in Accordance with J-Std-020b.

| Profile Feature                                                  | Lead Free Assembly |
|------------------------------------------------------------------|--------------------|
| Preheat/Soak :                                                   |                    |
| Temperature Min ( $T_{\text{min}}$ )                             | 150°C              |
| Temperature Max ( $T_{\text{max}}$ )                             | 200°C              |
| Maximum Time ( $t_s$ ) from $T_{\text{min}}$ to $T_{\text{max}}$ | 120 seconds        |
| Ramp-up Rate ( $T_L$ to $T_p$ )                                  | 3°C / second       |
| Liquidous Temperature ( $T_L$ )                                  | 217°C              |
| Maximum Time ( $t_L$ ) Maintained above $T_L$                    | 100 seconds        |
| Maximum Peak Package Body Temperature ( $T_p$ )                  | 260°C              |
| Time ( $t_p$ ) within 5°C of the specified temperature ( $T_c$ ) | 30 seconds         |
| Maximum Ramp-Down Rate ( $T_p$ to $T_L$ )                        | 6°C / second       |
| Maximum Time 25°C to Peak Temperature                            | 8 minutes          |

**Note for Table 6:**

I. All temperatures refer to the application Printed Circuit Board (PCB), measured on the surface adjacent to the package body.

## Mechanical Dimensions



**Figure 1. Package outline drawing.**

### Notes for Figure 1:

1. All dimensions are in millimeters.
2. Drawings not to scale.

# Pad Configuration

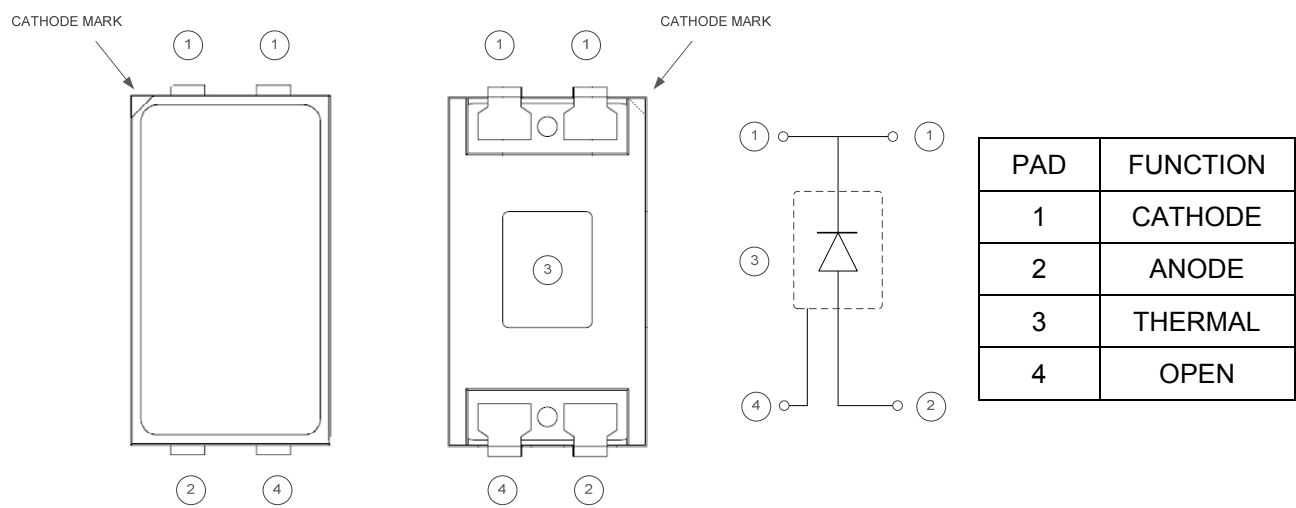


Figure 2. Pad configuration.

Note for Figure 2:

- 1. The Thermal Pad is electrically isolated from the anode and cathode contact pads.

# Solder Pad Design

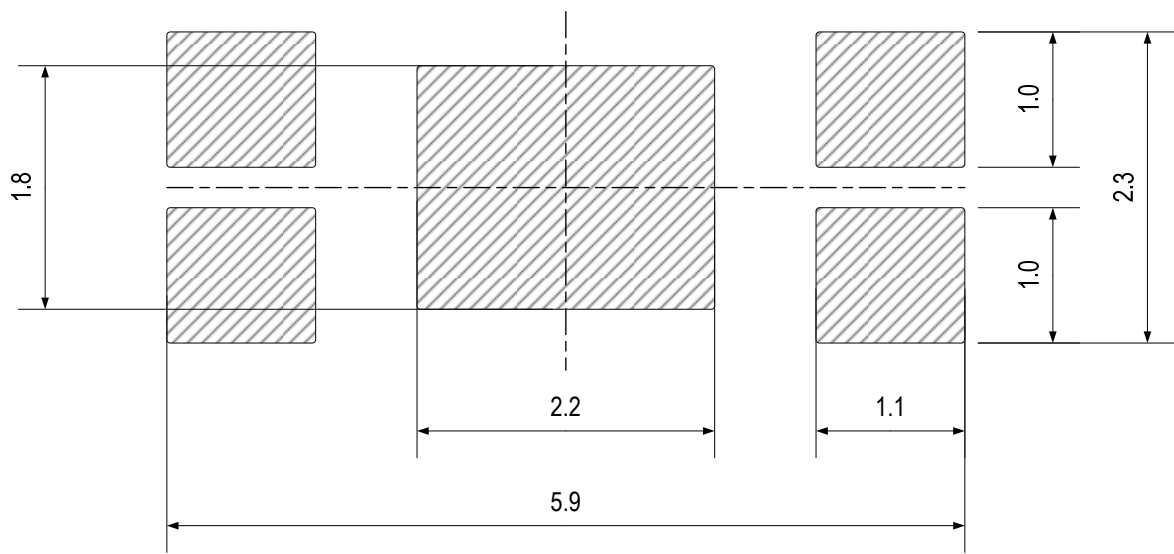


Figure 3. Solder pad layout.

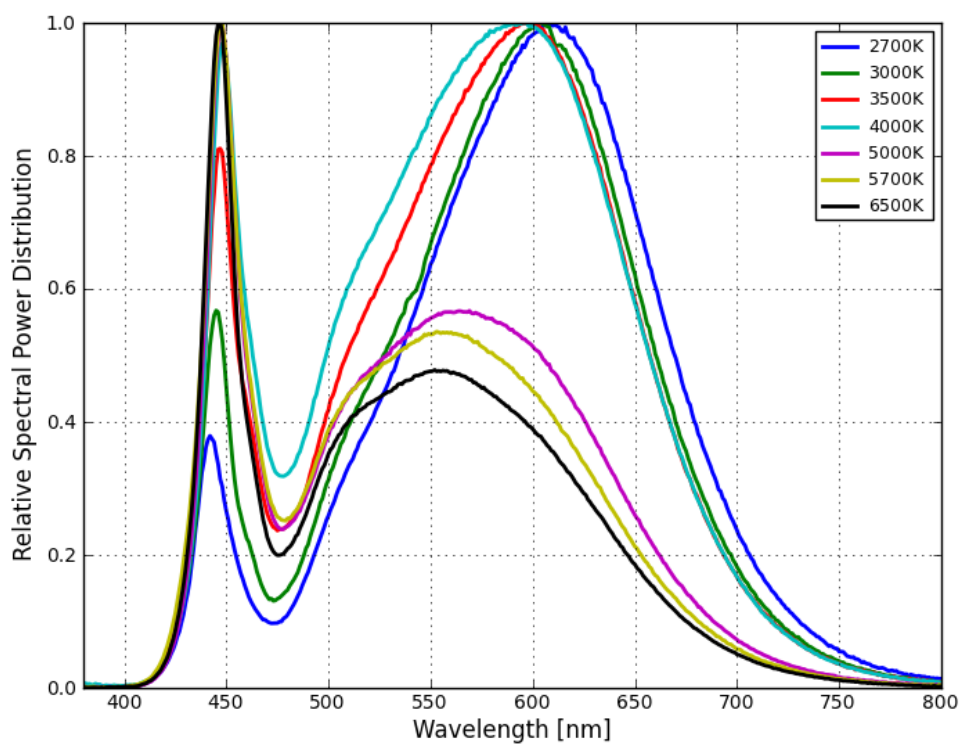
Notes for Figure 3:

- 1. The drawing above shows the recommended solder pad layout on Printed Circuit Board (PCB).
- 2. Application Brief AB201 provides extensive details for this layout.



# Relative Spectral Distribution

## Relative Intensity vs. Wavelength for MXL8-PWXX-0000



**Figure 4. Typical color spectrum of MXL8-PWXX-0000 emitter, integrated measurement at thermal pad temperature = 25°C, current = 100 mA.**

# Light Output Characteristics

## Relative Flux over Temperature for MXL8-PWXX-0000

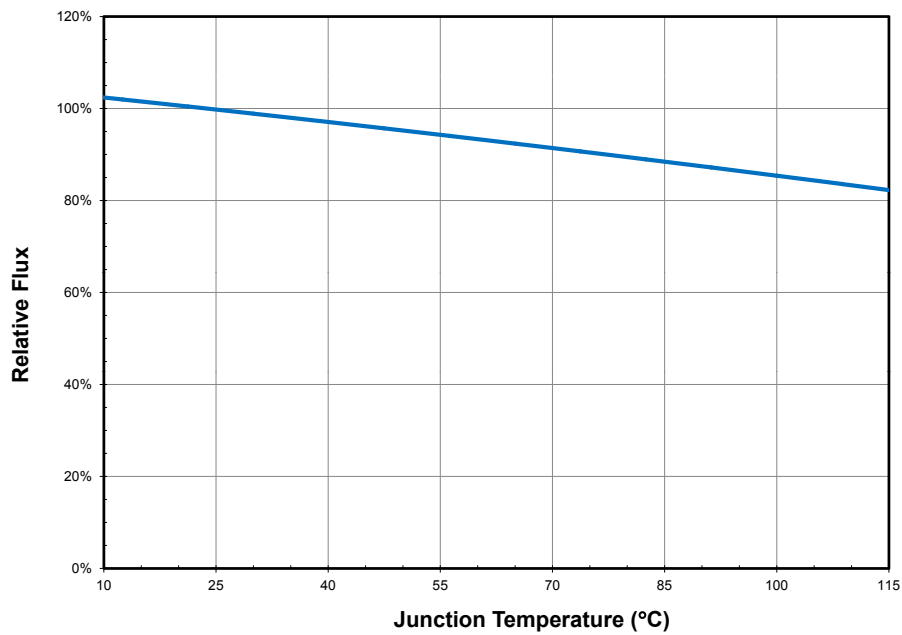


Figure 5. Typical relative light output vs. thermal pad temperature, forward current = 100 mA.

## Relative Flux vs. Forward Current for MXL8-PWXX-0000

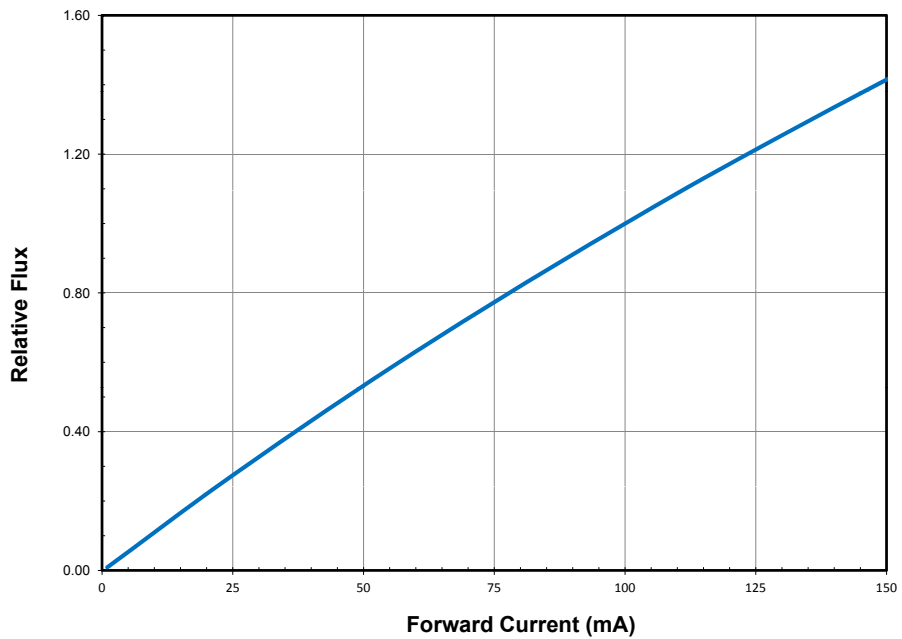


Figure 6. Typical relative luminous flux vs. forward current, thermal pad temperature = 25°C.

# Luminous Efficacy Characteristics

## Relative Luminous Efficacy vs. Forward Current for MXL8-PWXX-0000

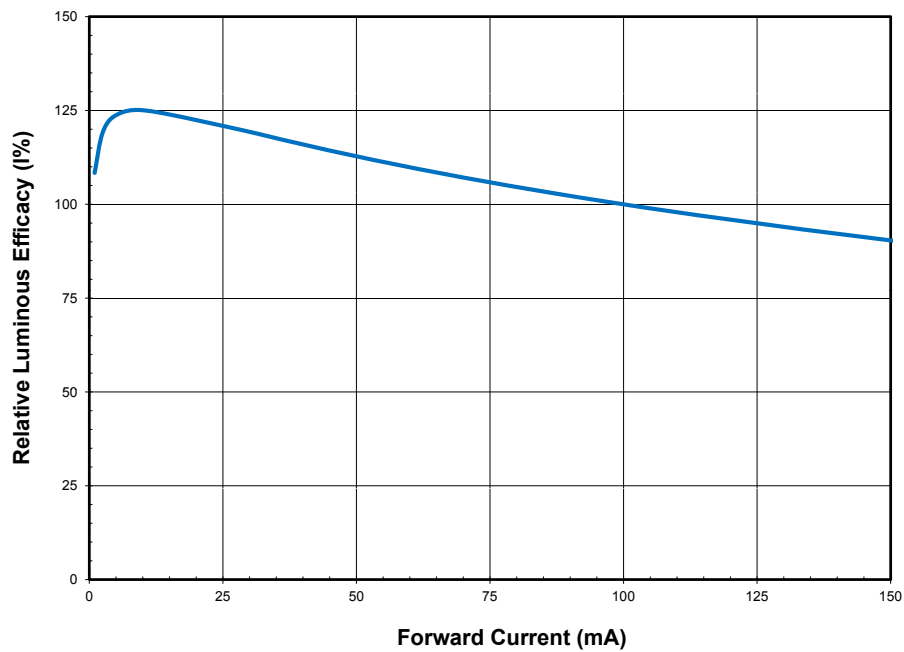


Figure 7. Typical emitter efficacy versus forward current, thermal pad temperature = 25°C.

# Forward Current Characteristics

## Forward Current vs. Forward Voltage for MXL8-PWXX-0000

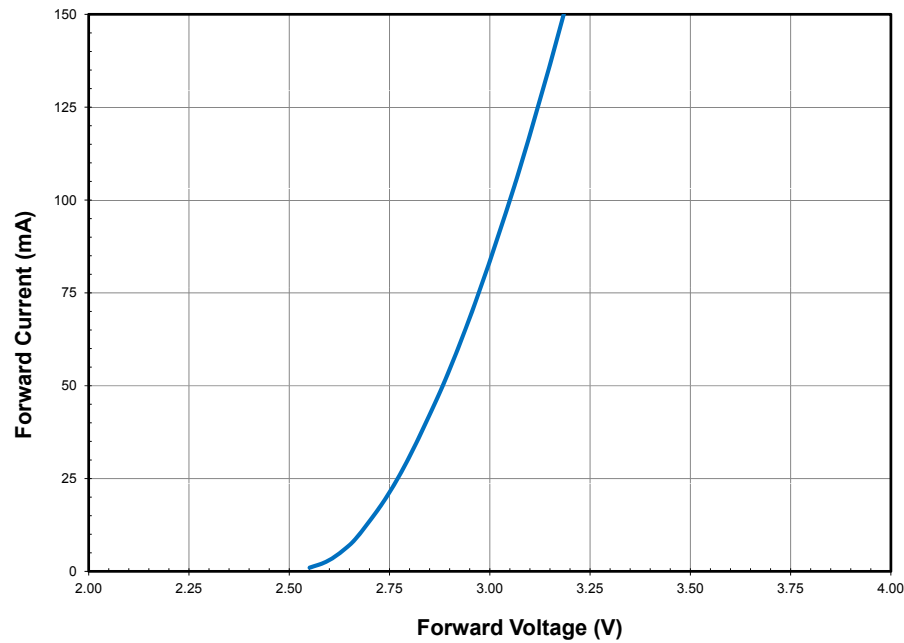


Figure 8. Typical forward current vs. forward voltage, thermal pad temperature = 25°C.

# Current Derating Curves

Maximum DC Current vs. Ambient Temperature at Different  $R_{th\ j-air}$  for MXL8-PWXX-0000

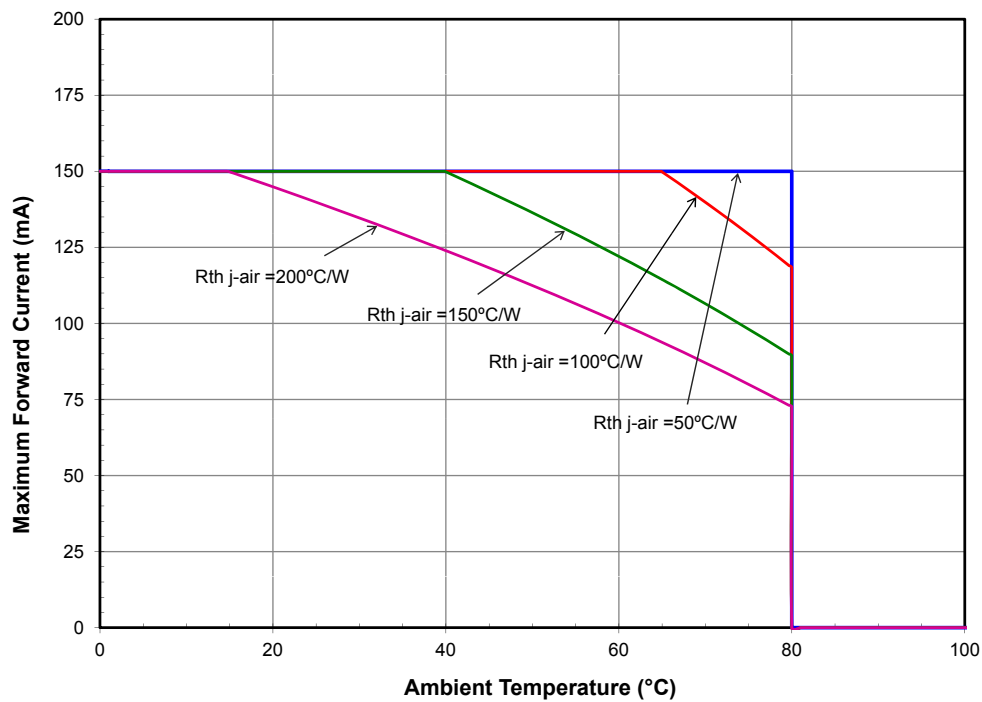


Figure 9. Maximum forward current vs. ambient temperature, based on  $T_{JMAX} = 115^{\circ}C$ , forward voltage = 3.5V.

# Typical Radiation Patterns

## Radiation Pattern in Cartesian Coordinate System

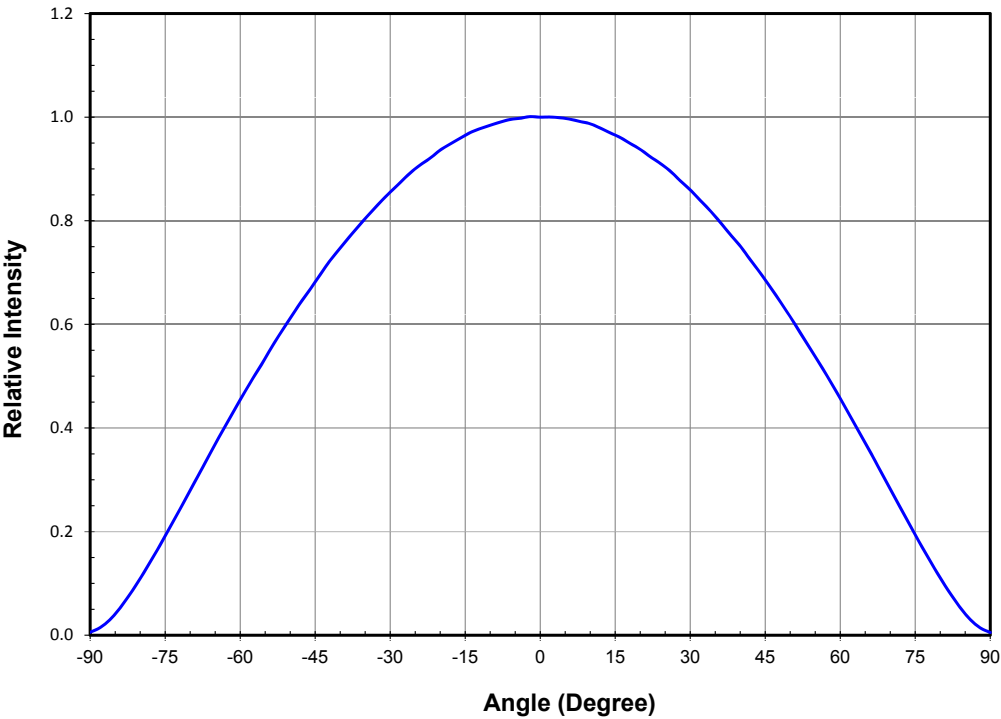


Figure 10. Typical representative spatial radiation pattern.

## Radiation Pattern in Polar Coordinate System

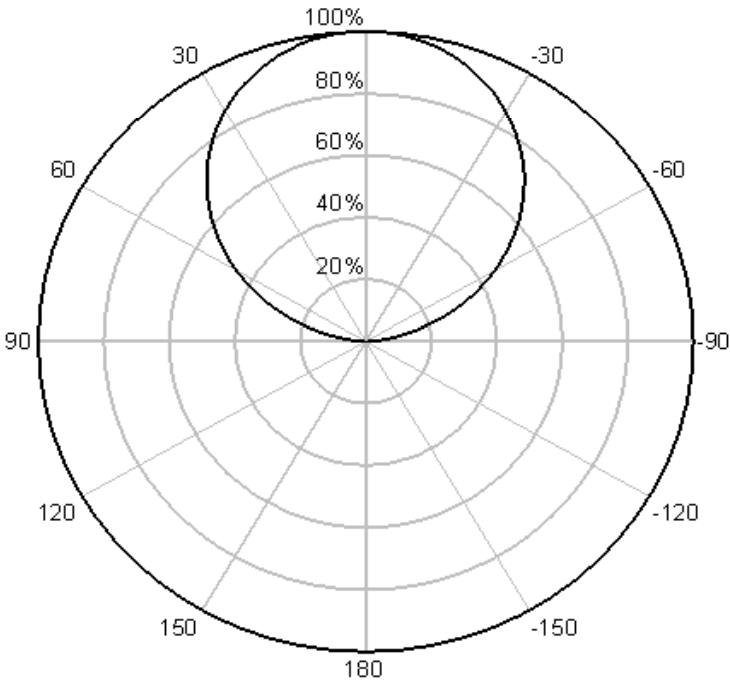


Figure 11. Typical polar plot of radiation pattern.

Color Shift vs. Viewing Angle

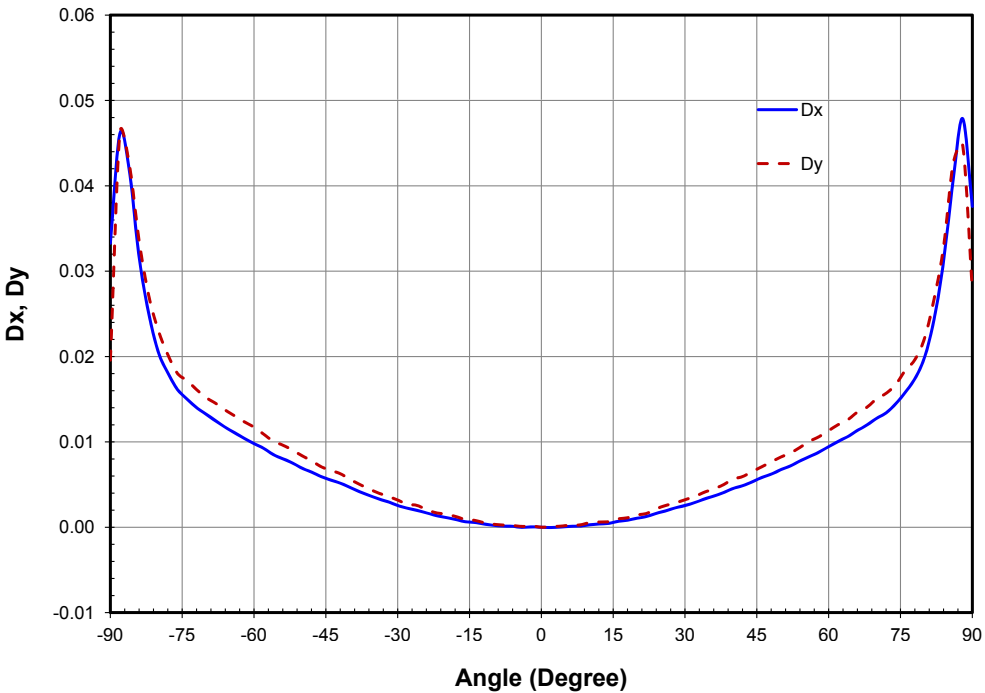
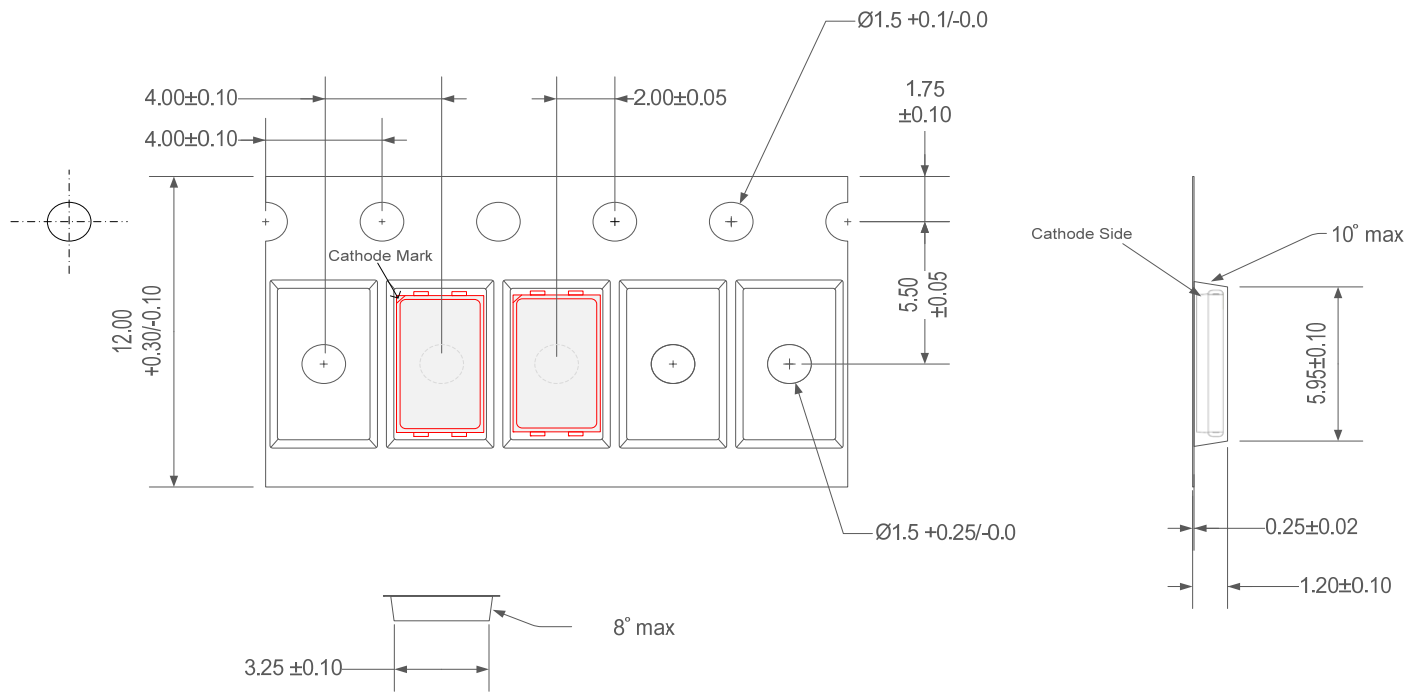


Figure 12. Typical plot of color shift vs. viewing angle.

# Emitter Pocket Tape Packaging

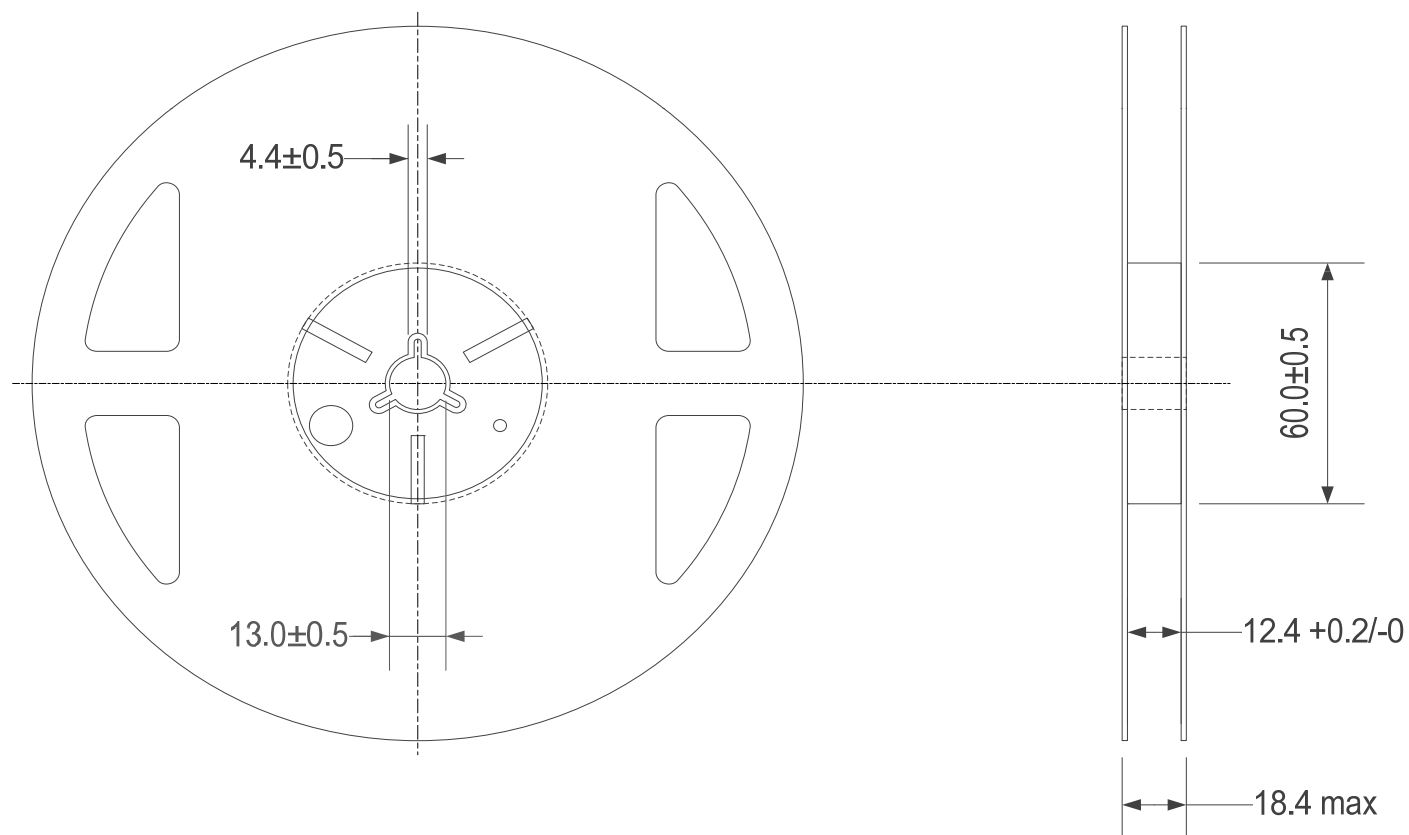


**Figure 13. Emitter pocket tape packaging.**

## Notes for Figure 13:

1. All dimensions are in millimeters
2. Empty component pockets sealed with top cover tape
3. The maximum number of consecutive missing LEDs is two.

## Emitter Reel Packaging



**Figure 14. Emitter reel packaging.**

### Notes for Figure 14:

1. All dimensions are in millimeters.
2. Empty component pockets sealed with top cover tape.
3. 7 inch reel-1500 pieces per reel.
4. Minimum packing quantity is 500 pieces.
5. The maximum number of consecutive missing LEDs is two.
6. In accordance with EIA-481-I-B specification.



# Product Binning and Labeling

## Purpose of Product Binning

In the manufacturing of semiconductor products, there is a variation of performance around the average values given in the technical data sheets. For this reason, Philips Lumileds bins the LED components for luminous flux, color and forward voltage ( $V_f$ ).

## Decoding Product Bin Labeling

LUXEON Mid-Power emitters are labeled using a four digit alphanumeric code (CAT code) depicting the bin values for emitters packaged on a single reel. All emitters packaged within a reel are of the same 3-variable bin combination. Using these codes, it is possible to determine optimum mixing and matching of products for consistency in a given application.

Reels of 3000K, 3500K, 4000K, 5000K, 6500K emitters are labeled with a four digit alphanumeric CAT code following the format below.

A B C D

A = Flux bin (L etc.)

B & C = Color bin (For example 51, 52, 53, 54, 55, 56)

D =  $V_f$  bin

## Luminous Flux Bins

Table 7 lists the standard photometric luminous flux bins for LUXEON Mid-Power emitters (tested and binned at 100 mA). Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are available in all colors.

**Table 7. Flux Bins**

| Bin Code | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) |
|----------|-------------------------------|-------------------------------|
| K        | 28                            | 32                            |
| L        | 32                            | 36                            |
| M        | 36                            | 40                            |

Tested and binned at 25°C,  $I_f$  = 100 mA. Tester tolerance  $\pm$  7.5%.

# Forward Voltage Bins

Table 8.  $V_f$  Bins

| Bin Code | Minimum Forward Voltage (V) | Maximum Forward Voltage (V) |
|----------|-----------------------------|-----------------------------|
| V        | 2.9                         | 3.0                         |
| W        | 3.0                         | 3.1                         |
| X        | 3.1                         | 3.2                         |
| Y        | 3.2                         | 3.3                         |
| Z        | 3.3                         | 3.4                         |

Notes for Table 8:

- 1. Tested and binned at 25°C,  $I_f = 100\text{ mA}$ .
- 2. Tester tolerance  $\pm, - 0.1\text{v}$ .

# Color Bin Structure

## MXL8-PW27-0000 Color Bin Structure

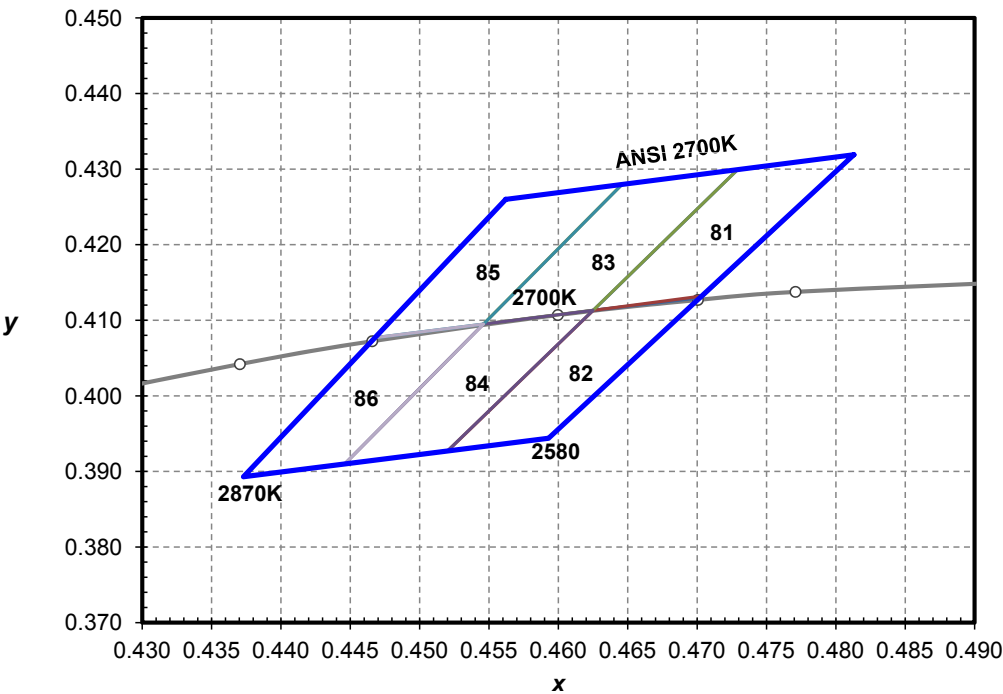


Figure 15. ANSI 2700K 1/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 9. LUXEON Mid-Power ANSI 1/6 Color Bin Coordinates for MXL8-PW27-0000 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 81       | 0.4625 | 0.4113 | 84       | 0.4446 | 0.3910 |
|          | 0.4729 | 0.4299 |          | 0.4546 | 0.4095 |
|          | 0.4813 | 0.4319 |          | 0.4625 | 0.4113 |
|          | 0.4703 | 0.4130 |          | 0.4520 | 0.3927 |
| 82       | 0.4520 | 0.3927 | 85       | 0.4468 | 0.4077 |
|          | 0.4625 | 0.4113 |          | 0.4562 | 0.4260 |
|          | 0.4703 | 0.4132 |          | 0.4646 | 0.4280 |
|          | 0.4593 | 0.3944 |          | 0.4546 | 0.4095 |
| 83       | 0.4546 | 0.4095 | 86       | 0.4373 | 0.3893 |
|          | 0.4646 | 0.4280 |          | 0.4468 | 0.4077 |
|          | 0.4729 | 0.4299 |          | 0.4546 | 0.4095 |
|          | 0.4625 | 0.4113 |          | 0.4446 | 0.3910 |

Note for Table 9:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.

MXL8-PW30-0000 Color Bin Structure

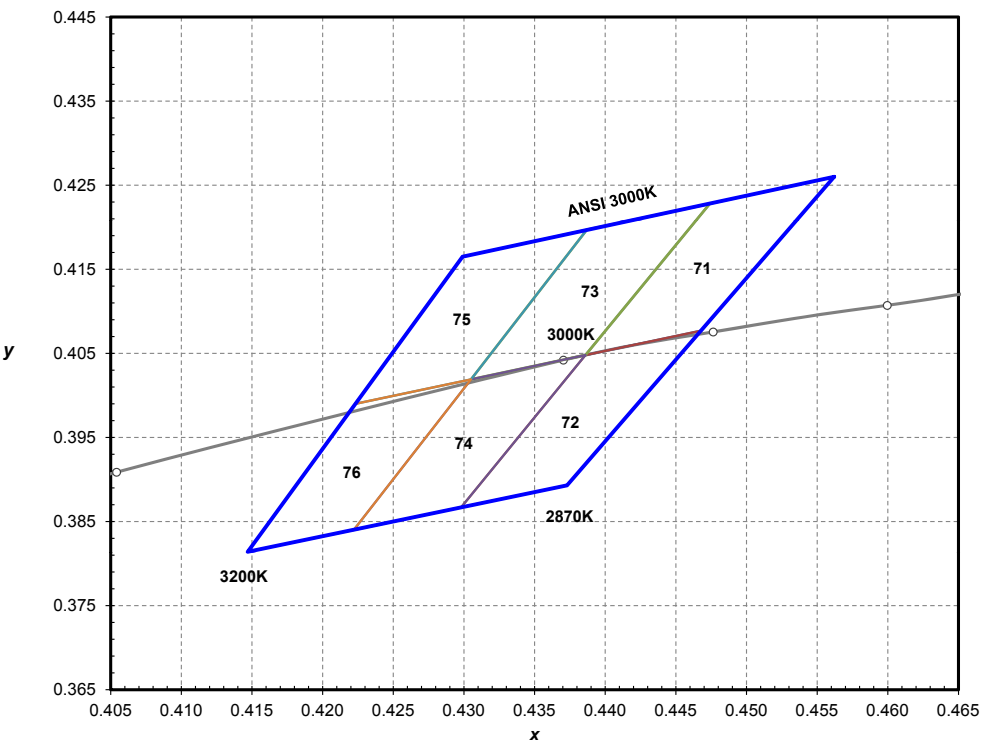


Figure 16. ANSI 3000K I/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 10. LUXEON Mid-Power ANSI I/6 Color Bin Coordinates for MXL8-PW30-0000 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 71       | 0.4386 | 0.4048 | 74       | 0.4222 | 0.3840 |
|          | 0.4474 | 0.4228 |          | 0.4305 | 0.4019 |
|          | 0.4562 | 0.4260 |          | 0.4386 | 0.4048 |
|          | 0.4468 | 0.4077 |          | 0.4298 | 0.3867 |
| 72       | 0.4298 | 0.3867 | 75       | 0.4223 | 0.3990 |
|          | 0.4386 | 0.4048 |          | 0.4299 | 0.4165 |
|          | 0.4468 | 0.4077 |          | 0.4387 | 0.4197 |
|          | 0.4373 | 0.3893 |          | 0.4305 | 0.4019 |
| 73       | 0.4305 | 0.4019 | 76       | 0.4147 | 0.3814 |
|          | 0.4387 | 0.4197 |          | 0.4223 | 0.3990 |
|          | 0.4474 | 0.4228 |          | 0.4305 | 0.4019 |
|          | 0.4386 | 0.4048 |          | 0.4222 | 0.3840 |

Note for Table 10:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.

MXL8-PW35 Color Bin Structure

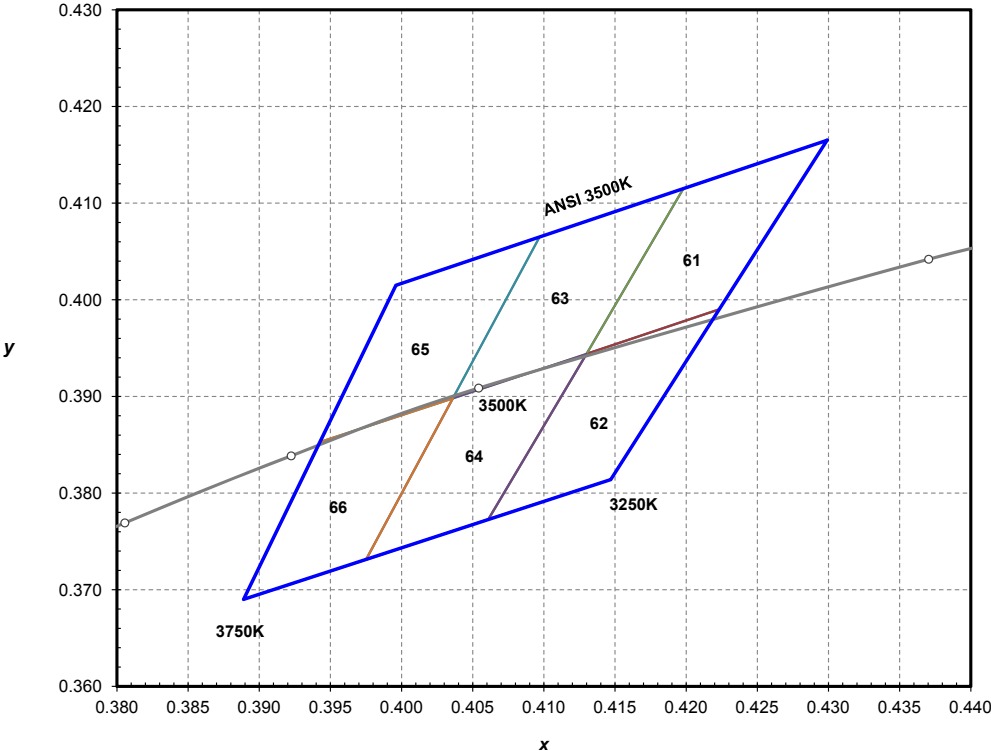


Figure 17. ANSI 3500K I/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 11. LUXEON Mid-Power ANSI I/6 Color Bin Coordinates for MXL8-PW35 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 61       | 0.4130 | 0.3944 | 64       | 0.3975 | 0.3731 |
|          | 0.4198 | 0.4115 |          | 0.4036 | 0.3898 |
|          | 0.4299 | 0.4165 |          | 0.4130 | 0.3944 |
|          | 0.4223 | 0.3990 |          | 0.4061 | 0.3773 |
| 62       | 0.4061 | 0.3773 | 65       | 0.3943 | 0.3853 |
|          | 0.4130 | 0.3944 |          | 0.3996 | 0.4015 |
|          | 0.4223 | 0.3990 |          | 0.4097 | 0.4065 |
|          | 0.4147 | 0.3814 |          | 0.4036 | 0.3898 |
| 63       | 0.4036 | 0.3898 | 66       | 0.3889 | 0.3690 |
|          | 0.4097 | 0.4065 |          | 0.3943 | 0.3853 |
|          | 0.4198 | 0.4115 |          | 0.4036 | 0.3898 |
|          | 0.4130 | 0.3944 |          | 0.3975 | 0.3731 |

Note for Table 11:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.

MXL8-PW40 Color Bin Structure

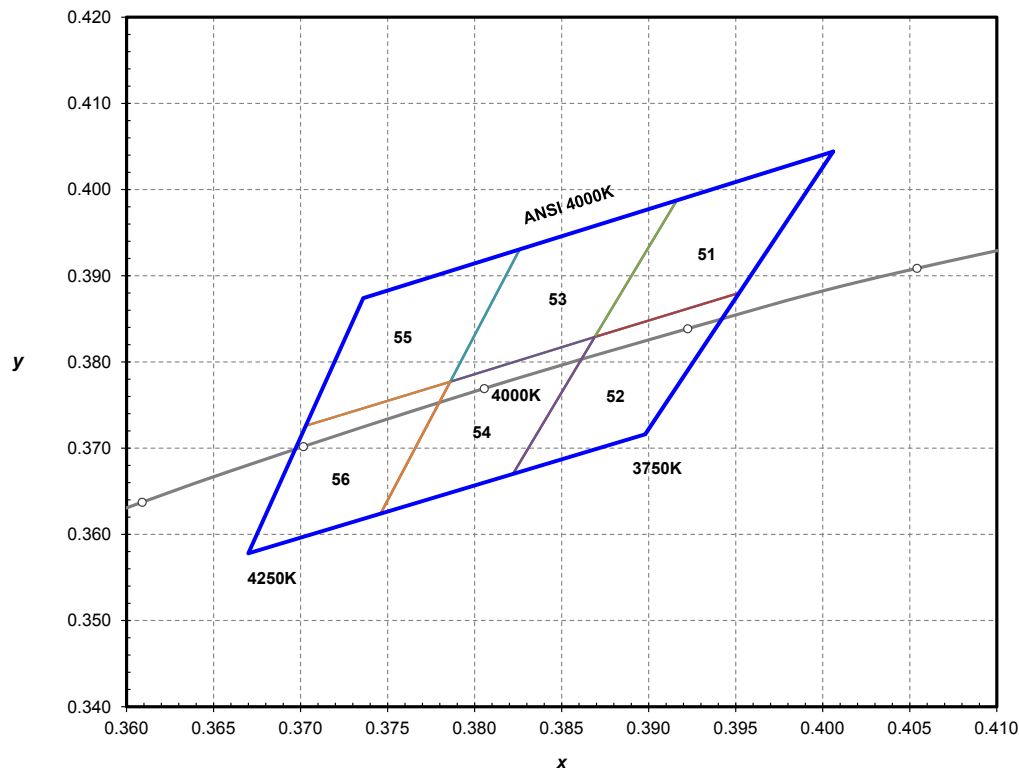


Figure 18. ANSI 4000K 1/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 12. LUXEON Mid-Power ANSI 1/6 Color Bin Coordinates for MXL8-PW40 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 51       | 0.3869 | 0.3829 | 54       | 0.3746 | 0.3624 |
|          | 0.3916 | 0.3987 |          | 0.3786 | 0.3777 |
|          | 0.4006 | 0.4044 |          | 0.3869 | 0.3829 |
|          | 0.3952 | 0.3880 |          | 0.3822 | 0.3670 |
| 52       | 0.3822 | 0.3670 | 55       | 0.3703 | 0.3726 |
|          | 0.3869 | 0.3829 |          | 0.3736 | 0.3874 |
|          | 0.3952 | 0.3880 |          | 0.3826 | 0.3931 |
|          | 0.3898 | 0.3716 |          | 0.3786 | 0.3777 |
| 53       | 0.3786 | 0.3777 | 56       | 0.3670 | 0.3578 |
|          | 0.3826 | 0.3931 |          | 0.3703 | 0.3726 |
|          | 0.3916 | 0.3987 |          | 0.3786 | 0.3777 |
|          | 0.3869 | 0.3829 |          | 0.3746 | 0.3624 |

Note for Table 12:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.

MXL8-PW50 Color Bin Structure

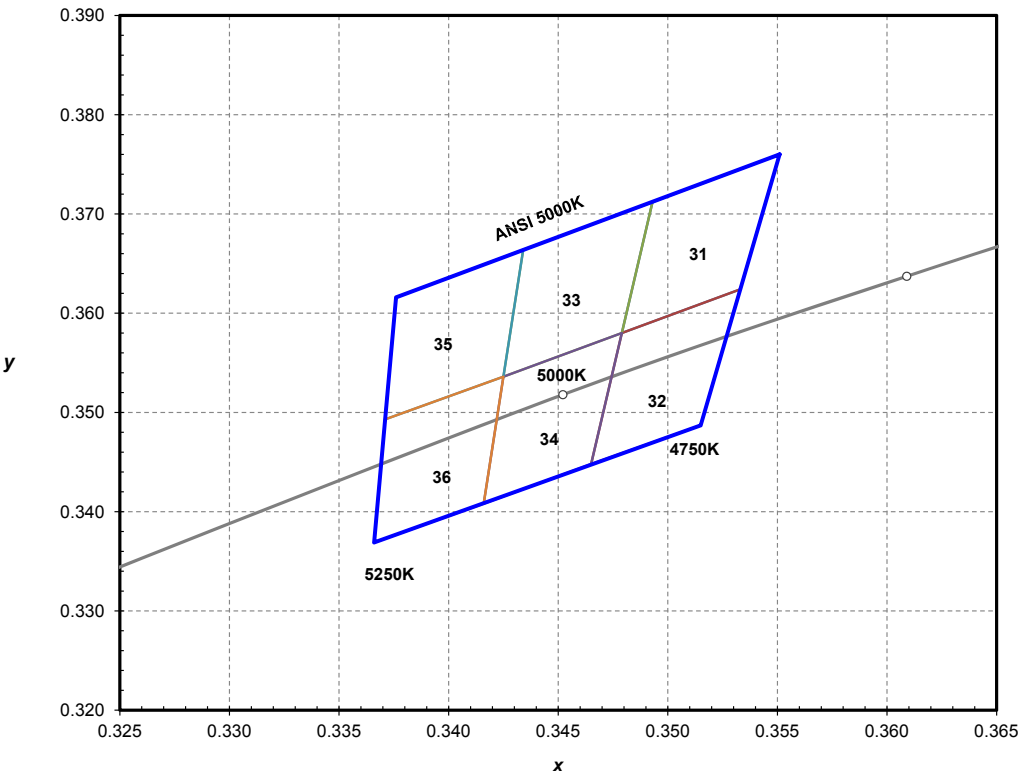


Figure 19. ANSI 5000K 1/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 13. LUXEON Mid-Power ANSI 1/6 Color Bin Coordinates for MXL8-PW50 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 31       | 0.3479 | 0.3580 | 34       | 0.3416 | 0.3408 |
|          | 0.3493 | 0.3712 |          | 0.3425 | 0.3536 |
|          | 0.3551 | 0.3760 |          | 0.3479 | 0.3580 |
|          | 0.3533 | 0.3624 |          | 0.3465 | 0.3448 |
| 32       | 0.3465 | 0.3448 | 35       | 0.3371 | 0.3493 |
|          | 0.3479 | 0.3580 |          | 0.3376 | 0.3616 |
|          | 0.3533 | 0.3624 |          | 0.3434 | 0.3664 |
|          | 0.3515 | 0.3487 |          | 0.3425 | 0.3536 |
| 33       | 0.3425 | 0.3536 | 36       | 0.3366 | 0.3369 |
|          | 0.3434 | 0.3664 |          | 0.3371 | 0.3493 |
|          | 0.3493 | 0.3712 |          | 0.3425 | 0.3536 |
|          | 0.3479 | 0.3580 |          | 0.3416 | 0.3408 |

Note for Table 13:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.

MXL8-PW57 Color Bin Structure

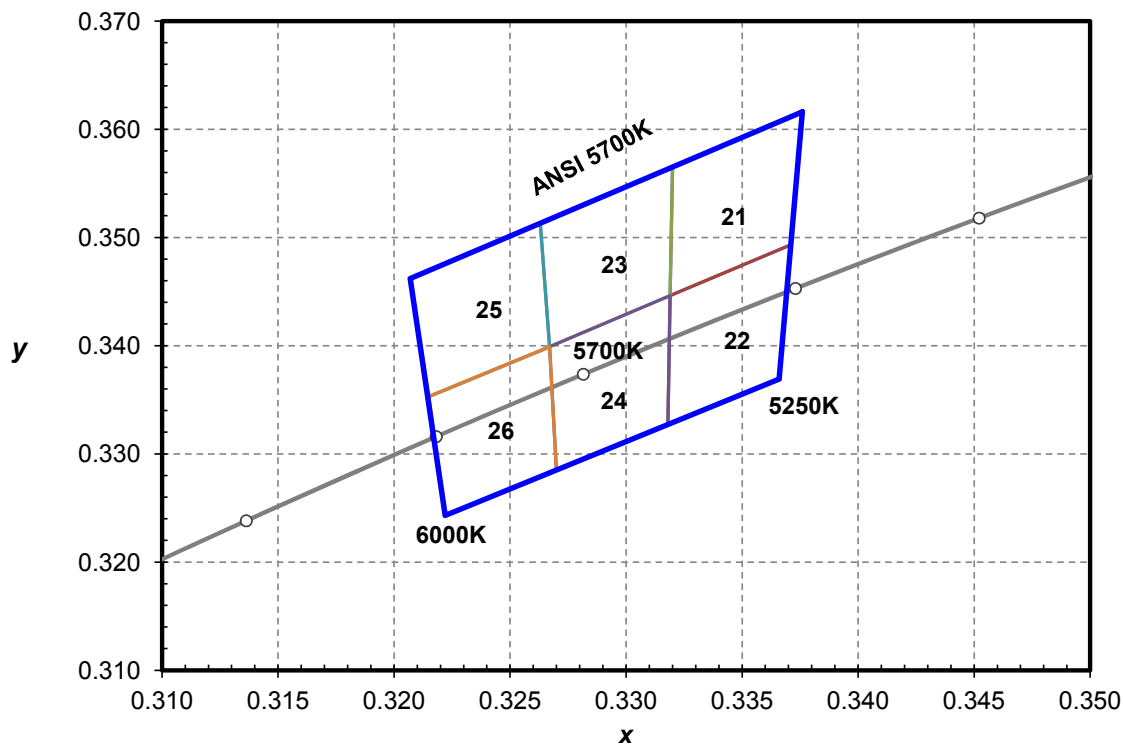


Figure 20. ANSI 5700K 1/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 14. LUXEON Mid-Power ANSI 1/6 Color Bin Coordinates for MXL8-PW57 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 21       | 0.3319 | 0.3446 | 24       | 0.3270 | 0.3285 |
|          | 0.3320 | 0.3565 |          | 0.3267 | 0.3399 |
|          | 0.3376 | 0.3616 |          | 0.3319 | 0.3446 |
|          | 0.3371 | 0.3493 |          | 0.3318 | 0.3327 |
| 22       | 0.3318 | 0.3327 | 25       | 0.3215 | 0.3353 |
|          | 0.3319 | 0.3446 |          | 0.3207 | 0.3462 |
|          | 0.3371 | 0.3493 |          | 0.3263 | 0.3513 |
|          | 0.3366 | 0.3369 |          | 0.3267 | 0.3399 |
| 23       | 0.3267 | 0.3399 | 26       | 0.3222 | 0.3243 |
|          | 0.3263 | 0.3513 |          | 0.3215 | 0.3353 |
|          | 0.3320 | 0.3565 |          | 0.3267 | 0.3399 |
|          | 0.3319 | 0.3446 |          | 0.3270 | 0.3285 |

Note for Table 14:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y coordinates.



MXL8-PW65 Color Bin Structure

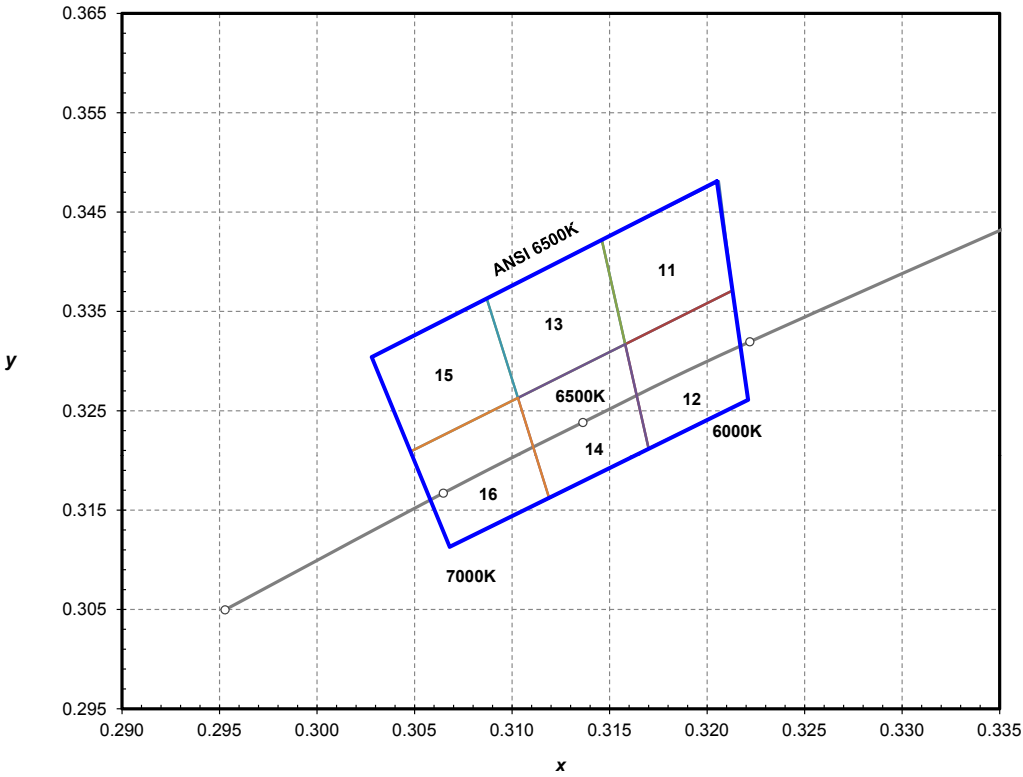


Figure 21. ANSI 6500K 1/6th color bin structure.

LUXEON Mid-Power Emitters are tested and binned by x,y coordinates.

Table 15. LUXEON Mid-Power ANSI 1/6 Color Bin Coordinates for MXL8-PW65 Emitter

| Bin Code | x      | y      | Bin Code | x      | y      |
|----------|--------|--------|----------|--------|--------|
| 11       | 0.3158 | 0.3317 | 14       | 0.3119 | 0.3162 |
|          | 0.3146 | 0.3422 |          | 0.3103 | 0.3263 |
|          | 0.3206 | 0.3481 |          | 0.3158 | 0.3317 |
|          | 0.3213 | 0.3371 |          | 0.3170 | 0.3212 |
| 12       | 0.3170 | 0.3212 | 15       | 0.3048 | 0.3209 |
|          | 0.3158 | 0.3317 |          | 0.3028 | 0.3304 |
|          | 0.3213 | 0.3371 |          | 0.3087 | 0.3363 |
|          | 0.3221 | 0.3261 |          | 0.3103 | 0.3263 |
| 13       | 0.3103 | 0.3263 | 16       | 0.3068 | 0.3113 |
|          | 0.3087 | 0.3363 |          | 0.3048 | 0.3209 |
|          | 0.3146 | 0.3422 |          | 0.3103 | 0.3263 |
|          | 0.3158 | 0.3317 |          | 0.3119 | 0.3162 |

Note for Table 15:

I. Tested and binned at 25°C and If = 100 mA. Tester tolerance: +/- 0.01 in x and y 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 CO2 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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