

# Shuen

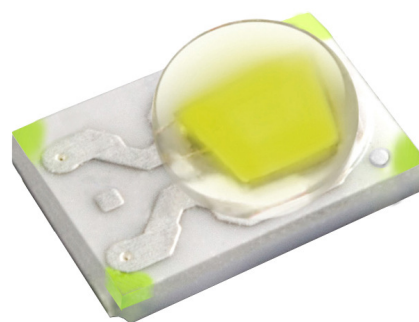
## 1W Series

# 炫

*"Shuen [Xuan] is the English translation for the Chinese word meaning Bright and Shiny. Both words are relevant descriptions of this Everlight LED series. The modern, adaptive Chinese definition of the word represents that which is New, Extravagant, and Highly Sought After."*

## Introduction

The Shuen series is a surface-mount high-power device featuring high brightness combined with a compact size that is suitable for all kinds of lighting applications such as general illumination, flash, spot, signal, industrial and commercial lighting. The thermal pad of this device is electrically isolated providing convenience in thermal and electrical design. The Shuen series is one of the most promising devices in Everlight's high power product offering and is ready to face the challenges of today's Solid-State Lighting requirements.



## Features

- ◆ Small package with high efficiency
- ◆ ESD protection up to 8KV
- ◆ Soldering method: SMT
- ◆ Binning Parameters: Brightness, Forward Voltage, Wavelength and Chromaticity
- ◆ Moisture Sensitivity Level: 1
- ◆ RoHS compliant
- ◆ Matches ANSI binning
- ◆ Reliability testing conforms to IESNA LM80 Lumen maintenance test method

## Applications

- ◆ General Lighting
- ◆ Decorative and Entertainment Lighting
- ◆ Signal and Symbol
- ◆ Exterior and Interior Automotive Illumination

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## Product Nomenclature

The product name is designated as below:

### ELSH – ABCDE – FGHIJ – V1234

Designation:

AB = min. luminous flux (lm) or radiation power (mW) performance

C = radiation pattern <sup>[1]</sup>

D = color <sup>[2]</sup>

E = power consumption <sup>[3]</sup>

F = reserved for future product offerings

G = chip source <sup>[4]</sup>

H = packaging type <sup>[5]</sup>

IJ = internal coding

V = forward voltage bin

1234 = color bin or CCT bin

#### Notes

1. Table of radiation patterns

| Symbol | Description |
|--------|-------------|
| 1      | Lambertian  |

2. Table of color offerings:

| Symbol | Color         | Dominant wavelength range |
|--------|---------------|---------------------------|
| R      | Red           | 620~635nm                 |
| O      | Orange        | 610~620nm                 |
| Y      | Amber         | 580~595nm                 |
| G      | Green         | 520~550nm                 |
| B      | Blue          | 450~470nm                 |
| C      | Cool-White    | 4745~7050K                |
| N      | Neutral-White | 3710~4745K                |
| M      | Warm-White    | 2580~3710K                |
| E      | Deep-Red      | 645~675nm                 |
| F      | Far-Red       | 715~745nm                 |

3. Table of power consumptions:

| Symbol | Description |
|--------|-------------|
| 1      | 1W          |

4. Table of chip sources:

| Symbol | Description    |
|--------|----------------|
| L      | Others         |
| S      | Better Request |
| C      | High Request   |

5. Table of packaging types:

| Symbol | Description |
|--------|-------------|
| P      | Tape        |
| B      | Tube        |

## Absolute Maximum Ratings

| Parameter               | Symbol      | Ratings                   | Unit   |
|-------------------------|-------------|---------------------------|--------|
| DC Forward Current (mA) | $I_F$       | 400                       | mA     |
| Peak Pulse Current (mA) | $I_{Pulse}$ | 1000                      | mA     |
| ESD Resistance          | $V_B$       | 8000                      | V      |
| Reverse Voltage         | $V_R$       | Note 2                    | V      |
| Thermal Resistance      | $R_{th}$    | 10~12 <sup>[3]</sup>      | °C/W   |
| Junction Temperature    | $T_J$       | 125 <sup>[4]</sup>        | °C     |
| Operating Temperature   | $T_{Opr}$   | -40 ~ +100 <sup>[5]</sup> | °C     |
| Storage Temperature     | $T_{Stg}$   | -40 ~ +100                | °C     |
| Soldering Temperature   | $T_{Sol}$   | 260                       | °C     |
| Allowable Reflow Cycles | n/a         | 2                         | cycles |

### Notes:

- Maximum forward current for 1W is 400mA ( $T_{Thermal Pad}=25^{\circ}C$ ).
- The Shuen series LEDs are not designed for reverse bias used.
- Thermal Resistance is 10°C/W for Blue, Green, Cool-White, Neutral-White, and Warm-White LEDs and 12°C/W for Red, Amber, and Yellow LEDs.
- Maximum junction temperature of Cool-White, Neutral-White, Warm-White, Blue, Cyan, Green, Deep-Red, Red, Amber, and Yellow LEDs are 125°C.
- Maximum Operating Temperature (Thermal Pad) of Cool-White, Neutral-White, Warm-White, Blue, Cyan, Green, Deep-Red, Red, Amber, and Yellow LEDs are 100°C.
- Avoid operating Shuen LEDs at maximum operating temperature exceed 1 hour.

## JEDEC Moisture Sensitivity

| Level | Floor Life   |                             | Soak Requirements Standard |               |
|-------|--------------|-----------------------------|----------------------------|---------------|
|       | Time (hours) | Conditions                  | Time (hours)               | Conditions    |
| 1     | unlimited    | $\leq 30^{\circ}C$ / 85% RH | 168 (+5/-0)                | 85°C / 85% RH |

## Luminous Flux Characteristics for the Shuen series

| Color         | Part Number   | 1W                                                                      |                       |
|---------------|---------------|-------------------------------------------------------------------------|-----------------------|
|               |               | Minimum Luminous Flux(lm)<br>or<br>Radiometric Power(mW) <sup>[1]</sup> | Drive Current<br>(mA) |
| Cool White    | ELSH – F81CX  | 80                                                                      | 350                   |
|               | ELSH – F91CX  | 90                                                                      | 350                   |
|               | *ELSH – J11CX | 100                                                                     | 350                   |
| Neutral White | ELSH – F71NX  | 70                                                                      | 350                   |
|               | ELSH – F81NX  | 80                                                                      | 350                   |
|               | *ELSH – F91NX | 90                                                                      | 350                   |
| Warm White    | ELSH – F61MX  | 60                                                                      | 350                   |
|               | ELSH – F71MX  | 70                                                                      | 350                   |
|               | *ELSH – F81MX | 80                                                                      | 350                   |
| Red           | ELSH – F41RX  | 45                                                                      | 350                   |
|               | ELSH – F51RX  | 52                                                                      | 350                   |
|               | *ELSH – F61RX | 60                                                                      | 350                   |
| Orange        | ELSH – F41OX  | 45                                                                      | 350                   |
|               | ELSH – F51OX  | 52                                                                      | 350                   |
|               | *ELSH – F61OX | 60                                                                      | 350                   |
| Amber         | ELSH – F31YX  | 39                                                                      | 350                   |
|               | ELSH – F41YX  | 45                                                                      | 350                   |
|               | *ELSH – F51YX | 52                                                                      | 350                   |
| Green         | ELSH – F71GX  | 70                                                                      | 350                   |
|               | *ELSH – F81GX | 80                                                                      | 350                   |
| Blue          | ELSH – E61BX  | 13                                                                      | 350                   |
|               | *ELSH – E71BX | 17                                                                      | 350                   |
| Deep Red      | ELSH – Q91EX  | 275                                                                     | 350                   |
|               | *ELSH – R11EX | 350                                                                     | 350                   |
| Far Red       | ELSH – Q61LX  | 125                                                                     | 350                   |
|               | *ELSH – Q71LX | 175                                                                     | 350                   |

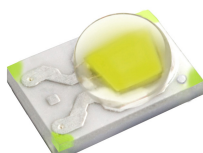
### Note:

1. Luminous flux measurement tolerance:  $\pm 10\%$ .
2. The data of luminous flux measured at thermal pad=25 °C
3. Typical luminous flux or light output performance is operated within the condition guided by this datasheet.
4. Please contact sales for timing and availability of P/N's marked with an asterisk "\*\*".

## PN of the Shuen series: White LEDs

The table below is a list of part numbers for the Everlight Shuen 1W series White LED. All parts listed match ANSI binning standards. Bin offerings of 5700K, 6500K, and 3000K are listed and currently available. CRI is also listed with a typical 75 to 90. These clearly listed binning options allow for proper design and implementation into lighting applications. The Order Codes below are currently available White Shuen LEDs.

For Example: If you order product using P/N **ELSH-F81C1-0LPGS-C5700**, you will get



| Color Variant | Radiation Pattern | CRI | CCT                                 | Forward Voltage (V)                             | Minimum Luminous Flux (lm) |
|---------------|-------------------|-----|-------------------------------------|-------------------------------------------------|----------------------------|
| Cool White    | Lambertian        | 75  | 57K-1 ~ 57K-2<br>~<br>57K-3 ~ 57K-4 | 2.95~3.25(V1)<br>3.25~3.55(V2)<br>3.55~3.85(V3) | 80                         |

White, Shuen series LEDs at 350mA are listed below

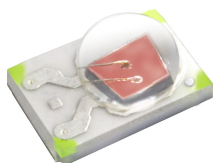
| Color              | Order Code of ELSH      | Minimum Luminous Flux (lm) | CCT (K)<br>Wavelength (nm) | Forward Voltage (V) | CRI<br>(Typical)[1] |
|--------------------|-------------------------|----------------------------|----------------------------|---------------------|---------------------|
| Cool White 6500    | ELSH-F81C1-0LPGS-C6500  | 80                         | 6500-1~6500-4              | 2.95~3.85           | 75                  |
|                    | ELSH-F91C1-0LPGS-C6500  | 90                         | 6500-1~6500-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-FJ1C1-0LPGS-C6500 | 100                        | 6500-1~6500-4              | 2.95~3.85           | 75                  |
| Cool White 5700    | ELSH-F81C1-0LPGS-C5700  | 80                         | 5700-1~5700-4              | 2.95~3.85           | 75                  |
|                    | ELSH-F91C1-0LPGS-C5700  | 90                         | 5700-1~5700-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-FJ1C1-0LPGS-C5700 | 100                        | 5700-1~5700-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-F71C1-0LPFS-C5700 | 70                         | 5700-1~5700-4              | 2.95~3.85           | 90                  |
|                    | *ELSH-F81C1-0LPFS-C5700 | 80                         | 5700-1~5700-4              | 2.95~3.85           | 90                  |
| Neutral White 4000 | ELSH-F71N1-0LPGS-C4000  | 70                         | 4000-1~4000-4              | 2.95~3.85           | 75                  |
|                    | ELSH-F81N1-0LPGS-C4000  | 80                         | 4000-1~4000-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-F61N1-0LPFS-C4000 | 60                         | 4000-1~4000-4              | 2.95~3.85           | 90                  |
|                    | *ELSH-F71N1-0LPFS-C4000 | 70                         | 4000-1~4000-4              | 2.95~3.85           | 90                  |
| Warm White 3000    | ELSH-F61M1-0LPGS-C3000  | 60                         | 3000-1~3000-4              | 2.95~3.85           | 75                  |
|                    | ELSH-F71M1-0LPGS-C3000  | 70                         | 3000-1~3000-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-F81M1-0LPGS-C3000 | 80                         | 3000-1~3000-4              | 2.95~3.85           | 75                  |
|                    | *ELSH-F51M1-0LPFS-C3000 | 52                         | 3000-1~3000-4              | 2.95~3.85           | 90                  |
|                    | *ELSH-F61M1-0LPFS-C3000 | 60                         | 3000-1~3000-4              | 2.95~3.85           | 90                  |

### Note:

1. CRI measurement tolerance:  $\pm 5$ .
2. Please contact sales for timing and availability of P/N's marked with an asterisk \*\*\*.

## PN of the Shuen series: Color LEDs

The table below is a list of part numbers for the Everlight Shuen series Color LED. Standard Everlight color bins are listed according to wavelength and represent the standard primary colors of the spectrum. These clearly listed binning options allow for proper design and implementation into lighting applications. For Example: If you order product using P/N **ELSH-F41R1-0LPNM-AR5R6**, you will get



| Color Variant | Radiation Pattern | Dominant Wavelength (nm)   | Forward Voltage (V)                             | Minimum Luminous Flux (lm) |
|---------------|-------------------|----------------------------|-------------------------------------------------|----------------------------|
| Red           | Lambertian        | 620~625(R5)<br>625~630(R6) | 1.75~2.05(U1)<br>2.05~2.35(U2)<br>2.35~2.65(U3) | 52                         |

Color, Shuen series LEDs at 350mA are listed below.

| Color                                                                               | Order Code of ELSH      | Minimum Luminous Flux (lm) | Wavelength (nm) | Forward Voltage(V) |
|-------------------------------------------------------------------------------------|-------------------------|----------------------------|-----------------|--------------------|
|  | ELSH-F41R1-0LPNM-AR5R6  | 45                         | 620~630         | 1.75~2.95          |
|                                                                                     | ELSH-F51R1-0LPNM-AR5R6  | 52                         | 620~630         | 1.75~2.95          |
|                                                                                     | *ELSH-F61R1-0LPNM-AR5R6 | 60                         | 620~630         | 1.75~2.95          |
|  | ELSH-F41O1-0LPNM-AR3R4  | 45                         | 610~620         | 1.75~2.95          |
|                                                                                     | ELSH-F51O1-0LPNM-AR3R4  | 52                         | 610~620         | 1.75~2.95          |
|                                                                                     | *ELSH-F61O1-0LPNM-AR3R4 | 60                         | 610~620         | 1.75~2.95          |
|  | ELSH-F31Y1-0LPNM-AA3A5  | 39                         | 585~592.5       | 1.75~2.95          |
|                                                                                     | ELSH-F41Y1-0LPNM-AA3A5  | 45                         | 585~592.5       | 1.75~2.95          |
|                                                                                     | *ELSH-F51Y1-0LPNM-AA3A5 | 52                         | 585~592.5       | 1.75~2.95          |
|                                                                                     | ELSH-F31Y1-0LPNM-AA4A6  | 39                         | 587.5~595       | 1.75~2.95          |
|                                                                                     | ELSH-F41Y1-0LPNM-AA4A6  | 45                         | 587.5~595       | 1.75~2.95          |
|                                                                                     | *ELSH-F51Y1-0LPNM-AA4A6 | 52                         | 587.5~595       | 1.75~2.95          |
|  | ELSH-F71G1-0LPNM-CG1G2  | 70                         | 520~530         | 2.95~3.85          |
|                                                                                     | *ELSH-F81G1-0LPNM-CG1G2 | 80                         | 520~530         | 2.95~3.85          |
|                                                                                     | ELSH-F71G1-0LPNM-CG2G3  | 70                         | 525~535         | 2.95~3.85          |
|                                                                                     | *ELSH-F81G1-0LPNM-CG2G3 | 80                         | 525~535         | 2.95~3.85          |
|  | ELSH-E61B1-0LPNM-CB7B8  | 13                         | 460~470         | 2.95~3.85          |
|                                                                                     | *ELSH-E71B1-0LPNM-CB7B8 | 17                         | 460~470         | 2.95~3.85          |

| Color    | Order Code of ELSH     | Radiometric Power (mW) | Wavelength (nm) | Forward Voltage(V) |
|----------|------------------------|------------------------|-----------------|--------------------|
| Deep Red | ELSH-Q91E1-0LPNM-BD3D8 | 275                    | 645~675         | 2.05~2.95          |
| Far Red  | ELSH-Q61F1-0LPNM-BF3F8 | 125                    | 715~745         | 2.05~2.95          |

**Note:**

1. Please contact sales for timing and availability of P/N's marked with an asterisk "\*\*".



## Product Binning

### Luminous Flux Bins

| Group | Bin      | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) |
|-------|----------|-------------------------------|-------------------------------|
| E     | 1        | 4                             | 5                             |
|       | 2        | 5                             | 6                             |
|       | 3        | 6                             | 8                             |
|       | 4        | 8                             | 10                            |
|       | 5        | 10                            | 13                            |
|       | 6        | 13                            | 17                            |
|       | 7        | 17                            | 20                            |
|       | 8        | 20                            | 23                            |
|       | 9        | 23                            | 27                            |
| F     | 1        | 27                            | 33                            |
|       | 2        | 33                            | 39                            |
|       | 3        | 39                            | 45                            |
|       | 4        | 45                            | 52                            |
|       | <b>5</b> | <b>52</b>                     | <b>60</b>                     |
|       | <b>6</b> | <b>60</b>                     | <b>70</b>                     |
|       | <b>7</b> | <b>70</b>                     | <b>80</b>                     |
|       | <b>8</b> | <b>80</b>                     | <b>90</b>                     |
|       | <b>9</b> | <b>90</b>                     | <b>100</b>                    |

| Group | Bin | Minimum Photometric Flux (lm) | Maximum Photometric Flux (lm) |
|-------|-----|-------------------------------|-------------------------------|
| J     | 1   | 100                           | 110                           |
|       | 2   | 110                           | 120                           |
|       | 3   | 120                           | 130                           |
|       | 4   | 130                           | 140                           |
|       | 5   | 140                           | 150                           |
|       | 6   | 150                           | 160                           |
|       | 7   | 160                           | 180                           |
|       | 8   | 180                           | 200                           |
|       | 9   | 200                           | 225                           |
| K     | 1   | 225                           | 250                           |
|       | 2   | 250                           | 275                           |
|       | 3   | 275                           | 300                           |
|       | 4   | 300                           | 325                           |
|       | 5   | 325                           | 350                           |
|       | 6   | 350                           | 375                           |
|       | 7   | 375                           | 400                           |
|       | 8   | 400                           | 425                           |
|       | 9   | 425                           | 450                           |
| N     | 1   | 450                           | 475                           |
|       | 2   | 475                           | 500                           |
|       | 3   | 500                           | 525                           |
|       | 4   | 525                           | 550                           |

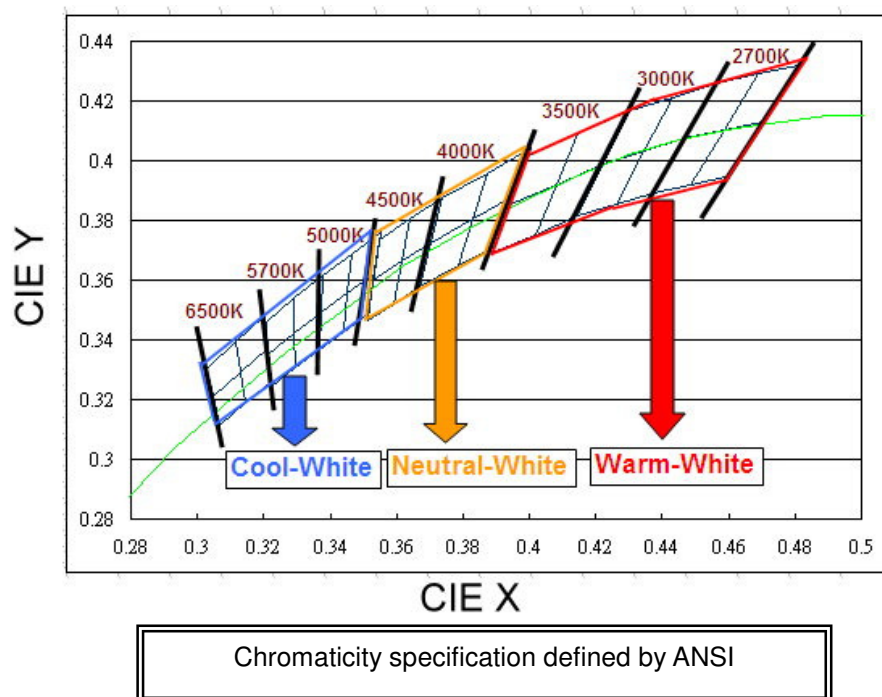
**Note:** Currently available brightness bins for White LEDs are highlighted and bolded.

### Radiometric Power Bins

| Group | Bin | Minimum Radiometric Power(mW) | Maximum Radiometric Power(mW) |
|-------|-----|-------------------------------|-------------------------------|
| Q     | 1   | 0                             | 25                            |
|       | 2   | 25                            | 50                            |
|       | 3   | 50                            | 75                            |
|       | 4   | 75                            | 100                           |
|       | 5   | 100                           | 125                           |
|       | 6   | 125                           | 175                           |
|       | 7   | 175                           | 225                           |
|       | 8   | 225                           | 275                           |
|       | 9   | 275                           | 350                           |

| Group | Bin | Minimum Radiometric Power(mW) | Maximum Radiometric Power(mW) |
|-------|-----|-------------------------------|-------------------------------|
| R     | 1   | 350                           | 425                           |
|       | 2   | 425                           | 500                           |
|       | 3   | 500                           | 600                           |
|       | 4   | 600                           | 700                           |
|       | 5   | 700                           | 800                           |
|       | 6   | 800                           | 900                           |
|       | 7   | 900                           | 1000                          |
|       | 8   | 1000                          | 1300                          |
|       | 9   | 1300                          | 1600                          |

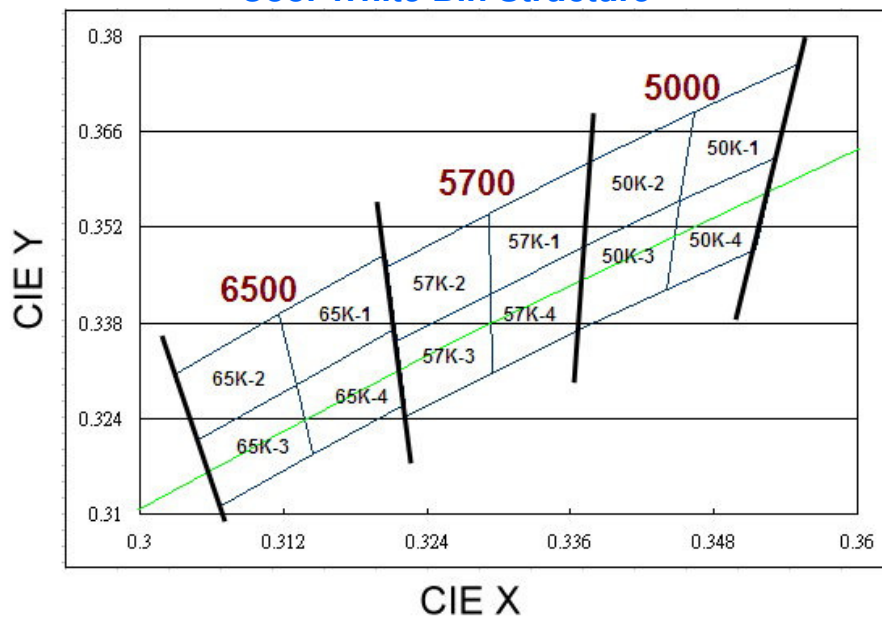
## White Bin Structure



### Notes:

1. The CCT range of Cool-White varies from 4745K to 7050K.
2. The CCT range of Neutral-White varies from 3710K to 4745K.
3. The CCT range of Warm-White varies from 2580K to 3710K
4. Color coordinates measurement allowance :  $\pm 0.01$
5. Color bins are defined at  $I_f=350\text{mA}$  operation.

## Cool-White Bin Structure



## Cool-White Bin Coordinates

### 5000K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 50K-1                       | 0.346 | 0.369 |
|                             | 0.345 | 0.356 |
|                             | 0.353 | 0.362 |
|                             | 0.355 | 0.376 |
| Reference Range: 4745~5000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 50K-2                       | 0.338 | 0.362 |
|                             | 0.337 | 0.349 |
|                             | 0.345 | 0.356 |
|                             | 0.346 | 0.369 |
| Reference Range: 5000~5310K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 50K-4                       | 0.345 | 0.356 |
|                             | 0.344 | 0.343 |
|                             | 0.352 | 0.349 |
|                             | 0.353 | 0.362 |
| Reference Range: 4745~5000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 50K-3                       | 0.337 | 0.349 |
|                             | 0.337 | 0.337 |
|                             | 0.344 | 0.343 |
|                             | 0.345 | 0.356 |
| Reference Range: 5000~5310K |       |       |

### 5700K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 57K-1                       | 0.329 | 0.354 |
|                             | 0.329 | 0.342 |
|                             | 0.337 | 0.349 |
|                             | 0.338 | 0.362 |
| Reference Range: 5310~5700K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 57K-2                       | 0.321 | 0.346 |
|                             | 0.321 | 0.335 |
|                             | 0.329 | 0.342 |
|                             | 0.329 | 0.354 |
| Reference Range: 5700~6020K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 57K-4                       | 0.329 | 0.342 |
|                             | 0.329 | 0.331 |
|                             | 0.337 | 0.337 |
|                             | 0.337 | 0.349 |
| Reference Range: 5310~5700K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 57K-3                       | 0.321 | 0.335 |
|                             | 0.322 | 0.324 |
|                             | 0.329 | 0.331 |
|                             | 0.329 | 0.342 |
| Reference Range: 5700~6020K |       |       |

### 6500K

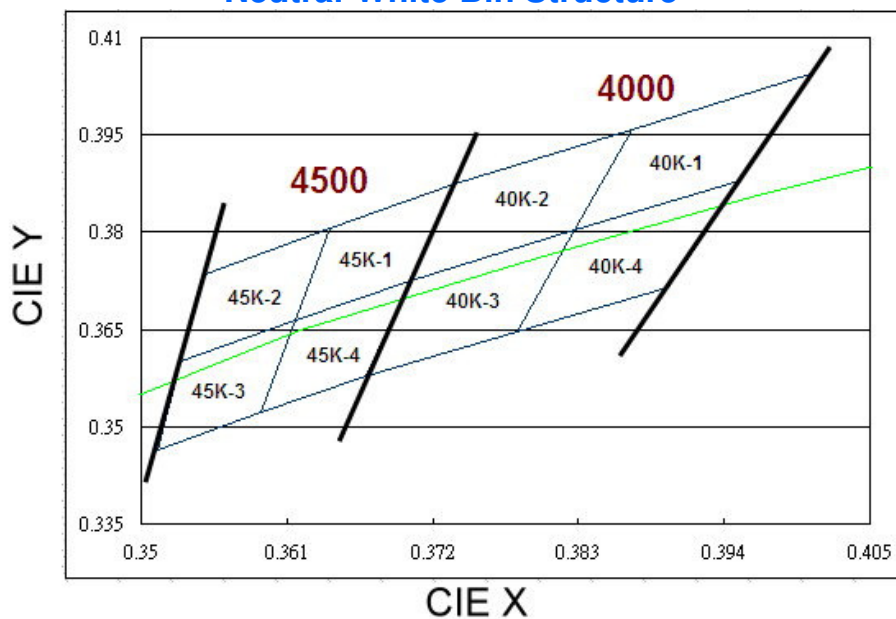
| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 65K-1                       | 0.312 | 0.339 |
|                             | 0.313 | 0.329 |
|                             | 0.321 | 0.337 |
|                             | 0.321 | 0.348 |
| Reference Range: 6020~6500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 65K-2                       | 0.303 | 0.330 |
|                             | 0.305 | 0.321 |
|                             | 0.313 | 0.329 |
|                             | 0.312 | 0.339 |
| Reference Range: 6500~7050K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 65K-4                       | 0.313 | 0.329 |
|                             | 0.314 | 0.319 |
|                             | 0.322 | 0.326 |
|                             | 0.321 | 0.337 |
| Reference Range: 6020~6500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 65K-3                       | 0.305 | 0.321 |
|                             | 0.307 | 0.311 |
|                             | 0.314 | 0.319 |
|                             | 0.313 | 0.329 |
| Reference Range: 6500~7050K |       |       |

## Neutral-White Bin Structure



## Neutral-White Bin Coordinates

### 4000K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 40K-1                       | 0.387 | 0.396 |
|                             | 0.383 | 0.380 |
|                             | 0.395 | 0.388 |
|                             | 0.401 | 0.404 |
| Reference Range: 3710~4000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 40K-2                       | 0.374 | 0.387 |
|                             | 0.370 | 0.373 |
|                             | 0.383 | 0.380 |
|                             | 0.387 | 0.396 |
| Reference Range: 4000~4260K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 40K-4                       | 0.383 | 0.380 |
|                             | 0.378 | 0.365 |
|                             | 0.390 | 0.372 |
|                             | 0.395 | 0.388 |
| Reference Range: 3710~4000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 40K-3                       | 0.370 | 0.373 |
|                             | 0.367 | 0.358 |
|                             | 0.378 | 0.365 |
|                             | 0.383 | 0.380 |
| Reference Range: 4000~4260K |       |       |

### 4500K

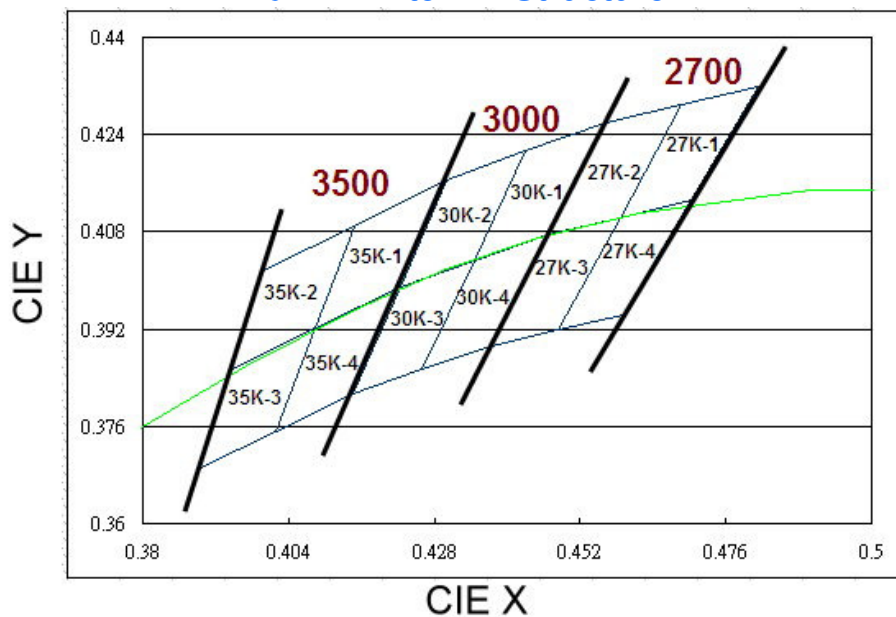
| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 45K-1                       | 0.364 | 0.381 |
|                             | 0.362 | 0.366 |
|                             | 0.370 | 0.373 |
|                             | 0.374 | 0.387 |
| Reference Range: 4260~4500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 45K-2                       | 0.355 | 0.374 |
|                             | 0.353 | 0.360 |
|                             | 0.362 | 0.366 |
|                             | 0.364 | 0.381 |
| Reference Range: 4500~4745K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 45K-4                       | 0.362 | 0.366 |
|                             | 0.359 | 0.352 |
|                             | 0.367 | 0.358 |
|                             | 0.370 | 0.373 |
| Reference Range: 4260~4500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 45K-3                       | 0.353 | 0.360 |
|                             | 0.351 | 0.347 |
|                             | 0.359 | 0.352 |
|                             | 0.362 | 0.366 |
| Reference Range: 4500~4745K |       |       |

## Warm-White Bin Structure



## Warm-White Bin Coordinates

### 2700K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 27K-1                       | 0.469 | 0.429 |
|                             | 0.459 | 0.410 |
|                             | 0.470 | 0.413 |
|                             | 0.481 | 0.432 |
| Reference Range: 2580~2700K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 27K-2                       | 0.456 | 0.426 |
|                             | 0.447 | 0.408 |
|                             | 0.459 | 0.410 |
|                             | 0.469 | 0.429 |
| Reference Range: 2700~2870K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 27K-4                       | 0.459 | 0.410 |
|                             | 0.448 | 0.392 |
|                             | 0.459 | 0.394 |
|                             | 0.470 | 0.413 |
| Reference Range: 2580~2700K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 27K-3                       | 0.447 | 0.408 |
|                             | 0.437 | 0.389 |
|                             | 0.448 | 0.392 |
|                             | 0.459 | 0.410 |
| Reference Range: 2700~2870K |       |       |

### 3000K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 30K-1                       | 0.443 | 0.421 |
|                             | 0.435 | 0.403 |
|                             | 0.447 | 0.408 |
|                             | 0.456 | 0.426 |
| Reference Range: 2870~3000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 30K-2                       | 0.430 | 0.417 |
|                             | 0.422 | 0.399 |
|                             | 0.435 | 0.403 |
|                             | 0.443 | 0.421 |
| Reference Range: 3000~3220K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 30K-4                       | 0.435 | 0.403 |
|                             | 0.426 | 0.385 |
|                             | 0.437 | 0.389 |
|                             | 0.447 | 0.408 |
| Reference Range: 2870~3000K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 30K-3                       | 0.422 | 0.399 |
|                             | 0.415 | 0.381 |
|                             | 0.426 | 0.385 |
|                             | 0.435 | 0.403 |
| Reference Range: 3000~3220K |       |       |

### 3500K

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 35K-1                       | 0.415 | 0.409 |
|                             | 0.408 | 0.392 |
|                             | 0.422 | 0.399 |
|                             | 0.430 | 0.417 |
| Reference Range: 3220~3500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 35K-2                       | 0.400 | 0.402 |
|                             | 0.394 | 0.385 |
|                             | 0.408 | 0.392 |
|                             | 0.415 | 0.409 |
| Reference Range: 3500~3710K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 35K-4                       | 0.408 | 0.392 |
|                             | 0.402 | 0.375 |
|                             | 0.415 | 0.381 |
|                             | 0.422 | 0.399 |
| Reference Range: 3220~3500K |       |       |

| Bin                         | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 35K-3                       | 0.394 | 0.385 |
|                             | 0.389 | 0.369 |
|                             | 0.402 | 0.375 |
|                             | 0.408 | 0.392 |
| Reference Range: 3500~3710K |       |       |

### Forward Voltage Bins

| Group Name | Bins            |
|------------|-----------------|
| A          | U1+U2+U3        |
| B          | U2+U3+U4        |
| <b>C</b>   | <b>V1+V2+V3</b> |
| D          | V2+V3+V4        |
| E          | V3+V4+V5        |
| F          | V1+V2           |
| G          | V1              |
| H          | U3+U4           |

| Bin       | Minimum Forward Voltage (V) | Maximum Forward Voltage (V) |
|-----------|-----------------------------|-----------------------------|
| U1        | 1.75                        | 2.05                        |
| U2        | 2.05                        | 2.35                        |
| U3        | 2.35                        | 2.65                        |
| U4        | 2.65                        | 2.95                        |
| <b>V1</b> | <b>2.95</b>                 | <b>3.25</b>                 |
| <b>V2</b> | <b>3.25</b>                 | <b>3.55</b>                 |
| <b>V3</b> | <b>3.55</b>                 | <b>3.85</b>                 |
| V4        | 3.85                        | 4.15                        |
| V5        | 4.15                        | 4.45                        |

#### Notes:

- Forward voltage measurement tolerance:  $\pm 0.1V$ .
- Forward voltage bins are defined at  $I_F=350$  mA operation.

## Color Bins

| Group                  | Bin | Minimum Dominant / Peak<br>Wavelength (nm) | Maximum Dominant / Peak<br>Wavelength (nm) |
|------------------------|-----|--------------------------------------------|--------------------------------------------|
| <b>B</b><br>(Blue)     | 1   | 430                                        | 435                                        |
|                        | 2   | 435                                        | 440                                        |
|                        | 3   | 440                                        | 445                                        |
|                        | 4   | 445                                        | 450                                        |
|                        | 5   | 450                                        | 455                                        |
|                        | 6   | 455                                        | 460                                        |
|                        | 7   | 460                                        | 465                                        |
|                        | 8   | 465                                        | 470                                        |
| <b>G</b><br>(Green)    | 1   | 520                                        | 525                                        |
|                        | 2   | 525                                        | 530                                        |
|                        | 3   | 530                                        | 535                                        |
|                        | 4   | 535                                        | 540                                        |
|                        | 5   | 540                                        | 545                                        |
|                        | 6   | 545                                        | 550                                        |
| <b>A</b><br>(Amber)    | 1   | 580                                        | 582.5                                      |
|                        | 2   | 582.5                                      | 585                                        |
|                        | 3   | 585                                        | 587.5                                      |
|                        | 4   | 587.5                                      | 590                                        |
|                        | 5   | 590                                        | 592.5                                      |
|                        | 6   | 592.5                                      | 595                                        |
| <b>R</b><br>(Red)      | 3   | 610                                        | 615                                        |
|                        | 4   | 615                                        | 620                                        |
|                        | 5   | 620                                        | 625                                        |
|                        | 6   | 625                                        | 630                                        |
|                        | 7   | 630                                        | 635                                        |
| <b>D</b><br>(Deep-Red) | 1   | 635                                        | 640                                        |
|                        | 2   | 640                                        | 645                                        |
|                        | 3   | 645                                        | 650                                        |
|                        | 4   | 650                                        | 655                                        |
|                        | 5   | 655                                        | 660                                        |
|                        | 6   | 660                                        | 665                                        |
|                        | 7   | 665                                        | 670                                        |
|                        | 8   | 670                                        | 675                                        |

### Notes.

1. Dominant / Peak wavelength measurement tolerance:  $\pm 1\text{nm}$ .
2. Dominant / Peak wavelength bins are defined at  $I_f=350\text{ mA}$  operation.
3. The range of wavelength in Deep-Red and Royal-Blue is described as peak-wavelength.

## Optical Characteristics

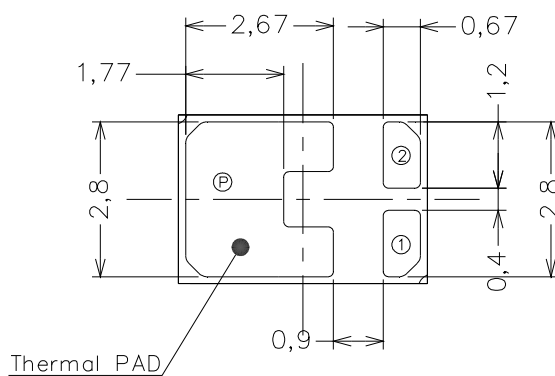
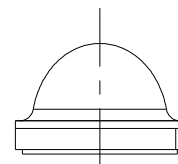
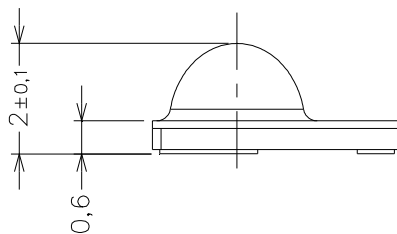
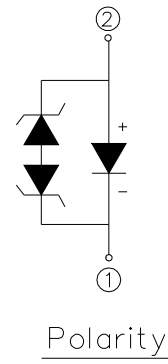
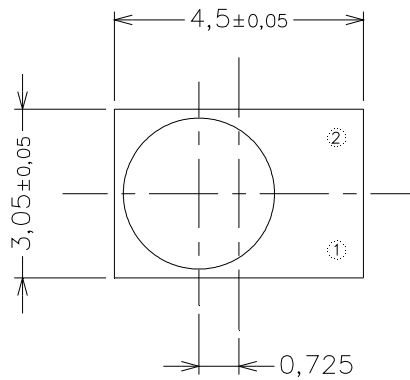
| Color         | Part Number  | Part Number<br>Dominant Wavelength $\lambda_D$<br>Peak Wavelength $\lambda_P$<br>Color Temperature<br>CCT |       |       | Typical Temperature<br>Coefficient of<br>Dominant Wavelength<br>(nm/°C)-( $\Delta\lambda_D/\Delta T_J$ ) | Typical Viewing Angle<br>(degrees)<br>$2\theta_{1/2}$ |
|---------------|--------------|-----------------------------------------------------------------------------------------------------------|-------|-------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
|               |              | Min.                                                                                                      | Typ.  | Max.  |                                                                                                          |                                                       |
| Cool-White    | ELSH – XX1CX | 4745K                                                                                                     | 5700K | 7050K | ---                                                                                                      | 120                                                   |
| Neutral-White | ELSH – XX1NX | 3710K                                                                                                     | 4260K | 4745K | ---                                                                                                      | 120                                                   |
| Warm-White    | ELSH – XX1MX | 2580K                                                                                                     | 3000K | 3710K | ---                                                                                                      | 120                                                   |
| Red           | ELSH – XX1RX | 620nm                                                                                                     | ---   | 630nm | 0.05                                                                                                     | 120                                                   |
| Orange        | ELSH – XX1OX | 610nm                                                                                                     | ---   | 620nm | 0.08                                                                                                     | 120                                                   |
| Amber         | ELSH – XX1YX | 585nm                                                                                                     | ---   | 595nm | 0.1                                                                                                      | 120                                                   |
| Green         | ELSH – XX1GX | 520nm                                                                                                     | ---   | 535nm | 0.05                                                                                                     | 120                                                   |
| Blue          | ELSH – XX1BX | 460nm                                                                                                     | ---   | 470nm | 0.05                                                                                                     | 120                                                   |
| Deep-Red      | ELSH – XX1EX | 645nm                                                                                                     | ---   | 675nm | 0.08                                                                                                     | 120                                                   |
| Far-Red       | ELSH – XX1LX | 715nm                                                                                                     | ---   | 745nm | 0.04                                                                                                     | 120                                                   |

### Notes:

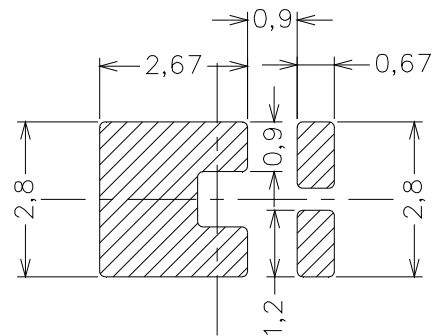
1. The test tolerance of Everlight is  $\pm 1\text{nm}$  for dominant wavelength,  $\pm 5\%$  for CCT.
2. Viewing angle is the width of half the light output intensity in all directions of  $180^\circ$ .
3. All Cool-White, Neutral-White, Warm-White, and dominant wavelength below 550nm LEDs are made with Indium Gallium Nitride (InGaN).
4. All LEDs with dominant wavelength exceeding 550nm are made with Aluminum Indium Gallium Phosphide (AlInGaP).
5. The range of wavelength in Deep-Red and Royal-Blue is described as peak-wavelength.



## Mechanical Dimension



Bot. view

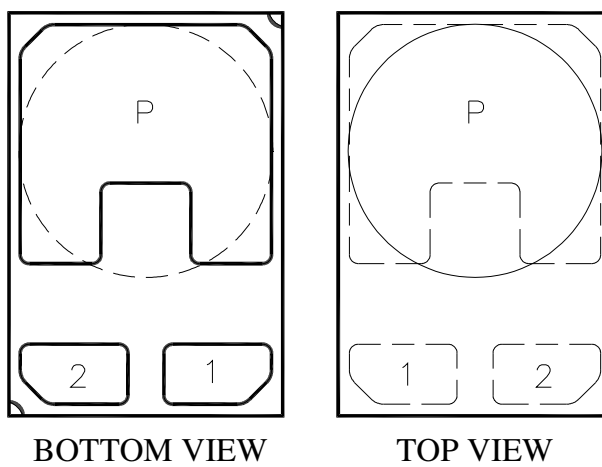


Soldering patterns

### Notes.

1. Dimensions are in millimeters.
2. Tolerances unless mentioned are  $\pm 0.1\text{mm}$ .
3. Do not handle the device by the lens. Incorrect force applied to the lens may lead to the failure of devices.

## Pad Configuration

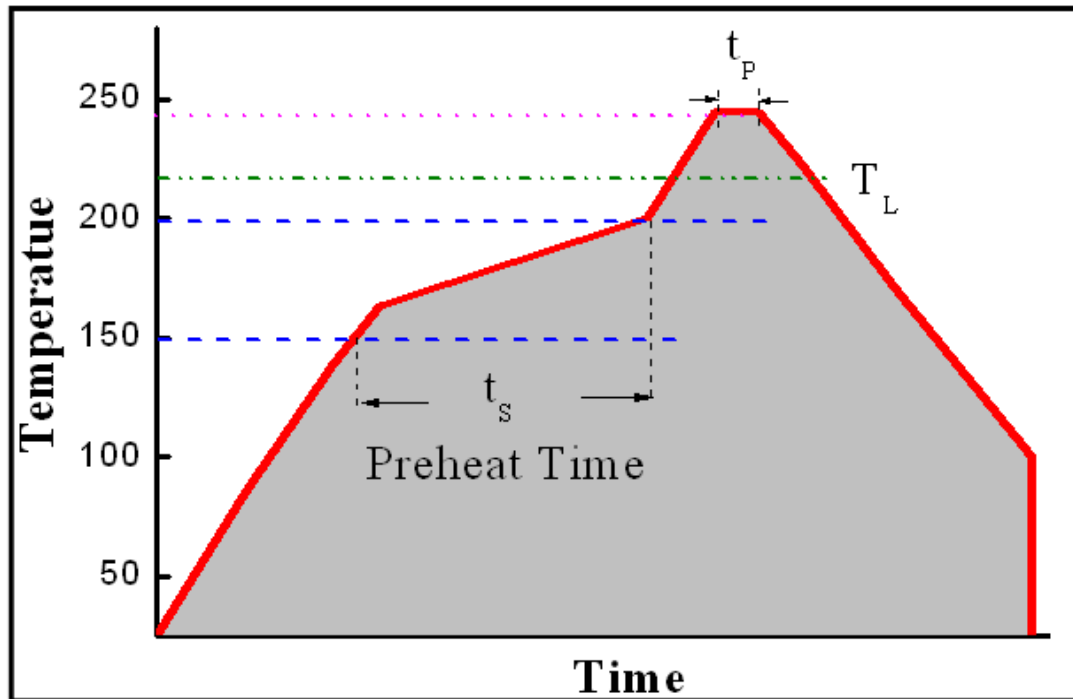


| PAD | FUNCTION    |
|-----|-------------|
| 1   | ANODE       |
| 2   | CATHODE     |
| P   | THERMAL PAD |

## Reflow Soldering Characteristics

### For Reflow Process

- ELSH series are suitable for SMT processes.
- Curing of glue in oven must be according to standard operation flow processes.

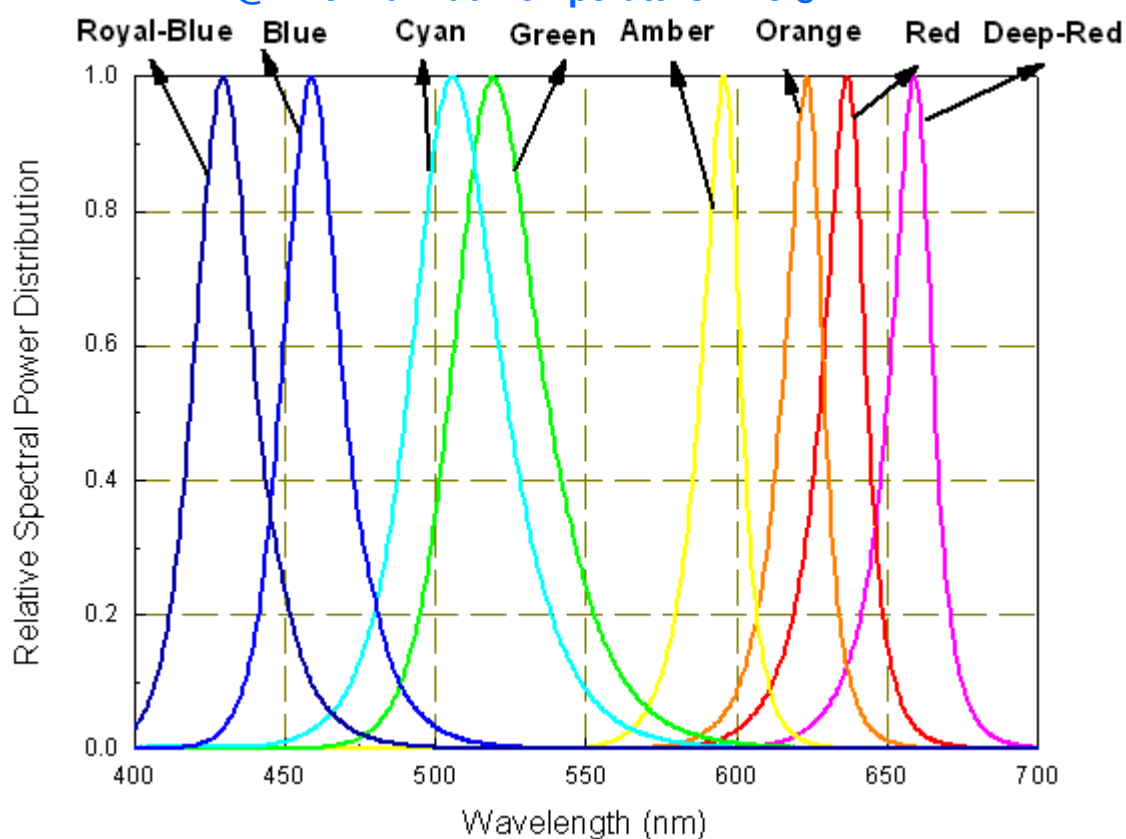


| Profile Feature              | Lead Free Assembly |
|------------------------------|--------------------|
| Ramp-Up Rate                 | 2-3 °C/S           |
| Preheat Temperature          | 150-200 °C         |
| Preheat Time ( $t_s$ )       | 60-120 S           |
| Liquid Temperature ( $T_L$ ) | 217 °C             |
| Time maintained above $T_L$  | 60-90 S            |
| Peak Temperature ( $T_P$ )   | 240±5 °C           |
| Peak Time ( $t_p$ )          | Max 20 S           |
| Ramp-Down Rate               | 3-5 °C/S           |

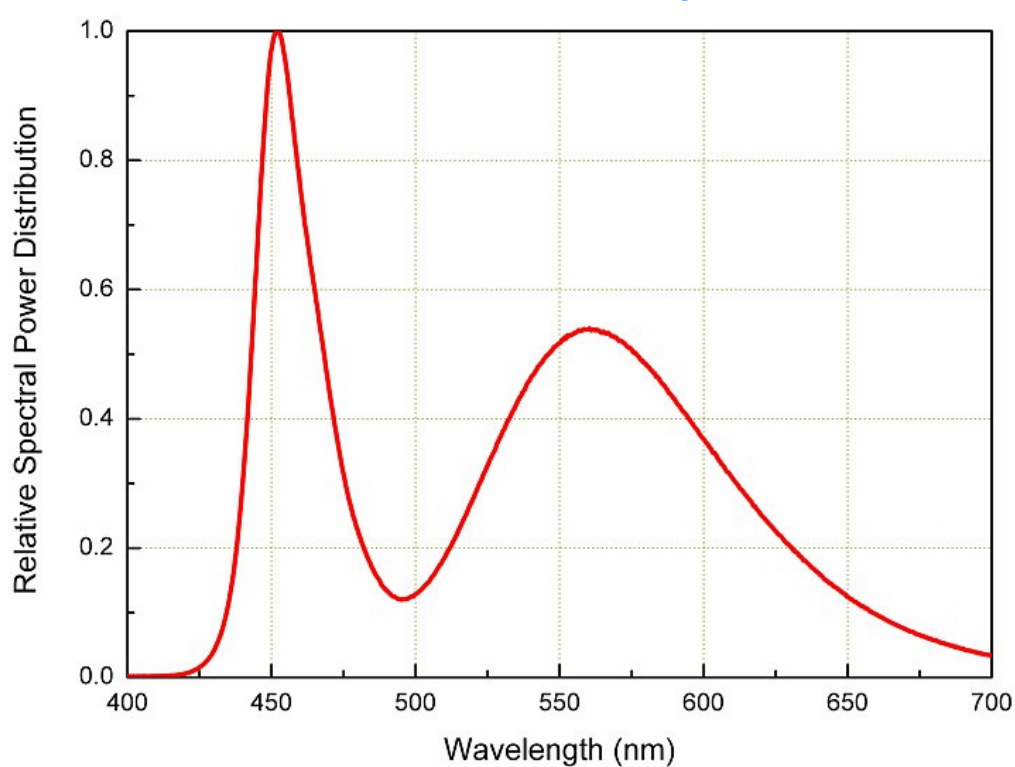
- Reflow soldering should not be done more than twice.
- In soldering process, stress on the LEDs during heating should be avoided.
- After soldering, do not bend the circuit board.

## Wavelength Characteristics

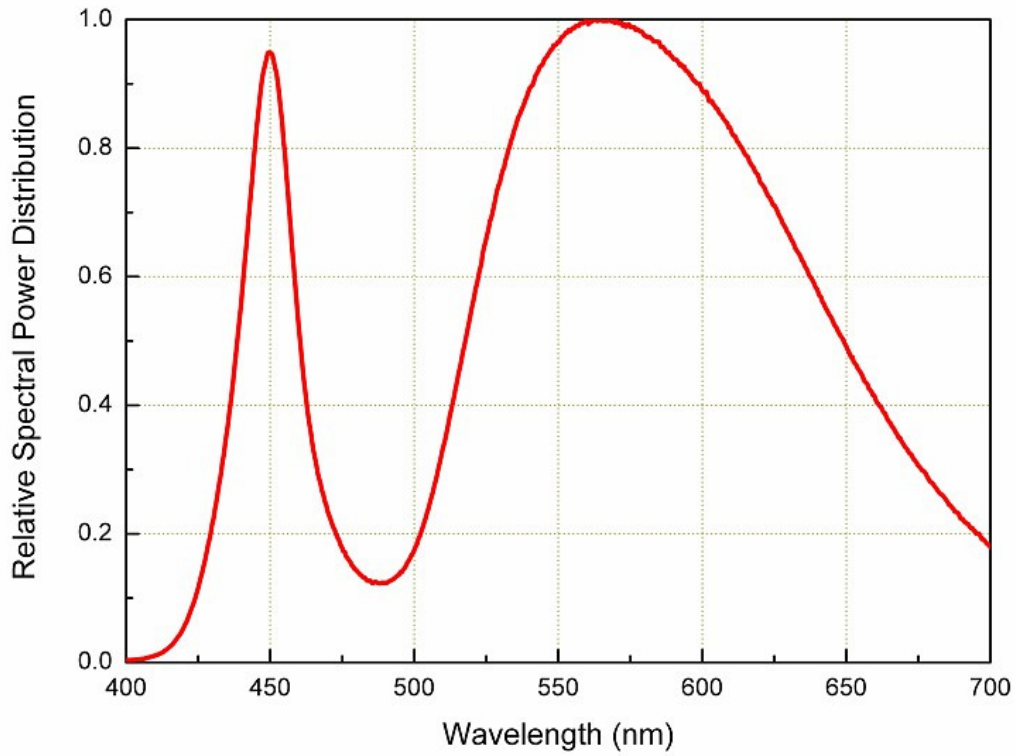
**For Deep-Red, Red, Amber, Yellow, Green, Cyan, Blue, Royal-Blue**  
**@ Thermal Pad Temperature = 25°C**



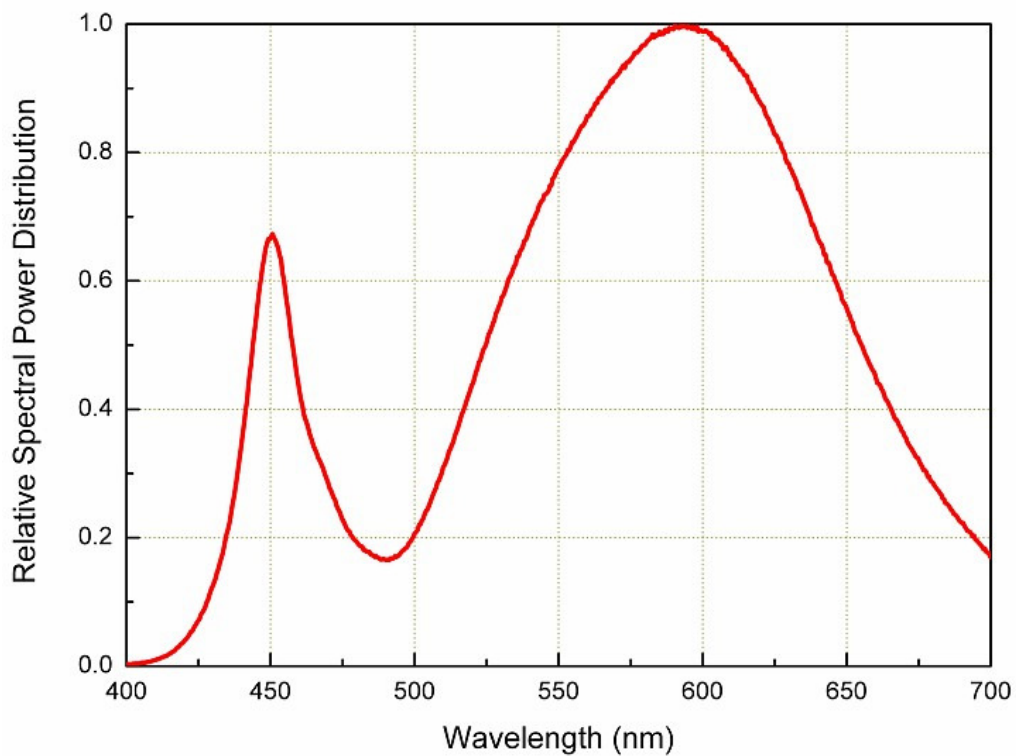
**For Cool-White, @ Thermal Pad Temperature = 25°C**



**For Neutral-White, @ Thermal Pad Temperature = 25°C**

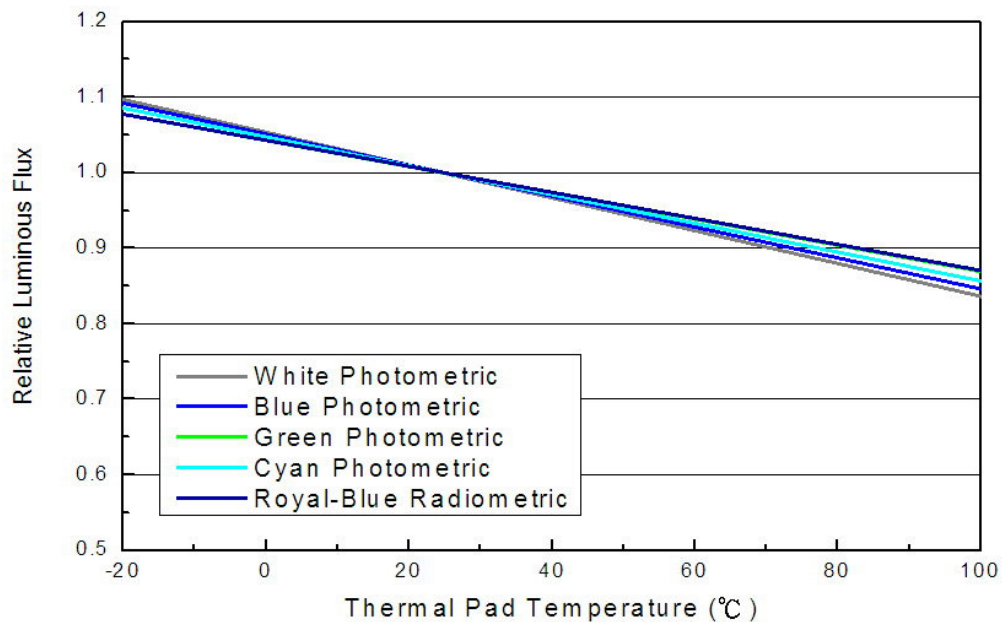


**For Warm-White, @ Thermal Pad Temperature = 25°C**

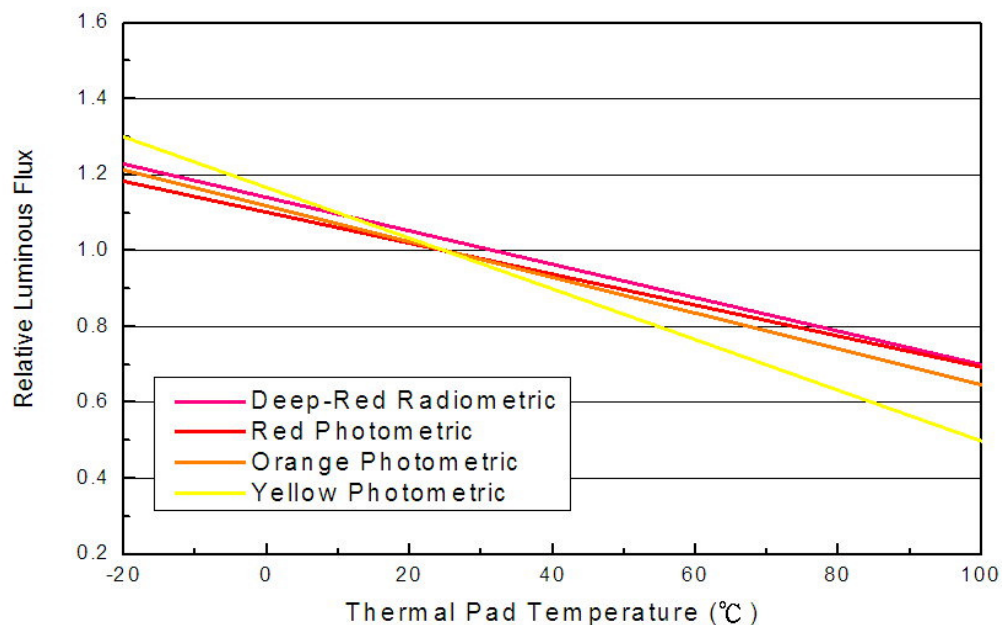


## Typical Light Output Characteristic vs. Thermal Pad Temperature

Cool-White, Neutral-White, Warm-White, Green, Cyan, Blue, Royal-Blue  
for 350mA Drive Current

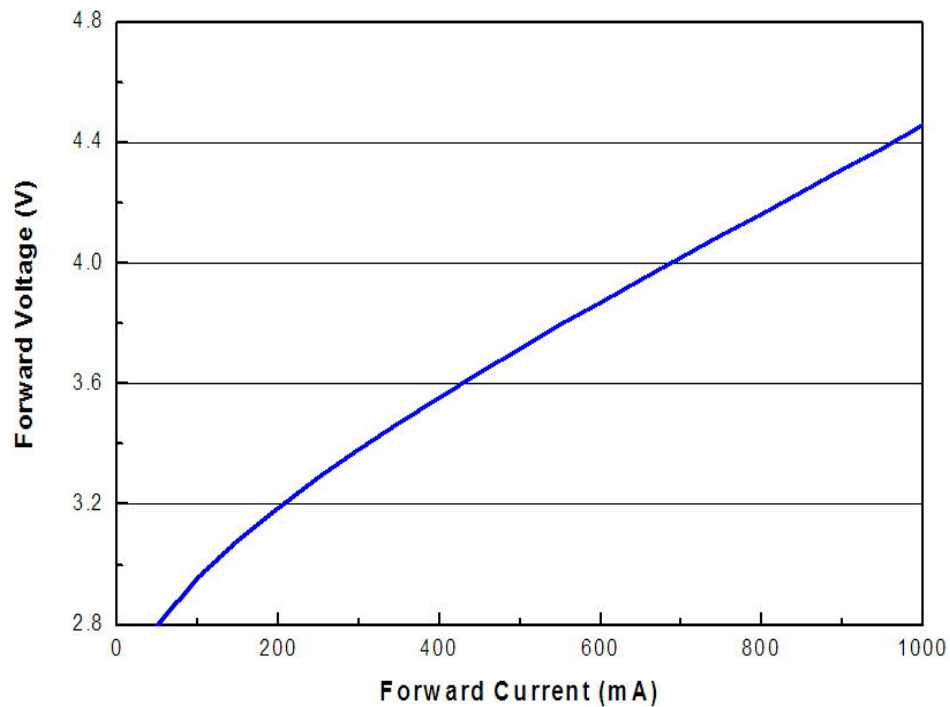


Deep-Red, Red, Orange, Amber for 350mA Drive Current

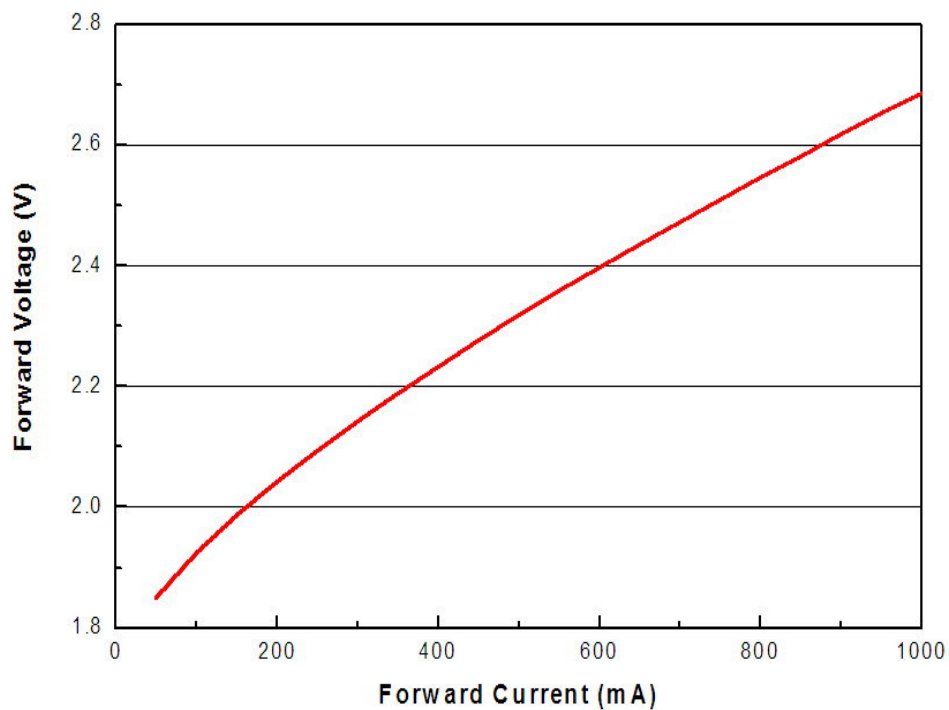


## Typical Electrical Characteristics

For Cool-White, Neutral-White, Warm-White, Green, Cyan, Blue, Royal-Blue  
@ Thermal Pad Temperature = 25°C

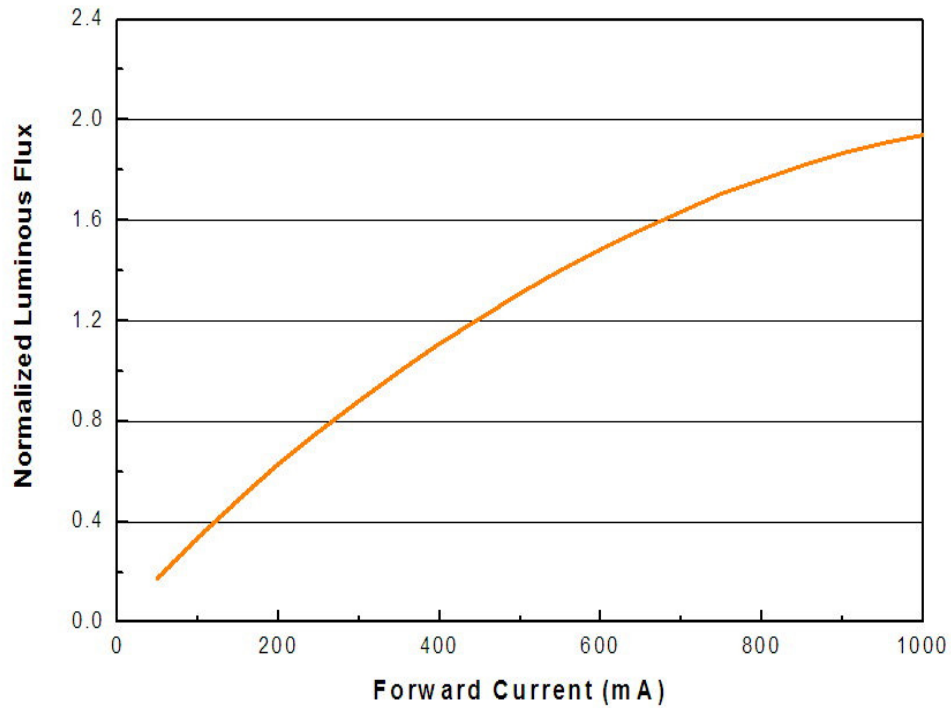


For Far-Red, Deep-Red, Red, Orange, Amber,  
@ Thermal Pad Temperature = 25°C

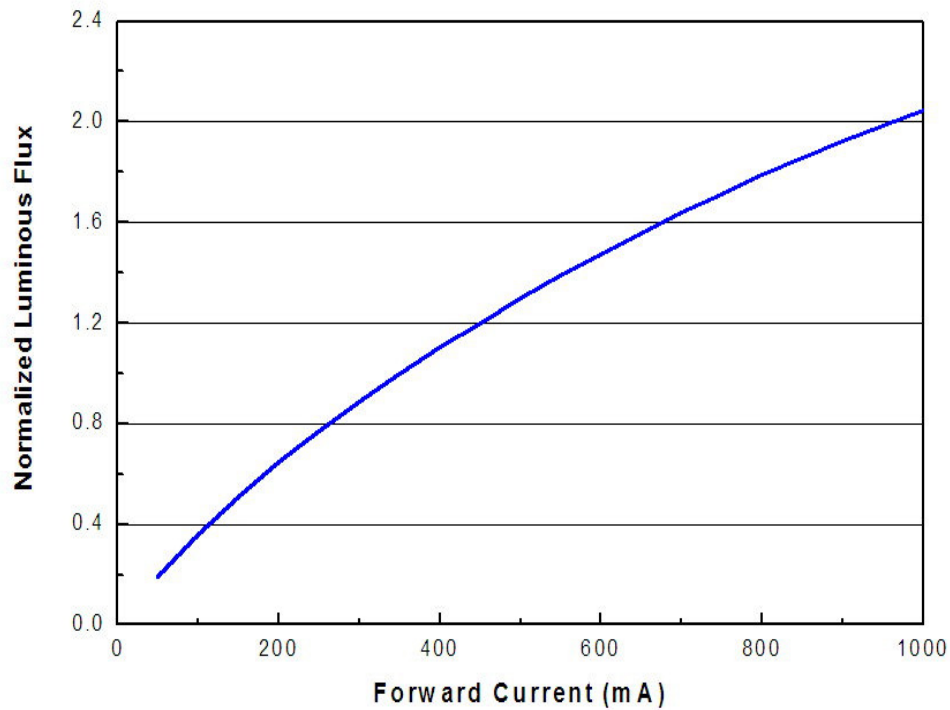


## Typical Relative Luminous Flux vs. Forward Current

For Cool-White, Neutral-White, Warm-White  
@ Thermal Pad Temperature = 25°C

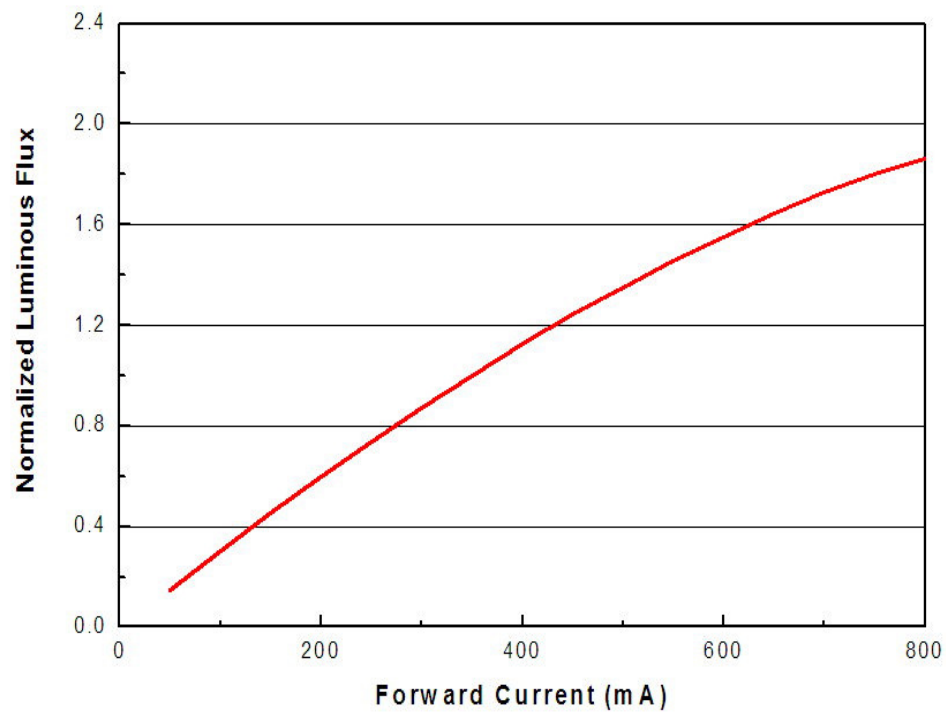


For Green, Cyan, Blue, Royal-Blue @ Thermal Pad Temperature = 25°C



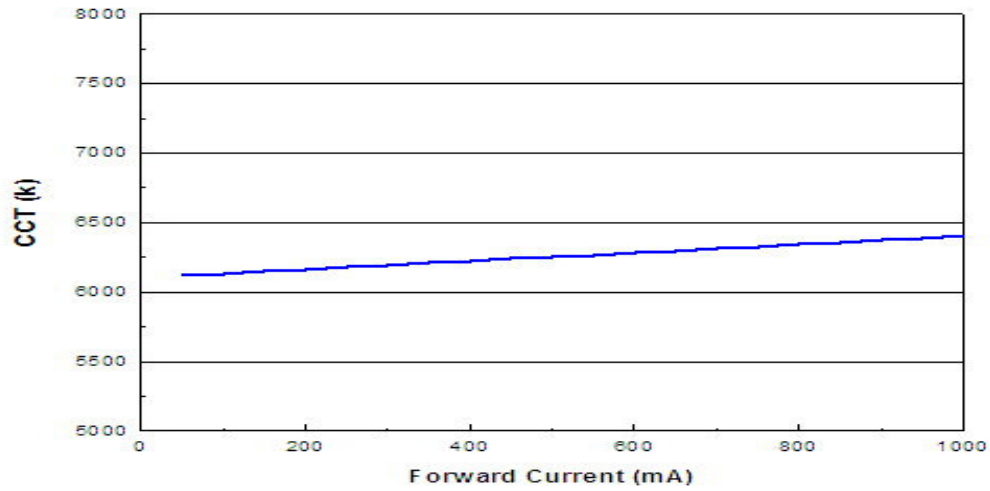


For Far-Red, Deep-Red, Red, Orange, Amber,  
@ Thermal Pad Temperature = 25°C

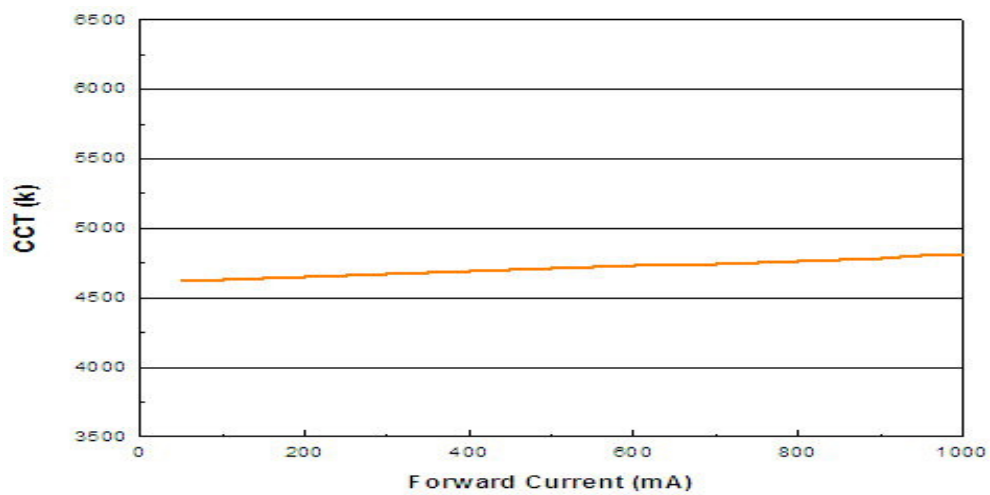


## Typical Wavelength & CCT Shift Characteristics vs. Forward Current

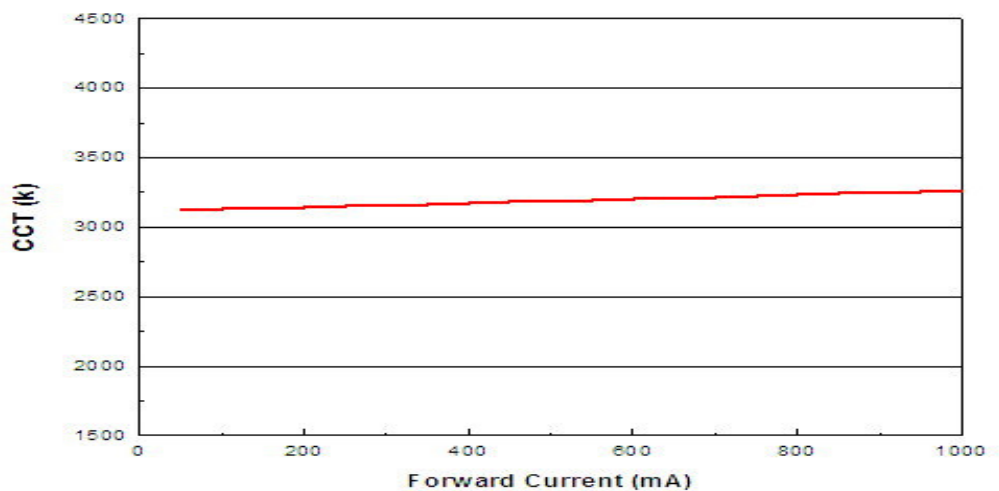
For Cool-White @ Thermal Pad Temperature = 25°C



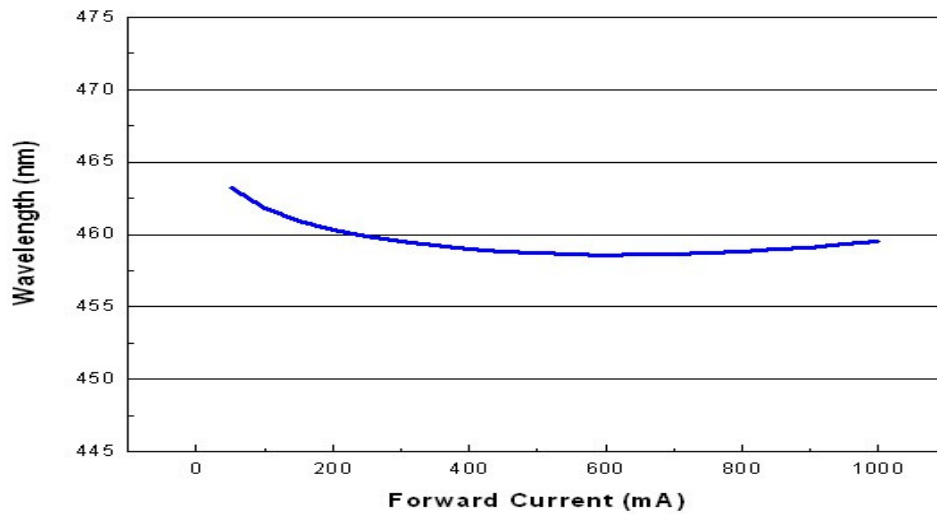
For Neutral-White @ Thermal Pad Temperature = 25°C



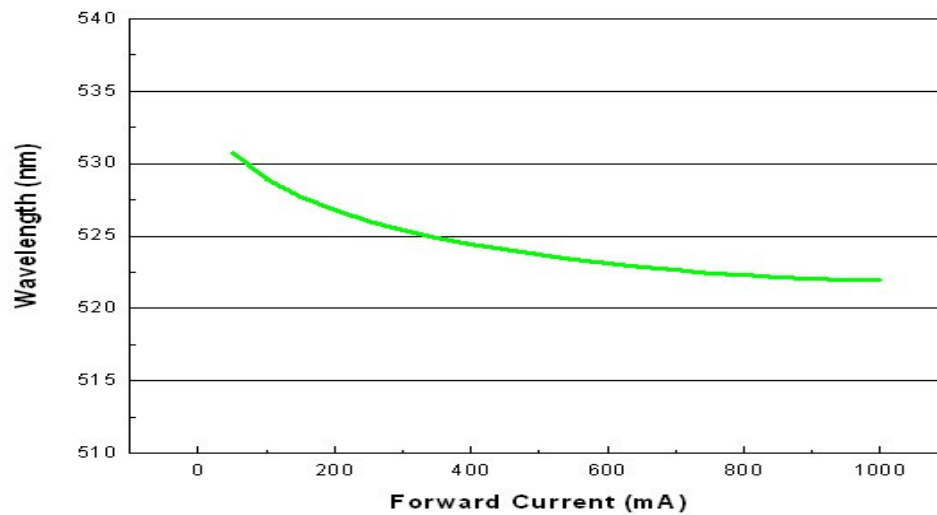
For Warm-White @ Thermal Pad Temperature = 25°C



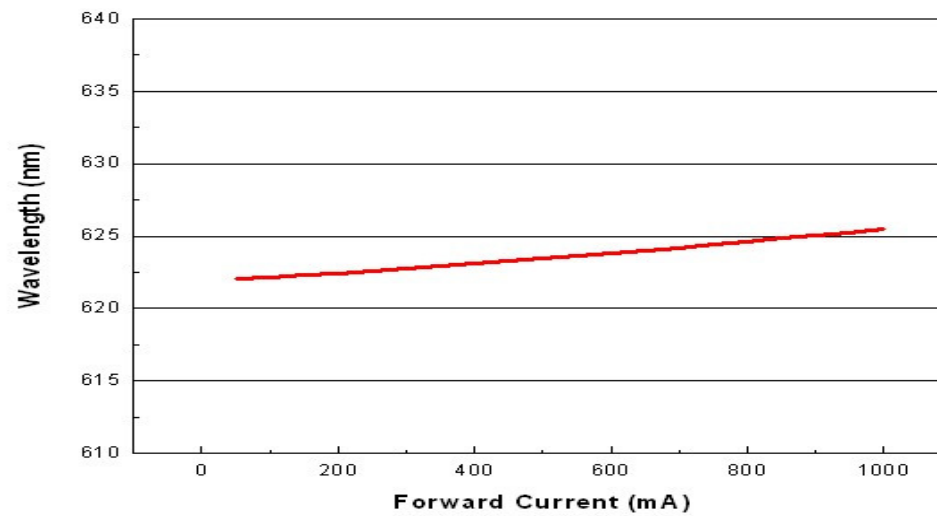
**For Blue @ Thermal Pad Temperature = 25°C**



**For Green @ Thermal Pad Temperature = 25°C**

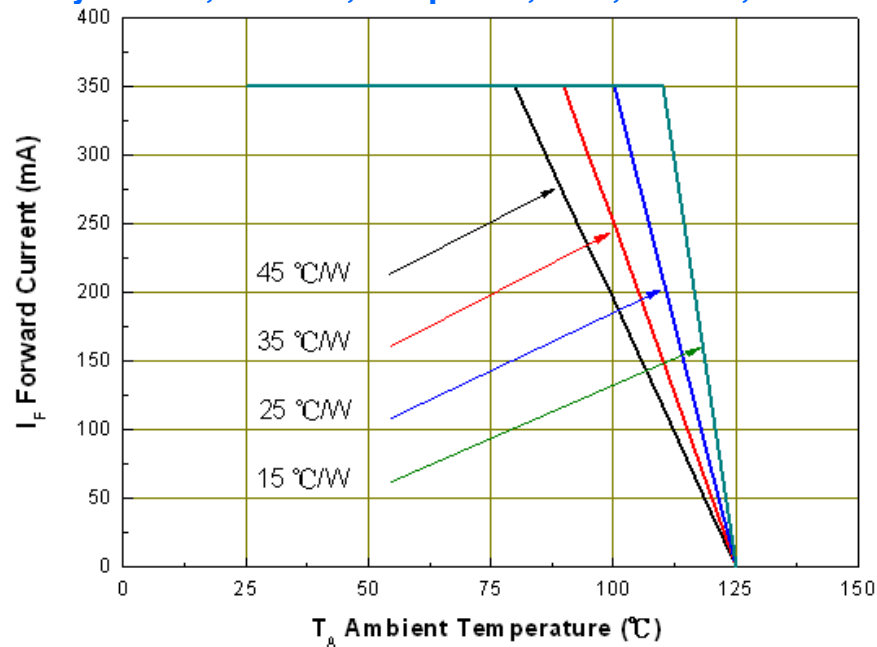


**For Red @ Thermal Pad Temperature = 25°C**



## Current Derating Curves

**Current Derating Curve for 350mA Drive Current**  
**Cool-White, Neutral-White, Warm-White, Green, Cyan, Blue,**  
**Royal-Blue, Far-Red, Deep-Red, Red, Amber, Yellow**

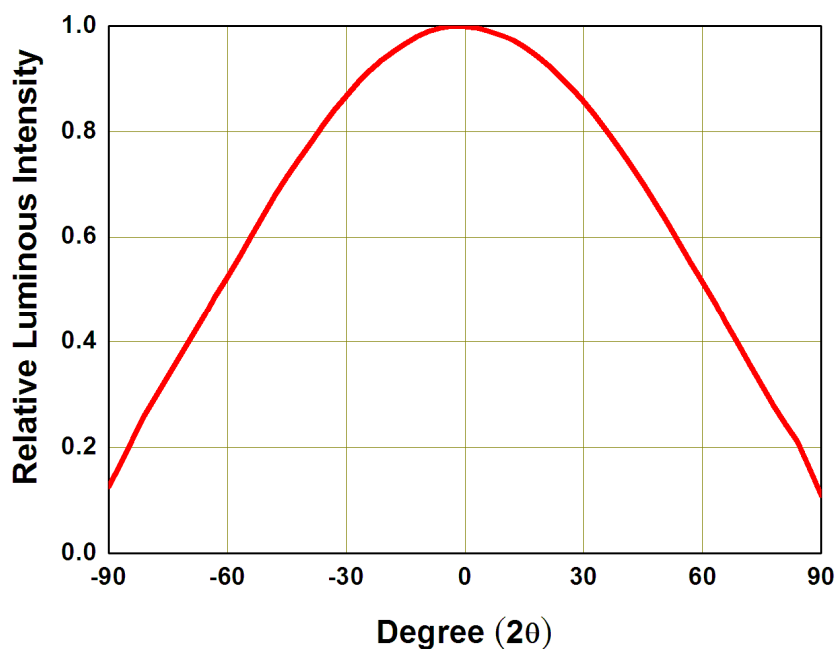


Note:

The current derating curves are depending on the thermal resistance between the junction to the soldering pad.

## Typical Radiation Patterns

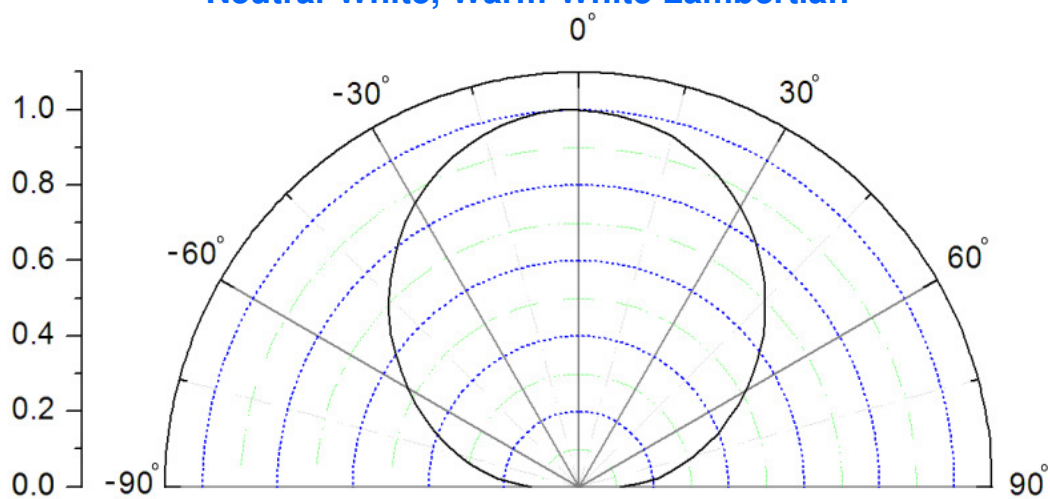
### Typical Spatial Radiation Pattern for Cool-White, Neutral-White, Warm-White Lambertian



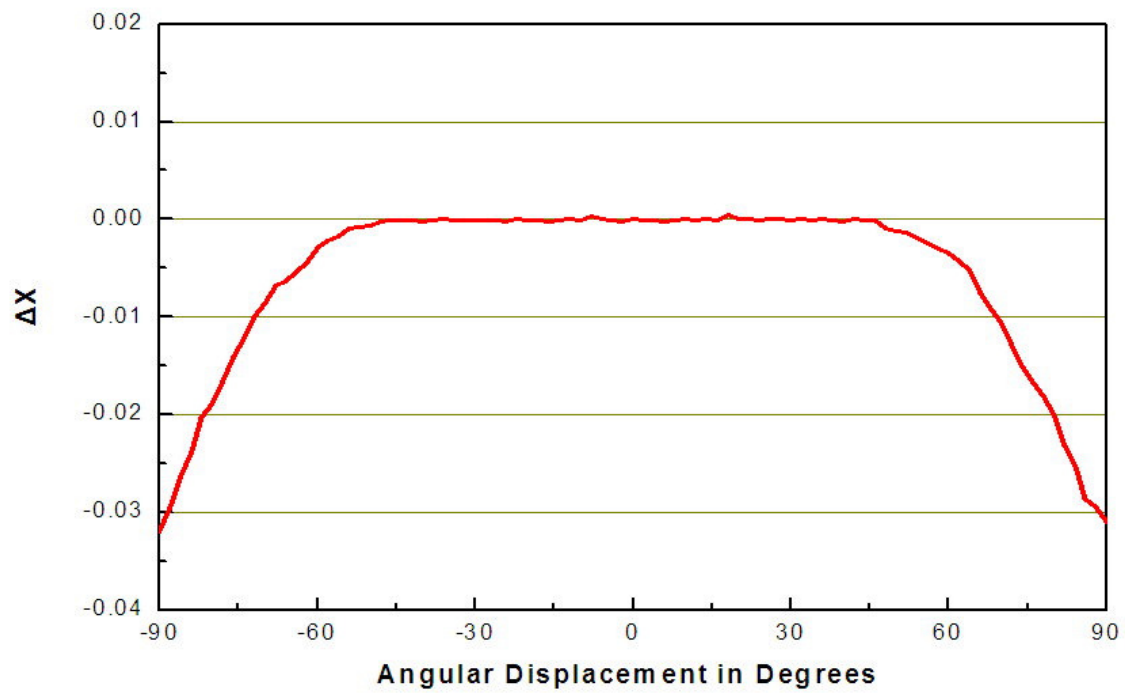
**Notes.**

1.  $2\theta_{1/2}$  is the off axis angle from lamp centerline where the luminous intensity is 1/2 of the peak value.
2. View angle tolerance is  $\pm 5^\circ$ .

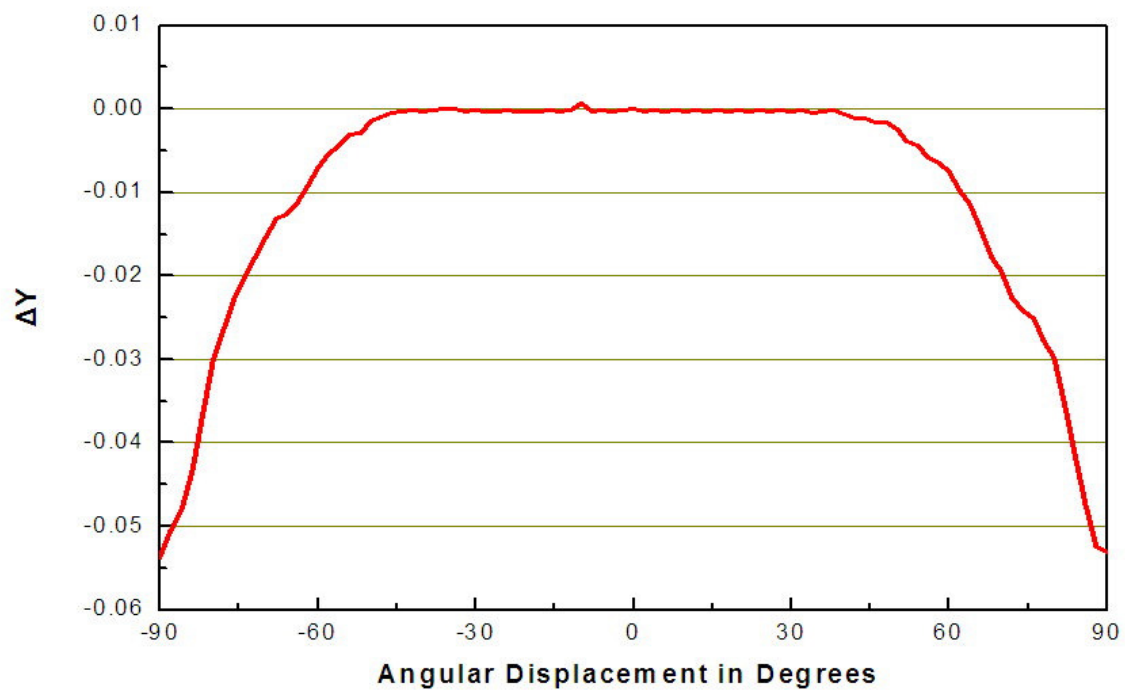
### Typical Polar Radiation Pattern for Cool-White, Neutral-White, Warm-White Lambertian



### Typical Difference of CIE X of Cool-White Versus Angle

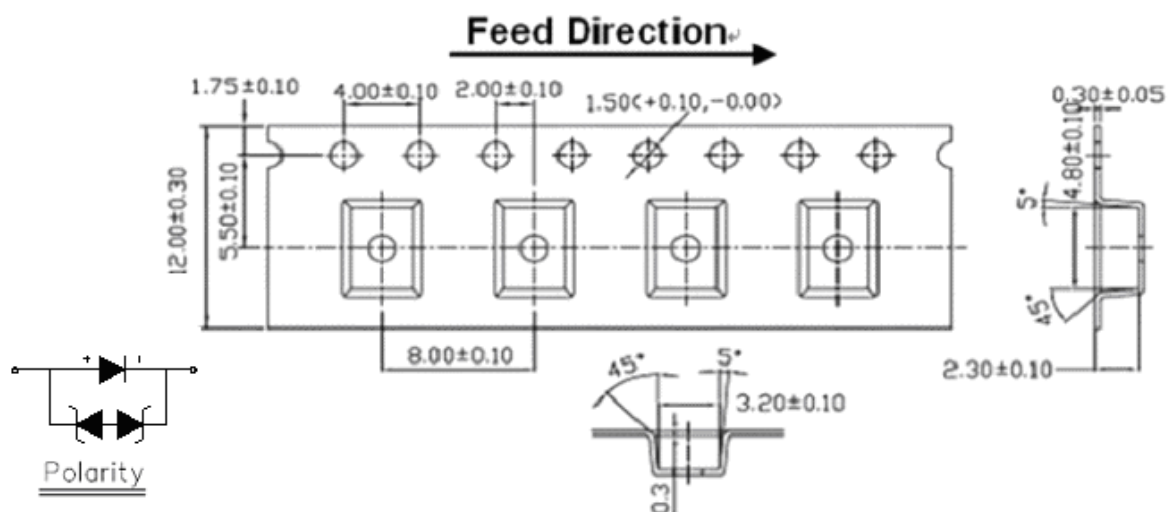


### Typical Difference of CIE Y of Cool-White Versus Angle



## Emitter Tape Packaging

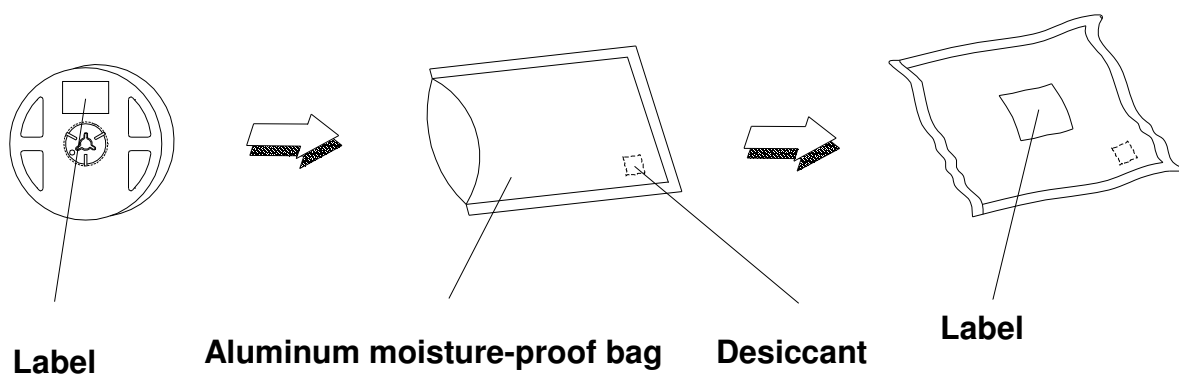
**Carrier Tape Dimensions: Loaded quantity 400 PCS per reel**



### Notes.

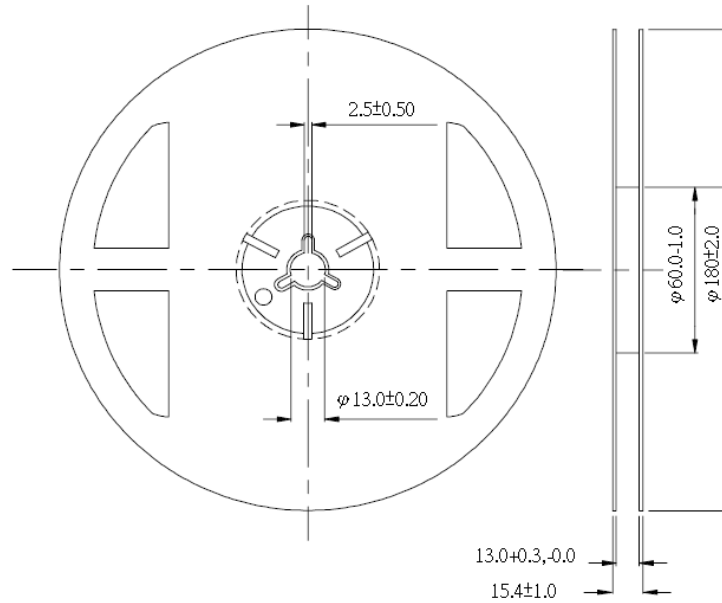
1. Dimensions are in millimeters.
2. Tolerances for fixed dimensions are  $\pm 0.1$  mm.

## Moisture Resistant Packaging



## Emitter Reel Packaging

### Reel Dimensions



#### Notes :

1. Dimensions are in millimeters.
2. Tolerances unless mentioned are  $\pm 0.1$  mm.

## Product Labeling

### Label Explanation

CPN: Customer Specification (when required)

P/N : Everlight Production Number

QTY: Packing Quantity

CAT: Luminous Flux (Brightness) Bin

HUE: Color Bin

REF: Forward Voltage Bin

LOT No: Lot Number

MADE IN TAIWAN: Production Place





## Revision History

Current version: **2010/05/14**  
 Device No. DHE-0000751  
 Rev. 5.0

| Page               | Subjects (major change in previous version)                                          | Date of change |
|--------------------|--------------------------------------------------------------------------------------|----------------|
| 6                  | Added a new PN that reaches CRI 90                                                   | 2010/01/03     |
| 18                 | Created a new feature to recognize the optical center.                               | 2010/02/09     |
| 14 、 4 、 5 、 6 、 7 | Added a new voltage bin group.<br>Luminous Flux Characteristics for the Shuen series | 2010/04/12     |
| 8                  | Added new Deep-Red / Far-Red PN.                                                     | 2010/5/14      |