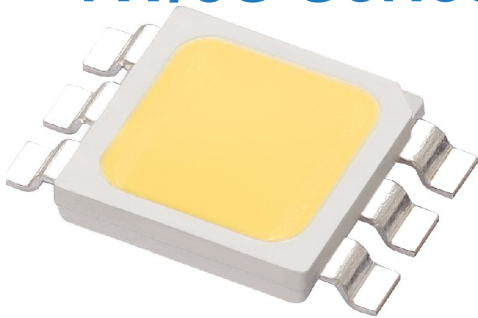


A22

1W/5S Series



Features

- ◆ LM-80 Certified
- ◆ Multi-Chip PLCC Solution
- ◆ Moisture Sensitivity Level: 3
- ◆ Main Parameters: Luminous Flux, Forward Voltage , Chromaticity and Color Rendering Index
- ◆ RoHS compliant
- ◆ Typical viewing angle: 120°

Applications

- ◆ High Wattage Replacement Bulb
- ◆ Down Light
- ◆ Recessed Can Light
- ◆ Low/High Bay Light

Materials

| Items | Description |
|---------------------|-------------------------|
| Encapsulating Resin | Silicone resin |
| Electrodes | Ag plating copper alloy |
| Die attach | Silver paste |
| Chip | InGaN |

Product Nomenclature

The product name is designated as below:

EHP-A22/ ABCDE –FGH/IJKL/MNO/PQ

Designation:

AB = color ^[1]

CDE = internal coding

FGH = power consumption ^[2]

IJKL = color range or CCT Range

MNO = luminous flux bin

PQ = packaging type ^[3]

Notes

1. Table of color offerings:

| Symbol | Color | CCT range | Color Rendering Index |
|--------|---------------|-------------|-----------------------|
| GT | Cool-White | 4745~7050K | >65 |
| KT | Cool-White | 4745~7050K | >80 |
| LM | Warm-White | 2580~3710K | >70 |
| | Neutral-White | 3710K-4745K | |
| KM | Warm White | 2580~3710K | >80 |
| | Neutral-White | 3710K-4745K | |

2. Table of power consumption :

| Symbol | Description |
|--------|-------------|
| P01 | 1W |

3. Table of packaging types:

| Symbol | Description |
|--------|---------------|
| TR | Tape and Reel |

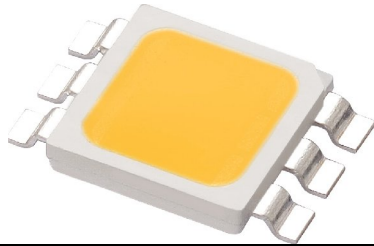
Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|------------------------------|-------------|--------------------|------|
| Max. DC Forward Current (mA) | I_F | 150 | mA |
| Max. Peak Pulse Current (mA) | I_{Pulse} | 200 ^[1] | mA |
| Thermal Resistance | R_{th} | 9 | °C/W |
| Max. Junction Temperature | T_J | 125 | °C |
| Operating Temperature | T_{Opr} | -40 ~ +85 | °C |
| Storage Temperature | T_{Stg} | -40 ~ +100 | °C |
| Max. Solder Pad Temperature | T_{Sol} | 260 | °C |

Notes:

1. t_p 100ms, Duty cycle = 25%

PN of the A22 series: Warm White LEDs



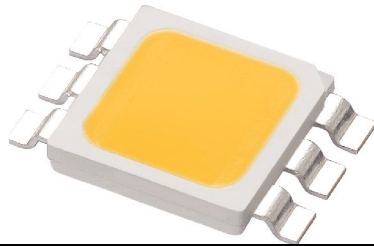
| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|-------------------------------|-------------------------|-------------------------|----------------------------|---------------------|----------------------|------------|
| EHP-A22/KM35H-P01/35K/ K51/TR | 100 | 116 | 35K-1,35K-2 35K-3,35K-4 | 13.5-16.5 | 80 | 80 |
| EHP-A22/KM35H-P01/30K/K51/TR | 100 | 114 | 30K-1,30K-2 30K-3,30K-4 | 13.5-16.5 | 80 | 80 |
| EHP-A22/KM35H-P01/30K/K52/TR | 110 | 121 | 30K-1,30K-2 30K-3,30K-4 | 13.5-16.5 | 80 | 80 |
| EHP-A22/KM35H-P01/27K/K43/TR | 95 | 107 | 27K-1,27K-2 27K-3,27K-4 | 13.5-16.5 | 80 | 80 |

| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|-------------------------------|-------------------------|-------------------------|----------------------------|---------------------|----------------------|------------|
| EHP-A22/KM35H-P01/35K/ K51/TR | 180 | 198 | 35K-1,35K-2 35K-3,35K-4 | 14.7-17.7 | 150 | 80 |
| EHP-A22/KM35H-P01/30K/K51/TR | 180 | 197 | 30K-1,30K-2 30K-3,30K-4 | 14.7-17.7 | 150 | 80 |
| EHP-A22/KM35H-P01/30K/K52/TR | 180 | 210 | 30K-1,30K-2 30K-3,30K-4 | 14.7-17.7 | 150 | 80 |
| EHP-A22/KM35H-P01/27K/K43/TR | 160 | 181 | 27K-1,27K-2 27K-3,27K-4 | 14.7-17.7 | 150 | 80 |

Notes:

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. The CRI value is based on the Everlight testing instrument.
5. CRI measurement tolerance: ± 2
6. Luminous Flux are reference only at IF=150 mA operation.

PN of the A22 series: Neutral White LEDs



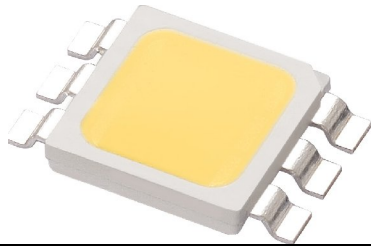
| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|------------------------------|-------------------------|-------------------------|----------------------------|---------------------|----------------------|------------|
| EHP-A22/KM35H-P01/45K/K51/TR | 100 | 117 | 45K-1,45K-2 45K-3,45K-4 | 13.5-16.5 | 80 | 80 |
| EHP-A22/KM35H-P01/40K/K51/TR | 100 | 116 | 40K-1,40K-2 40K-3,40K-4 | 13.5-16.5 | 80 | 80 |

| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|------------------------------|-------------------------|-------------------------|----------------------------|---------------------|----------------------|------------|
| EHP-A22/KM35H-P01/45K/K51/TR | 180 | 205 | 45K-1,45K-2 45K-3,45K-4 | 14.7-17.7 | 150 | 80 |
| EHP-A22/KM35H-P01/40K/K51/TR | 180 | 199 | 40K-1,40K-2 40K-3,40K-4 | 14.7-17.7 | 150 | 80 |

Notes:

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. The CRI value is based on the Everlight testing instrument.
5. CRI measurement tolerance: ± 2
6. Luminous Flux are reference only at IF=150 mA operation.

PN of the A22 series: Cool-White LEDs



| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|------------------------------|-------------------------|-------------------------|------------------------------|---------------------|----------------------|------------|
| EHP-A22/GT35H-P01/65K/K53/TR | 120 | 132 | 65K-1, 65K-2 65K-3, 65K-4 | 13.5-16.5 | 80 | 65 |
| EHP-A22/GT35H-P01/57K/N11/TR | 130 | 136 | 57K-1, 57K-2 57K-3, 57K-4 | 13.5-16.5 | 80 | 65 |
| EHP-A22/GT35H-P01/57K/N12/TR | 140 | 144 | 57K-1, 57K-2 57K-3, 57K-4 | 13.5-16.5 | 80 | 65 |
| EHP-A22/GT35H-P01/50K/K53/TR | 120 | 131 | 50K-1, 50K-2 50K-3, 50K-4 | 13.5-16.5 | 80 | 65 |
| EHP-A22/KT35H-P01/57K/K53/TR | 120 | 124 | 57K-1, 57K-2 57K-3, 57K-4 | 13.5-16.5 | 80 | 80 |

| Order Code of A22 | Min. Luminous Flux (lm) | Typ. Luminous Flux (lm) | CCT (K) Wavelength (nm) | Forward Voltage (V) | Forward Current (mA) | CRI (Min.) |
|------------------------------|-------------------------|-------------------------|------------------------------|---------------------|----------------------|------------|
| EHP-A22/GT35H-P01/65K/K53/TR | 200 | 230 | 65K-1, 65K-2 65K-3, 65K-4 | 14.7-17.7 | 150 | 65 |
| EHP-A22/GT35H-P01/57K/N11/TR | 200 | 243 | 57K-1, 57K-2 57K-3, 57K-4 | 14.7-17.7 | 150 | 65 |
| EHP-A22/GT35H-P01/57K/N12/TR | 225 | 254 | 57K-1, 57K-2 57K-3, 57K-4 | 14.7-17.7 | 150 | 65 |
| EHP-A22/GT35H-P01/50K/K53/TR | 200 | 236 | 50K-1, 50K-2 50K-3, 50K-4 | 14.7-17.7 | 150 | 65 |
| EHP-A22/KT35H-P01/57K/K53/TR | 200 | 221 | 57K-1, 57K-2 57K-3, 57K-4 | 14.7-17.7 | 150 | 80 |

Notes:

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. The CRI value is based on the Everlight testing instrument.
5. CRI measurement tolerance: ± 2
6. Luminous Flux are reference only at IF=150 mA operation.

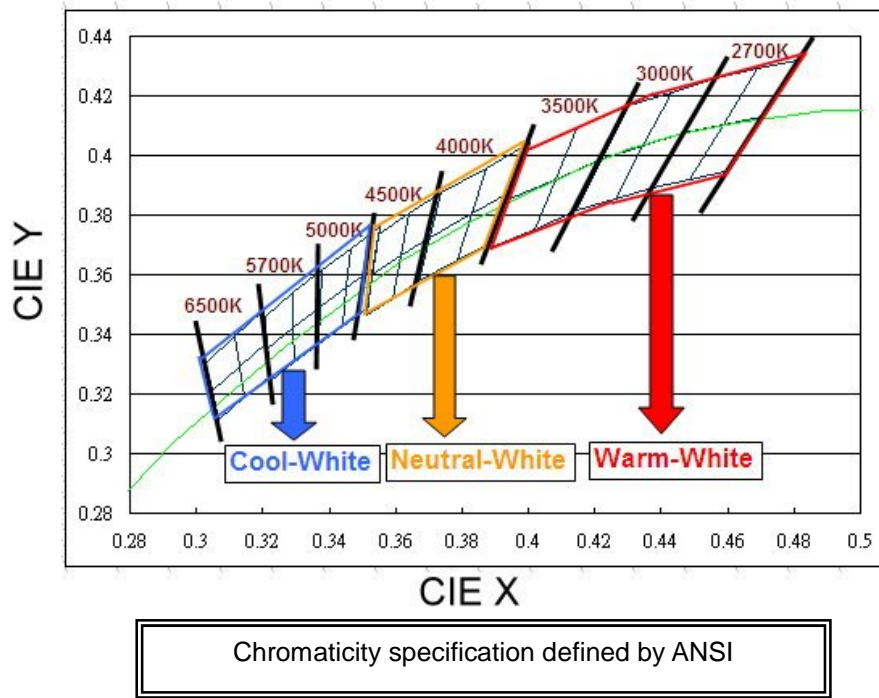
Product Binning

Luminous Flux Bins

| Group | Bin | Min | Typ. | Max |
|-------|-----|-----|------|-----|
| E | 1 | 1.5 | ---- | 3 |
| | 2 | 3 | ---- | 4 |
| | 3 | 4 | ---- | 5 |
| | 4 | 5 | ---- | 6 |
| | 5 | 6 | ---- | 8 |
| F | 1 | 8 | ---- | 10 |
| | 2 | 10 | ---- | 13 |
| | 3 | 13 | ---- | 17 |
| | 4 | 17 | ---- | 20 |
| | 5 | 20 | ---- | 23 |
| J | 1 | 23 | ---- | 27 |
| | 2 | 27 | ---- | 33 |
| | 3 | 33 | ---- | 39 |
| | 4 | 39 | ---- | 45 |
| | 5 | 45 | ---- | 52 |
| K | 1 | 52 | ---- | 60 |
| | 2 | 60 | ---- | 70 |
| | 31 | 70 | ---- | 75 |
| | 32 | 75 | ---- | 80 |
| | 33 | 80 | ---- | 85 |
| | 41 | 85 | ---- | 90 |
| | 42 | 90 | ---- | 95 |
| | 43 | 95 | ---- | 100 |
| | 51 | 100 | ---- | 110 |
| | 52 | 110 | ---- | 120 |
| | 53 | 120 | ---- | 130 |

| Group | Bin | Min | Typ. | Max |
|-------|-----|------|------|------|
| N | 11 | 130 | ---- | 140 |
| | 12 | 140 | ---- | 150 |
| | 13 | 150 | ---- | 160 |
| | 21 | 160 | ---- | 180 |
| | 22 | 180 | ---- | 200 |
| | 31 | 200 | ---- | 225 |
| | 32 | 225 | ---- | 250 |
| | 41 | 250 | ---- | 275 |
| | 42 | 275 | ---- | 300 |
| | 51 | 300 | ---- | 350 |
| R | 52 | 350 | ---- | 400 |
| | 1 | 400 | ---- | 500 |
| | 2 | 500 | ---- | 600 |
| | 3 | 600 | ---- | 750 |
| | 4 | 750 | ---- | 1000 |
| | 5 | 1000 | ---- | 1300 |

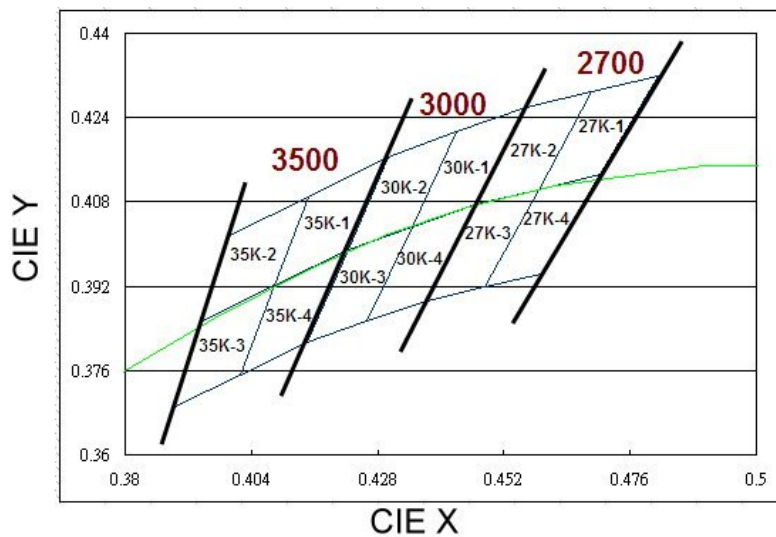
White Bin Structure



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 : ± 0.01
5. Color bins are defined at $I_f=80\text{mA}$ operation.

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

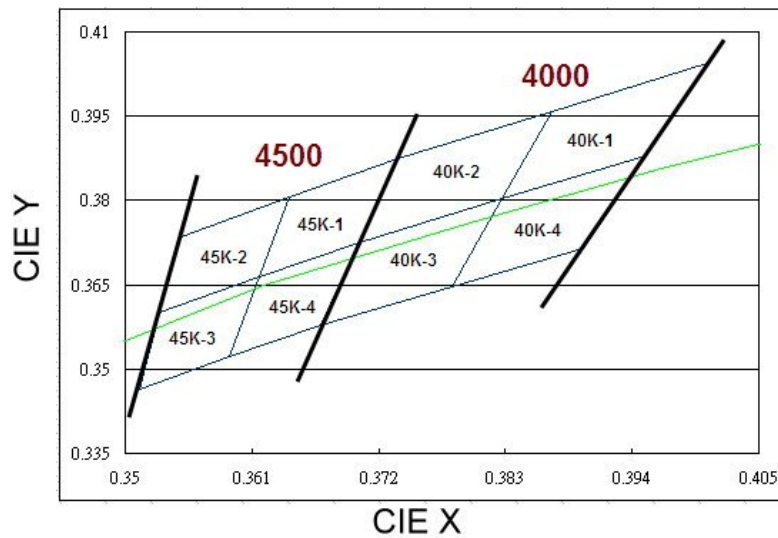
| Bin | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 35K-1 | 0.415 | 0.409 |
| | 0.408 | 0.392 |
| | 0.422 | 0.399 |
| | 0.430 | 0.417 |
| Reference Range: 3220~3500K | | |

| 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 | | |

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

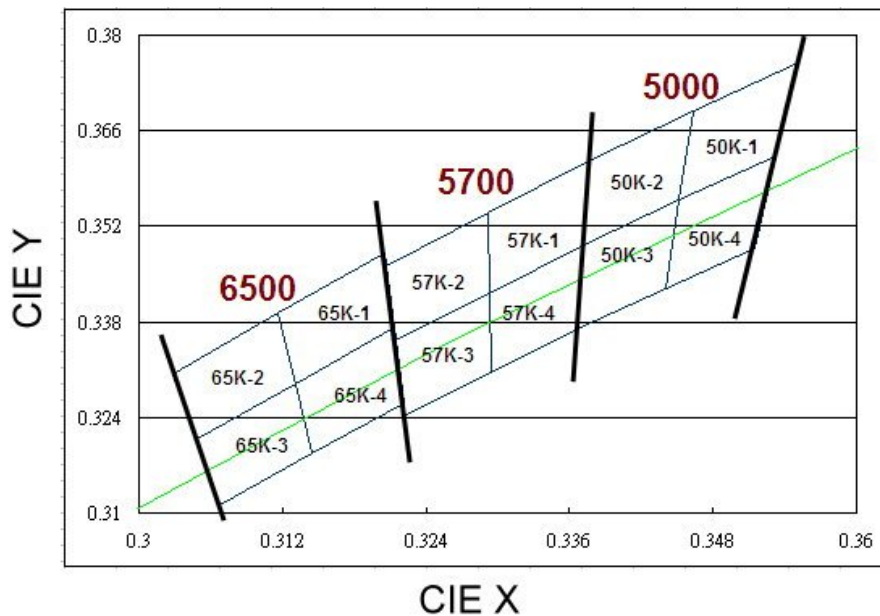
| Bin | CIE X | CIE Y |
|-----------------------------|-------|-------|
| 45K-1 | 0.364 | 0.381 |
| | 0.362 | 0.366 |
| | 0.370 | 0.373 |
| | 0.374 | 0.387 |
| Reference Range: 4260~4500K | | |

| 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 | | |

Cool-White Bin Structure



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 |
| | 0.322 | 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 | 0.322 | 0.335 |
| | 0.322 | 0.324 |
| | 0.329 | 0.331 |
| | 0.329 | 0.342 |
| Reference Range: 5700~6020K | | |

Cool-White Bin Coordinates

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 |
| | 0.315 | 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 |
| | 0.315 | 0.319 |
| | 0.313 | 0.329 |
| Reference Range: 6500~7050K | | |

Notes:

1. Color coordinates measurement allowance : ± 0.01 .

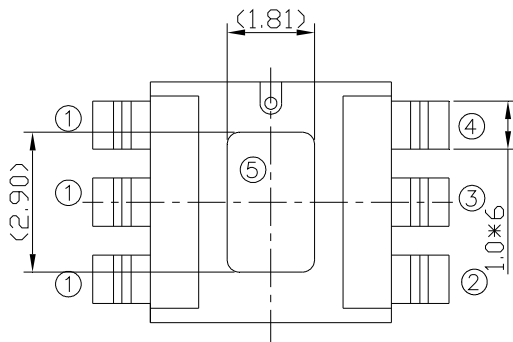
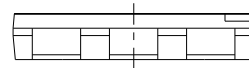
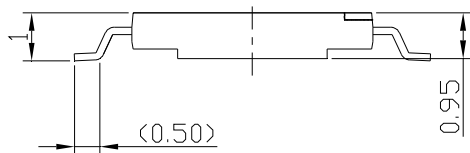
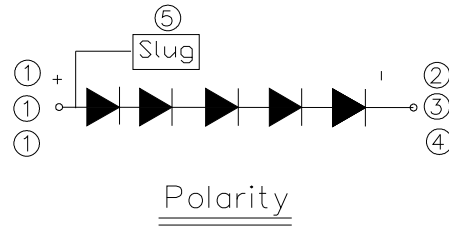
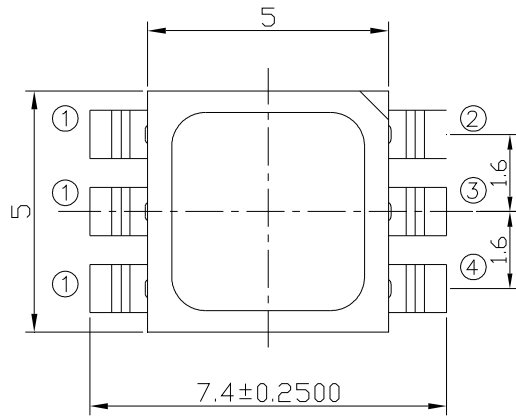
Forward Voltage Bins

| Bin | | Minimum Forward Voltage (V) | Maximum Forward Voltage (V) |
|-----|------|-----------------------------|-----------------------------|
| VD | | 13.5 | 14.7 |
| VE | | 14.7 | 15.9 |
| VF | VF-1 | 15.9 | 16.2 |
| | VF-2 | 16.2 | 16.5 |
| | VF-3 | 16.5 | 16.8 |
| | VF-4 | 16.8 | 17.1 |
| VG | VG-1 | 17.1 | 17.4 |
| | VG-2 | 17.4 | 17.7 |
| | VG-3 | 17.7 | 18.0 |
| | VG-4 | 18.0 | 18.3 |

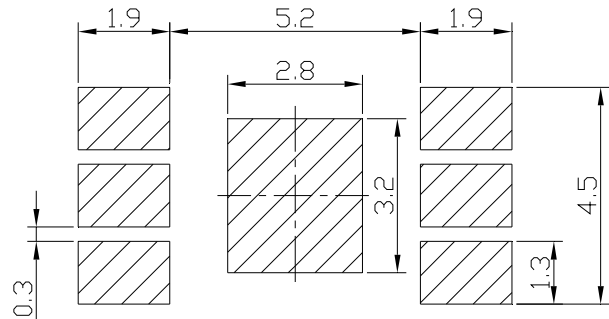
Notes:

1. Forward voltage measurement tolerance: $\pm 0.1V$.
2. Forward voltage bins are defined at $I_F=80mA$ operation.

Mechanical Dimension



Bot. view



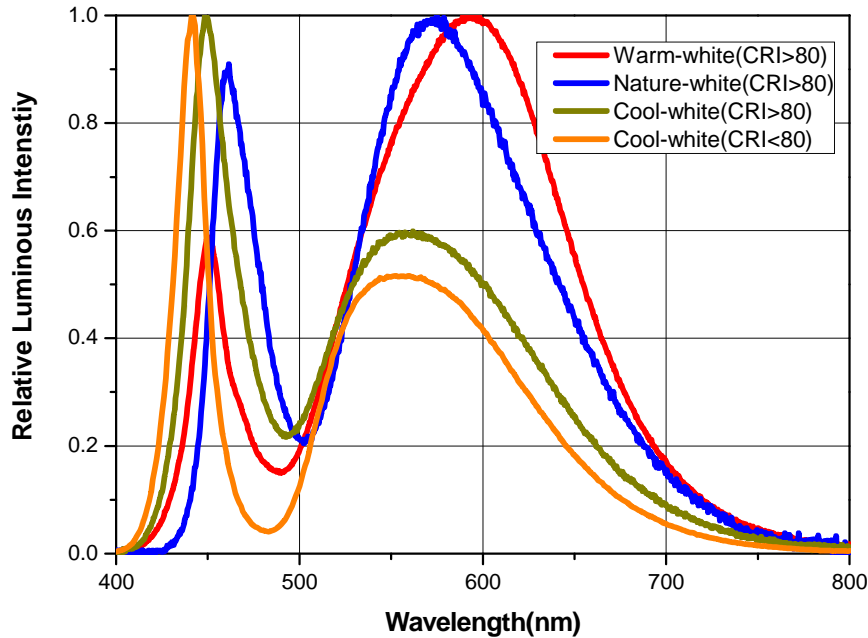
Soldering patterns

Notes.

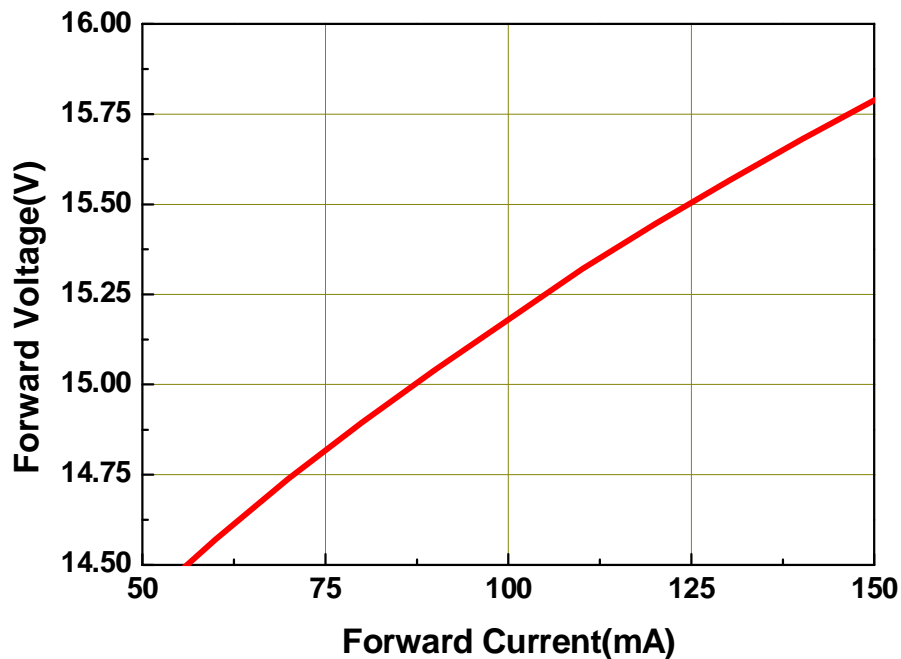
1. Dimensions are in millimeters.
2. Tolerances for fixed dimensions are $\pm 0.25\text{mm}$

Typical Electro-Optical Characteristic Curve

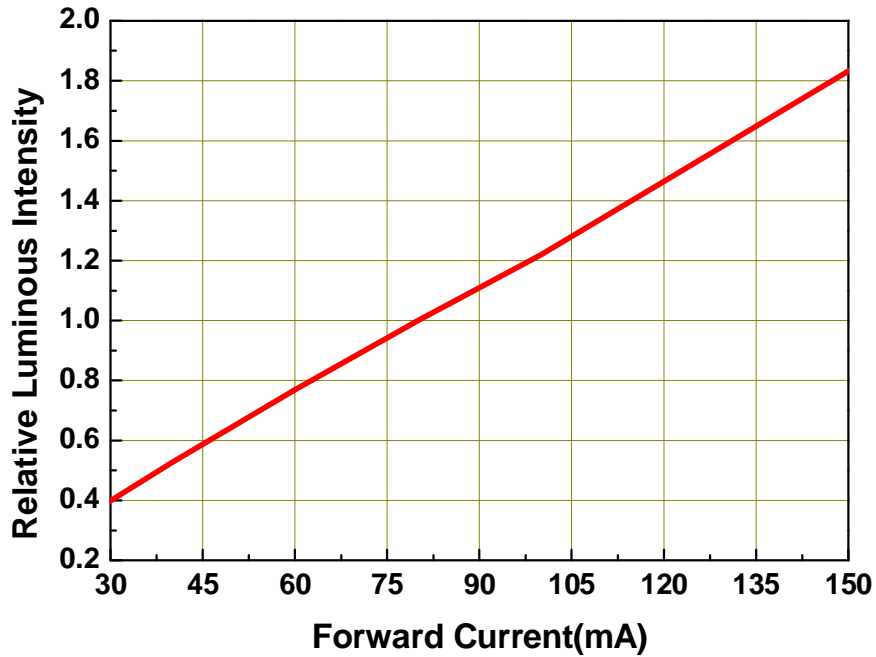
Relative Spectral Distribution
@ Solder Pad Temperature = 25



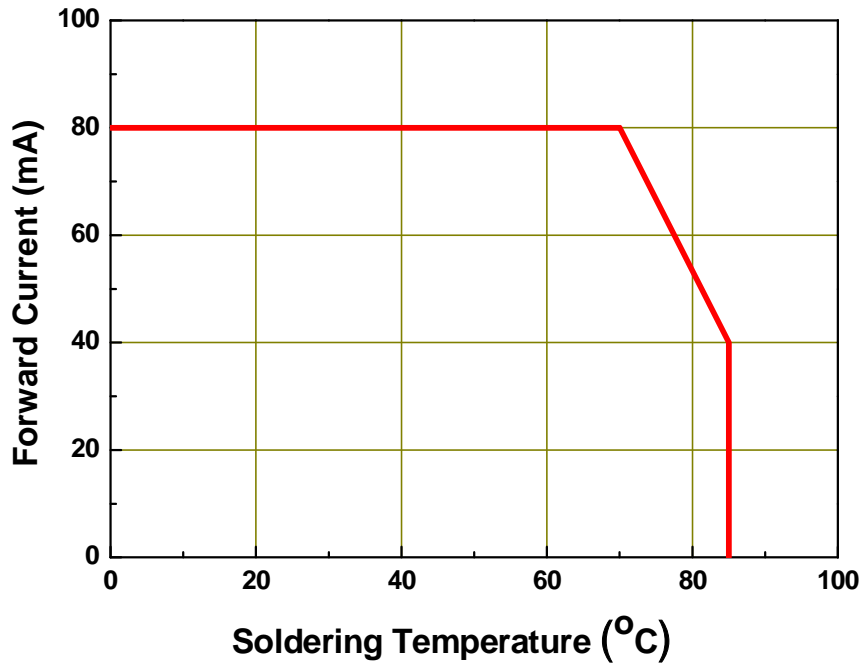
Forward Voltage vs. Forward Current
@ Solder Pad Temperature = 25



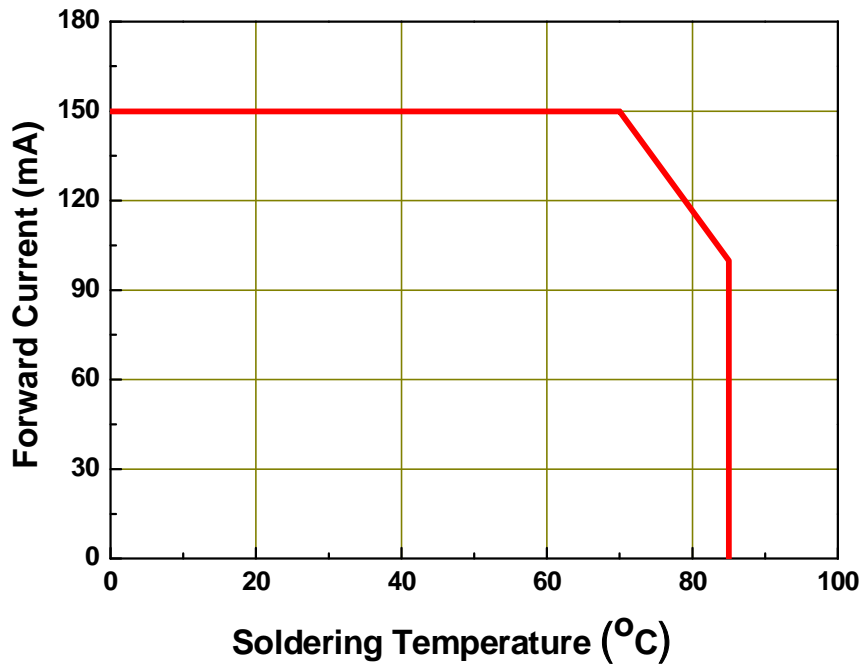
Relative Luminous Flux vs. Forward Current
@ Solder Pad Temperature = 25



Forward Current Derating Curve , IF=80mA
@ Junction Temperature <125

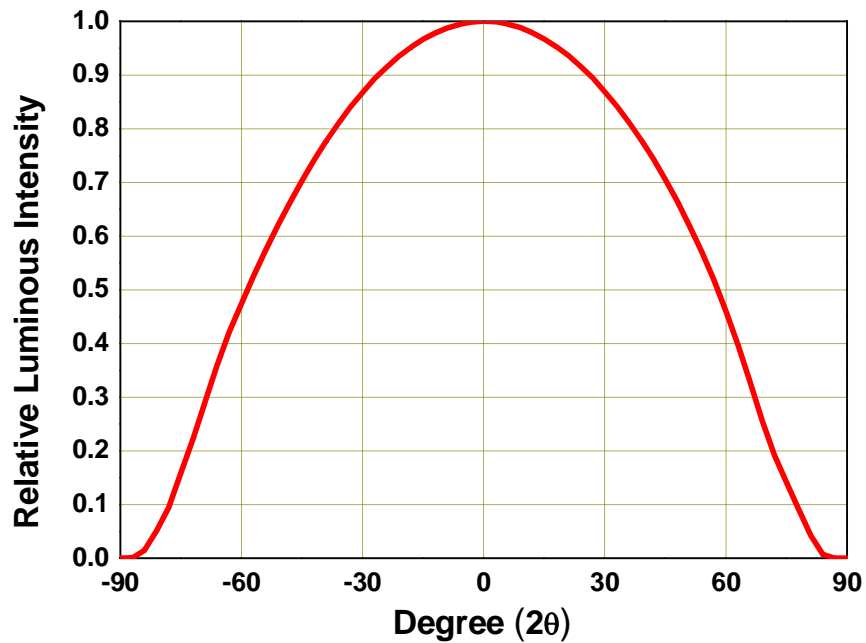


Forward Current Derating Curve , IF=150mA @ Junction Temperature <125



*Reference Only

Typical Diagram Characteristics of Radiation Patterns



Note:

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. Viewing angle tolerance is $\pm 5^\circ$

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

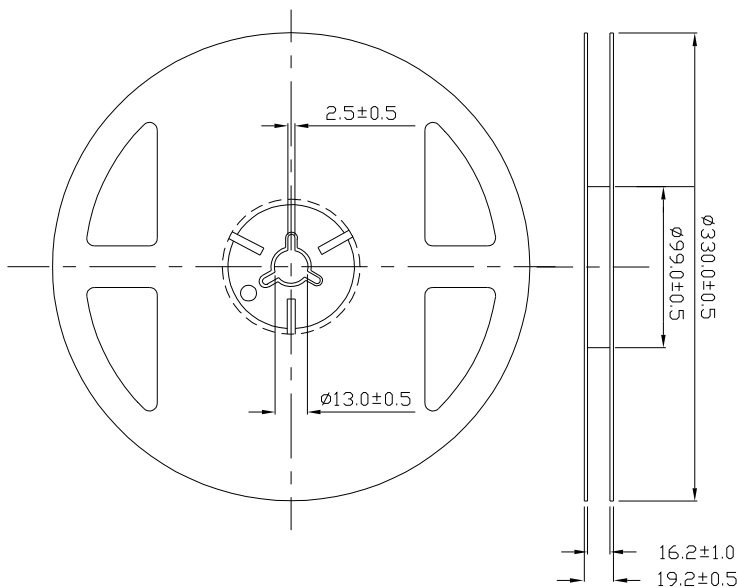
REF: Forward Voltage Bin

LOT No: Lot Number

MADE IN TAIWAN: Production Place



Reel Dimensions

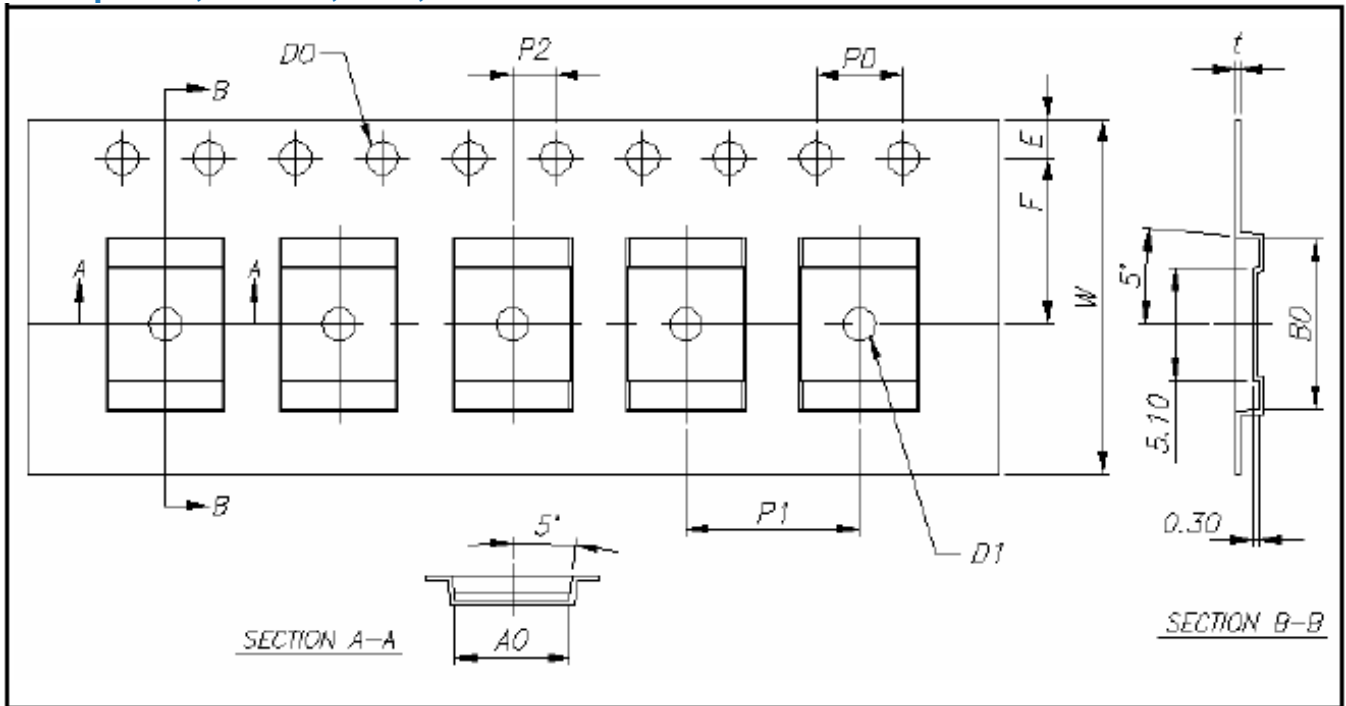


Note:

1. Dimensions are in millimeters.
2. Tolerances for fixed dimensions are ± 0.1 mm.

Emitter Tape Packaging

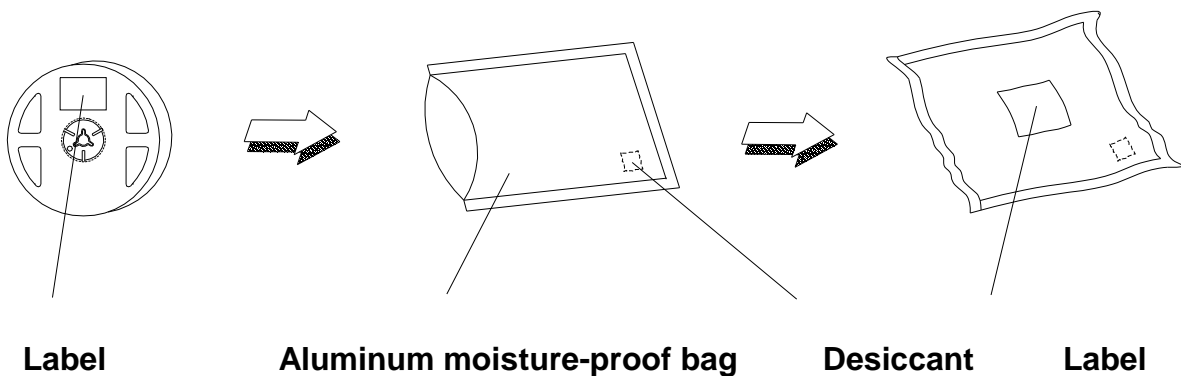
The amount of one reel is 2000pcs, and multiples of 500pcs per reel are acceptable, ex. 500,1000,1500..



Note:

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

Moisture Resistant Packaging



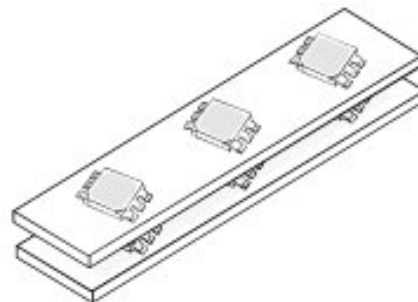
Precautions of Use

Over-Current-Protection

- Though the Everlight A22 has an ESD protection mechanism, customers must not use the device in reverse bias condition and should apply resistors for extra protection. Otherwise slight voltage shifts may cause significant current changes and may cause failure.

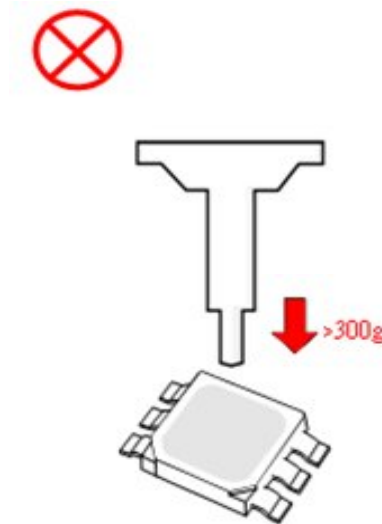
Storage

- Before the package is opened: The LEDs should be stored at 30°C or less and 50%RH or less after being shipped from Everlight. The storage life is 6 months. If the LEDs are to be stored for more than 6 months, they should be stored in a sealed container with a nitrogen atmosphere and moisture absorbent material.
- After opening the package: The LED's should be stored under 30°C or less and 30%RH or less. The LED should be used within 168hrs (7days) after opening the package. If unused LEDs remain, they should be stored in moisture proof packages.
- Before using LEDs: The LEDs should be baked under the following conditions: pre-curing at 60±5°C for 24 hours.
- Do not stack assemblies containing Everlight A22 LEDs to prevent damage to the optical surface of LEDs. Forces applied to the optical surface may result in the surface being damaged.

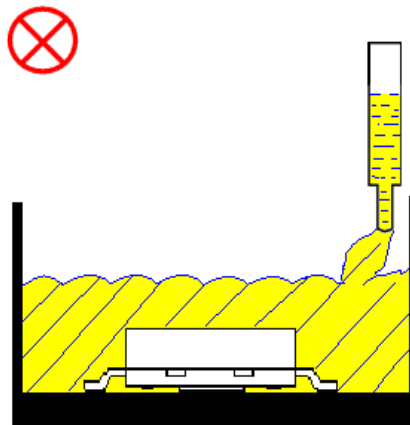


Handling

- Do not put mechanical stress on the LED.
- Never touch the optical surface. The LED surface could be soiled or damaged, which could affect the optical performance of the LED.
- Avoid directly contacting the lens with a downward force of more than 300g.



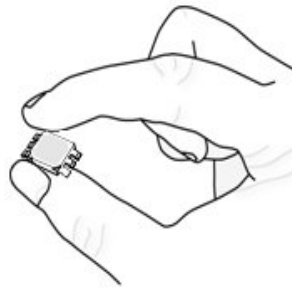
- Sealing or potting with water proof silicone is not suitable for EHP-A22 products.



- In a low-humidity work environment, please handle the LEDs while appropriately grounded.
- It is recommended to handle the LEDs with powder-less latex gloves.

Manual Handling

- When handling the product, do not apply direct pressure to the optical surface.



- Do not touch the resin with tweezers to avoid scratching or damaging the optical surface.

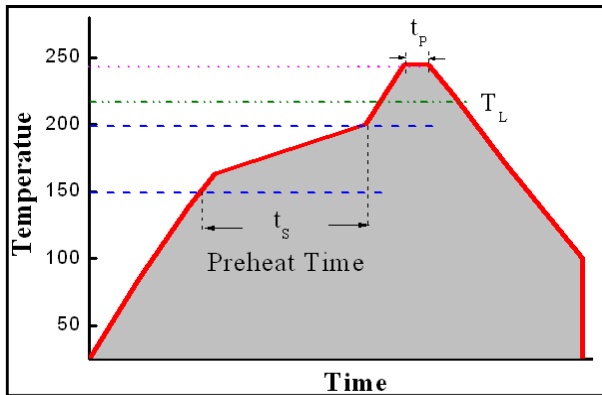


Thermal Management

- For maintaining high flux output and achieving maximum reliability, EHP-A22 series LEDs should be mounted on a metal core printed circuit board (MCPCB) or any other kind of heat sink with proper thermal connection to dissipate approximately 1W of thermal energy at 80mA operation.
- Heat dissipation or thermal conduction design is strongly recommended on PCB or MCPCB for reflow soldering purposes. Please refer to soldering patterns on Page 14.
- Sufficient thermal management must be implemented. Please refer to the graph “Forward Current Derating Curve “ on Page 16. The solder pad temperature must be kept under 70 at the driving current of 80mA. Otherwise, the junction temperature of die may exceed the limit at high current driving conditions and the LED’s lifetime may be decreased dramatically.

Soldering Ion for Reflow Process

- EHP-A22 series are suitable for SMT process.
- 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 the soldering process, stress on the LEDs during heating should be avoided.
- After soldering, do not warp the circuit board.

Soldering Ion for Manual Soldering Process

- For prototype builds or small series production runs it is possible to place and solder the LEDs by hand.
- Dispense thermal conductive glue or grease on the substrates and follow its curing specifications. Gently press LED housing to closely connect LED and substrate.
- It is recommended to hand solder the leads with a solder tip temperature of 280°C for less than 3 seconds, at a time and with a soldering iron of less than 25W. Solder at intervals of two seconds or more.
- Take caution and be aware that damaged products are often a result of improper hand soldering techniques.

LM-80 Test Reprot

SGS

Report No.: OA-2011-80001

Page 1 of 35

Issued: Aug. 09, 2012

TEST REPORT

The following tested product(s) were submitted and identified by the vendor as:

Applicant : Everlight Electronics Co., LTD.
Address of Applicant : No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City
23860, Taiwan
Testing Laboratory : SGS Taiwan Ltd., Optics Laboratory
Testing Address : 33, Wu Chyuan Rd., New Taipei Industrial Park, New
Taipei City, Taiwan 24886
Product Name : EHP-A2X Series LED Component
Model / Serial Number : EHP-A2X (3000K)
Manufacturer : Everlight Electronics Co., LTD.
Rating : DC 80 mA, 1 W
Test Standard/Method : IES LM-80-08 Approved Method: Measuring Lumen
Maintenance of LED Light Sources
Date of Issue : Aug. 09, 2012

The submitted products have been tested as requested and the following results were obtained,
and the report, not applicable for lawsuit, refers only to the unit(s) submitted for test.

Test Results : -PLEASE SEE ATTACHED SHEETS-

Signed for and on behalf of
SGS TAIWAN Ltd.



Calvin Tzou
Technical Manager

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Report No.: OA-2011-80001

Page 2 of 35

Issued: Aug. 09, 2012

1 DATE OF RECEIPT OF SAMPLES

Aug. 18, 2011

2 DATE(S) OF PERFORMANCE OF THE TEST

Oct. 31, 2011 ~ Aug. 01, 2012

3 IDENTITY OF SAMPLES

| Quantity | Model | Serial Number |
|----------|-----------------|-----------------------|
| 25 | EHP-A2X (3000K) | # A01 - # A25 (25 °C) |
| 25 | EHP-A2X (3000K) | # B01 - # B25 (55 °C) |
| 25 | EHP-A2X (3000K) | # C01 - # C25 (85 °C) |

4 TEST ITEMS

4.1 Data Summary of Lumen and Color Maintenance

Test results were concluded by different Case Temperatures (Ts).

4.2 Lumen Maintenance and Color Maintenance Test

Testing specifications by different case temperatures according to IES LM-80-08 Approved Method: Measuring Lumen Maintenance of LED Light Sources and client's requirements were implemented per the following items.

4.2.1 Total Luminous Flux (Φ_v)

The test results of total luminous flux were implemented referring to Clause 2 PROPERTIES OF LEDS & Clause 6 MEASUREMENT OF LUMINOUS FLUX of CIE 127: 2007 2nd edition MRASUREMENT OF LEDS and IES LM-80-08 Approved Method: Measuring Lumen Maintenance of LED Light Sources, when the UUTs were powered with constant current of I_f .

4.2.2 Correlated Color Temperature (CCT), CIE Color Coordinate (CIEx, CIEy) & Chromaticity Shift ($\Delta u'v'$)

The test results of correlated color temperature were implemented referring to CIE 127:2007 2nd edition MRASUREMENT OF LEDS, CIE 15: 2004 COLORIMETRY.

The test results of color coordinate were implemented referring to CIE 127: 2007 2nd edition MRASUREMENT OF LEDS, CIE 15: 2004 COLORIMETRY.

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Member of SGS Group



Report No.: OA-2011-80001

Page 3 of 35

Issued: Aug. 09, 2012

5 TEST CONDITIONS

Main Test Equipment:

| Name | Brand | Model | Traceability |
|-----------------------|-----------|----------|--------------|
| Spectroradiometer | Labsphere | CDS 2100 | NIST |
| Standard Light Source | Labsphere | SCL-600 | NIST |
| Source Meter | Kethley | 2400 | NMI |
| Digital Multimeter | Agilent | U1242A | NMI |

Environmental Conditions:

Temperature: (25 ± 1) °C
Relative Humidity: < 65 % RH

LIUT Conditions:

Drive Current: DC 80 mA
Forward Voltage: DC 15 ~ 18 V
Power Consumption: 1 W (Rated Value)
CCT: 3000 K
Package Dimension: L 5.5 x W 5.0 x H 0.95 mm
Prior operation: 0 hr
Total Operation Duration: 6000 hours
Product Specs: See Appendix A

Measurement Conditions:

Interval Time: 1000 hours
Warm up Time: < 1 minute (Initial)
Relative measurement uncertainty: 2.8 % (95 % Confidence Level)

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6 TEST RESULTS

6.1 Data Summary of Lumen and Color Maintenance

| Temp. | Initial(Ohrs) | | Luminous Maintenance (%) | | | | | |
|-----------|---------------|--------------------|--------------------------|----------|----------|----------|----------|----------|
| | TLF(lm) | V _F (V) | 1000 hrs | 2000 hrs | 3000 hrs | 4000 hrs | 5000 hrs | 6000 hrs |
| 25°C Avg. | 98.87 | 15.27 | 100.4% | 100.2% | 100.1% | 99.8% | 99.6% | 98.9% |
| 55°C Avg. | 99.23 | 15.31 | 101.0% | 100.6% | 100.2% | 99.6% | 99.2% | 98.1% |
| 85°C Avg. | 98.86 | 15.28 | 101.5% | 101.0% | 100.6% | 99.3% | 97.6% | 96.1% |

| Temp. | Initial(Ohrs) | | | Chromaticity Shift ($\Delta u'v'$) | | | | | |
|-----------|------------------|------------------|--------|--------------------------------------|----------|----------|----------|----------|----------|
| | CIE _x | CIE _y | CCT | 1000 hrs | 2000 hrs | 3000 hrs | 4000 hrs | 5000 hrs | 6000 hrs |
| 25°C Avg. | 0.4266 | 0.4005 | 3150.6 | 0.0004 | 0.0008 | 0.0007 | 0.0009 | 0.0009 | 0.0009 |
| 55°C Avg. | 0.4274 | 0.4012 | 3142.2 | 0.0007 | 0.0012 | 0.0013 | 0.0014 | 0.0013 | 0.0013 |
| 85°C Avg. | 0.4267 | 0.4004 | 3147.8 | 0.0009 | 0.0010 | 0.0012 | 0.0015 | 0.0014 | 0.0016 |

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Lumen Maintenance Life Projection

| Table 1: Report at each LM-80 Test Condition | | | | | |
|--|---------------|--|---------------|--|---------------|
| Description of LED Light Source Tested (manufacturer, model, catalog number) | | | | | |
| Test Condition 1 - 25°C Case Temp | | Test Condition 2 - 55°C Case Temp | | Test Condition 3 - 85°C Case Temp | |
| Sample size | 25 | Sample size | 25 | Sample size | 25 |
| Number of failures | 0 | Number of failures | 0 | Number of failures | 0 |
| DUT drive current used in the test (mA) | 80 | DUT drive current used in the test (mA) | 80 | DUT drive current used in the test (mA) | 80 |
| Test duration (hours) | 6,000 | Test duration (hours) | 6,000 | Test duration (hours) | 6,000 |
| Test duration used for projection (hour to hour) | 1,000 - 6,000 | Test duration used for projection (hour to hour) | 1,000 - 6,000 | Test duration used for projection (hour to hour) | 1,000 - 6,000 |
| Tested case temperature (°C) | 25 | Tested case temperature (°C) | 55 | Tested case temperature (°C) | 85 |
| α | 2.751E-06 | α | 5.535E-06 | α | 1.112E-05 |
| B | 1.008 | B | 1.017 | B | 1.033 |
| Calculated L70(6k) (hours) | 133,000 | Calculated L70(6k) (hours) | 68,000 | Calculated L70(6k) (hours) | 35,000 |
| Reported L70(6k) (hours) | >36000 | Reported L70(6k) (hours) | >36000 | Reported L70(6k) (hours) | 35,000 |

Revision History

Current version: Aug.15.2013

Issue No: DHE-0001811

Version: 7

Created by: Betty Hong

| Page | Subjects (major change in previous version) | Date of change |
|------|---|----------------|
| | Create new : reference only at 3W. | 2012.05.18 |
| | Delete reference data of CRI(typ) | 2012.07.02 |
| | New EHP-A22/KT35H-P01/57K/K53/TR | 2012.10.24 |
| | Change the LED picture | 2012.12.11 |
| P19 | Change the Loaded Quantity | 2013.04.15 |
| P1 | Created LM80 test report | 2013.08.15 |