

# OSRAM KW4 HPL631.TK

## Datasheet

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## OSLON® Black Flat X

# KW4 HPL631.TK

The OSLON Black Flat X product family offers LED devices with the highest efficiency in the Osram portfolio. This feature makes it the perfect light source for standard forward lighting applications with a high focus on system cost. The SMT device is very stable, durable and can be used with standard processes. The pad geometry of the widely used OSLON Black Flat product platform was further optimized to allow for excellent thermal conditions, while the already known, outstanding contrast of the package concept is kept on the familiar level.



## Applications

- Headlamps, LED & Laser & Night Vision

## Features

- Package: SMD epoxy package
- Chip technology: UX:3
- Typ. Radiation: 120° (Lambertian emitter)
- Color: Cx = 0.321, Cy = 0.339 acc. to CIE 1931 (● ultra white)
- Corrosion Robustness Class: 3B
- Qualifications: AEC-Q102 Qualified
- ESD: 8 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 3B)
- Color over angle: Better than passus 3.7.2.1 of supplement proposal 7 to ECE reg. 128

## Ordering Information

| Type                           | Luminous Flux <sup>1)</sup><br>$I_F = 1000 \text{ mA}$<br>$\Phi_V$ | Ordering Code |
|--------------------------------|--------------------------------------------------------------------|---------------|
| KW4 HPL631.TK-BCBH-4L05M0-AGAE | 1640 ... 2040 lm                                                   | Q65113A1248   |
| KW4 HPL631.TK-BCBJ-4L07M0-AGAE | 1640 ... 2115 lm                                                   | Q65113A4586   |
| KW4 HPL631.TK-BDBJ-6L07M0-AGAE | 1700 ... 2115 lm                                                   | Q65113A1296   |

During ramp up a smaller amount of pcs are taped on one reel.

## Maximum Ratings

| Parameter                                                                 | Symbol         |      | Values  |
|---------------------------------------------------------------------------|----------------|------|---------|
| Operating Temperature <sup>2)</sup>                                       | $T_{op}$       | min. | -40 °C  |
|                                                                           |                | max. | 135 °C  |
| Storage Temperature                                                       | $T_{stg}$      | min. | -40 °C  |
|                                                                           |                | max. | 135 °C  |
| Junction Temperature                                                      | $T_j$          | max. | 150 °C  |
| Junction Temperature for short time applications*                         | $T_j$          | max. | 175 °C  |
| Forward current<br>$T_s = 25\text{ °C}$                                   | $I_F$          | min. | 50 mA   |
|                                                                           |                | max. | 1500 mA |
| Forward current pulsed<br>$D = 0.005$ ; $T_s = 25\text{ °C}$              | $I_{F\ pulse}$ | max. | 1500 mA |
| Surge current<br>$t \leq 50\ \mu s$ ; $D = 0.025$ ; $T_j = 150\text{ °C}$ | $I_{FS}$       | max. | 2000 mA |
| Surge current<br>$t \leq 10\ \mu s$ ; $D = 0.005$ ; $T_s = 25\text{ °C}$  | $I_{FS}$       | max. | 2500 mA |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 3B)   | $V_{ESD}$      |      | 8 kV    |
| Reverse current <sup>3)</sup>                                             | $I_R$          | max. | 200 mA  |

\* The median lifetime (L70/B50) for  $T_j = 175\text{ °C}$  is 100h.

## Characteristics

$I_F = 1000 \text{ mA}$ ;  $T_S = 25 \text{ °C}$

| Parameter                                                                                                   | Symbol                  |      | Values              |
|-------------------------------------------------------------------------------------------------------------|-------------------------|------|---------------------|
| Chromaticity Coordinate <sup>4)</sup>                                                                       | Cx                      | typ. | 0.321               |
|                                                                                                             | Cy                      | typ. | 0.339               |
| Viewing angle at 50% $I_V$                                                                                  | 2φ                      | typ. | 120 °               |
| Radiating surface                                                                                           | $A_{\text{color}}$      | typ. | 4,4 mm <sup>2</sup> |
| Forward Voltage <sup>5)</sup><br>$I_F = 1000 \text{ mA}$                                                    | $V_F$                   | min. | 11.20 V             |
|                                                                                                             |                         | typ. | 12.81 V             |
|                                                                                                             |                         | max. | 13.50 V             |
| Reverse voltage (ESD device)                                                                                | $V_{R \text{ ESD}}$     | min. | 45 V                |
| Reverse voltage <sup>3)</sup><br>$I_R = 20 \text{ mA}$                                                      | $V_R$                   | max. | 1.2 V               |
|                                                                                                             |                         |      |                     |
| Real thermal resistance junction/solderpoint <sup>4)</sup>                                                  | $R_{\text{thJS real}}$  | typ. | 1.02 K / W          |
|                                                                                                             |                         | max. | 1.23 K / W          |
| Electrical thermal resistance junction/solderpoint <sup>6)</sup><br>with efficiency $\eta_e = 39 \text{ %}$ | $R_{\text{thJS elec.}}$ | typ. | 0.62 K / W          |
|                                                                                                             |                         | max. | 0.75 K / W          |

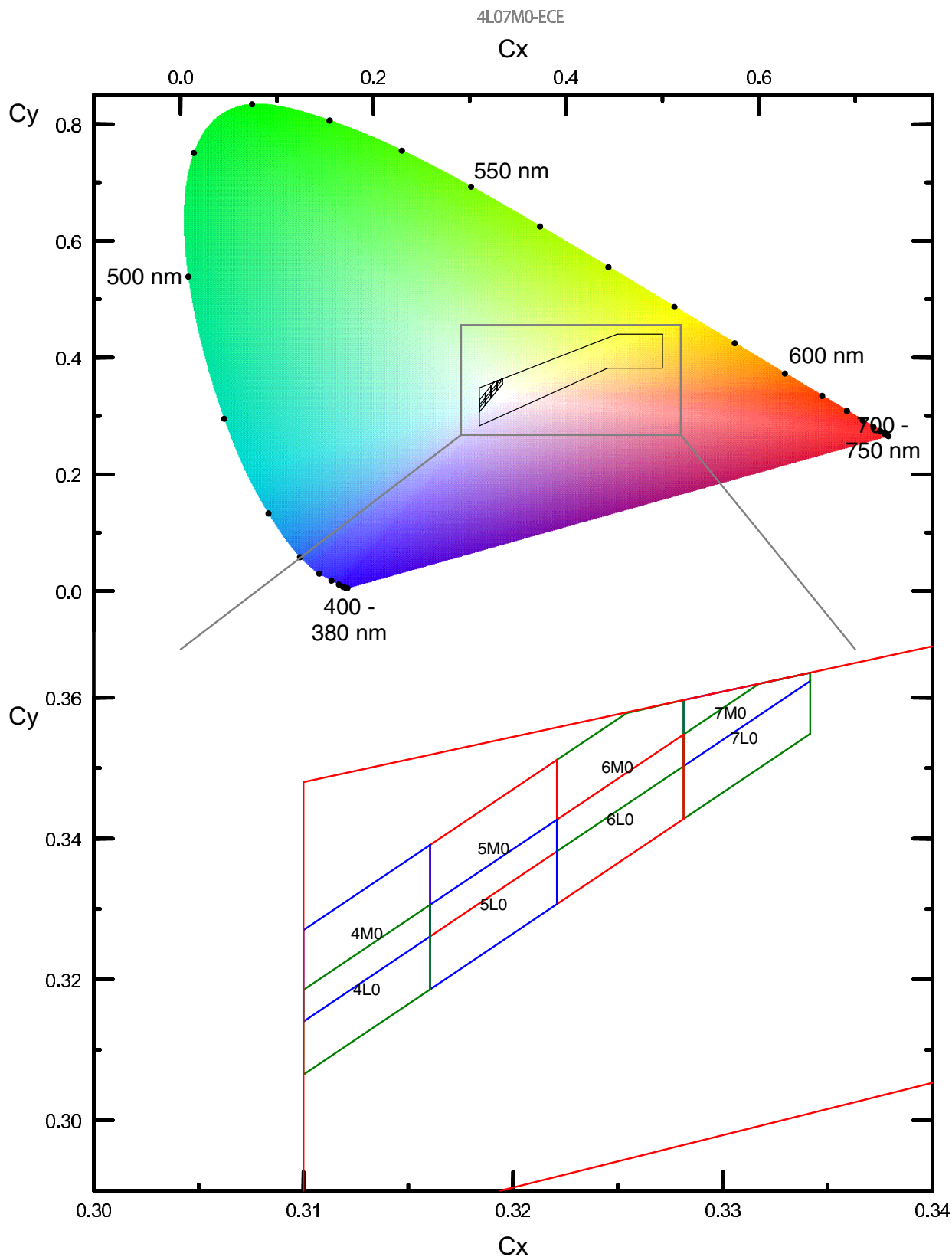
## Brightness Groups

| Group | Luminous Flux <sup>1)</sup><br>$I_F = 1000 \text{ mA}$<br>min.<br>$\Phi_V$ | Luminous Flux <sup>1)</sup><br>$I_F = 1000 \text{ mA}$<br>max.<br>$\Phi_V$ |
|-------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| BC    | 1640 lm                                                                    | 1700 lm                                                                    |
| BD    | 1700 lm                                                                    | 1760 lm                                                                    |
| BE    | 1760 lm                                                                    | 1825 lm                                                                    |
| BF    | 1825 lm                                                                    | 1895 lm                                                                    |
| BG    | 1895 lm                                                                    | 1965 lm                                                                    |
| BH    | 1965 lm                                                                    | 2040 lm                                                                    |
| BJ    | 2040 lm                                                                    | 2115 lm                                                                    |

## Forward Voltage Groups

| Group | Forward Voltage <sup>5)</sup><br>$I_F = 1000 \text{ mA}$<br>min.<br>$V_F$ | Forward Voltage <sup>5)</sup><br>$I_F = 1000 \text{ mA}$<br>max.<br>$V_F$ |
|-------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| AG    | 11.20 V                                                                   | 12.00 V                                                                   |
| SG    | 12.00 V                                                                   | 12.80 V                                                                   |
| AE    | 12.80 V                                                                   | 13.50 V                                                                   |

## Chromaticity Coordinate Groups



**Chromaticity Coordinate Groups** <sup>4)</sup>

| Group | Cx     | Cy     | Group | Cx     | Cy     | Group | Cx     | Cy     |
|-------|--------|--------|-------|--------|--------|-------|--------|--------|
| 4L0   | 0.3100 | 0.3065 | 5M0   | 0.3160 | 0.3261 | 7L0   | 0.3281 | 0.3428 |
|       | 0.3100 | 0.3185 |       | 0.3160 | 0.3391 |       | 0.3281 | 0.3548 |
|       | 0.3160 | 0.3306 |       | 0.3221 | 0.3512 |       | 0.3317 | 0.3620 |
|       | 0.3160 | 0.3186 |       | 0.3221 | 0.3382 |       | 0.3342 | 0.3635 |
| 4M0   | 0.3100 | 0.3140 | 6L0   | 0.3221 | 0.3307 | 7M0   | 0.3281 | 0.3503 |
|       | 0.3100 | 0.3270 |       | 0.3221 | 0.3427 |       | 0.3281 | 0.3597 |
|       | 0.3160 | 0.3391 |       | 0.3281 | 0.3548 |       | 0.3342 | 0.3635 |
|       | 0.3160 | 0.3261 |       | 0.3281 | 0.3428 |       | 0.3342 | 0.3624 |
| 5L0   | 0.3160 | 0.3186 | 6M0   | 0.3221 | 0.3382 |       |        |        |
|       | 0.3160 | 0.3306 |       | 0.3221 | 0.3512 |       |        |        |
|       | 0.3221 | 0.3427 |       | 0.3254 | 0.3578 |       |        |        |
|       | 0.3221 | 0.3307 |       | 0.3281 | 0.3597 |       |        |        |
|       |        |        |       | 0.3281 | 0.3503 |       |        |        |

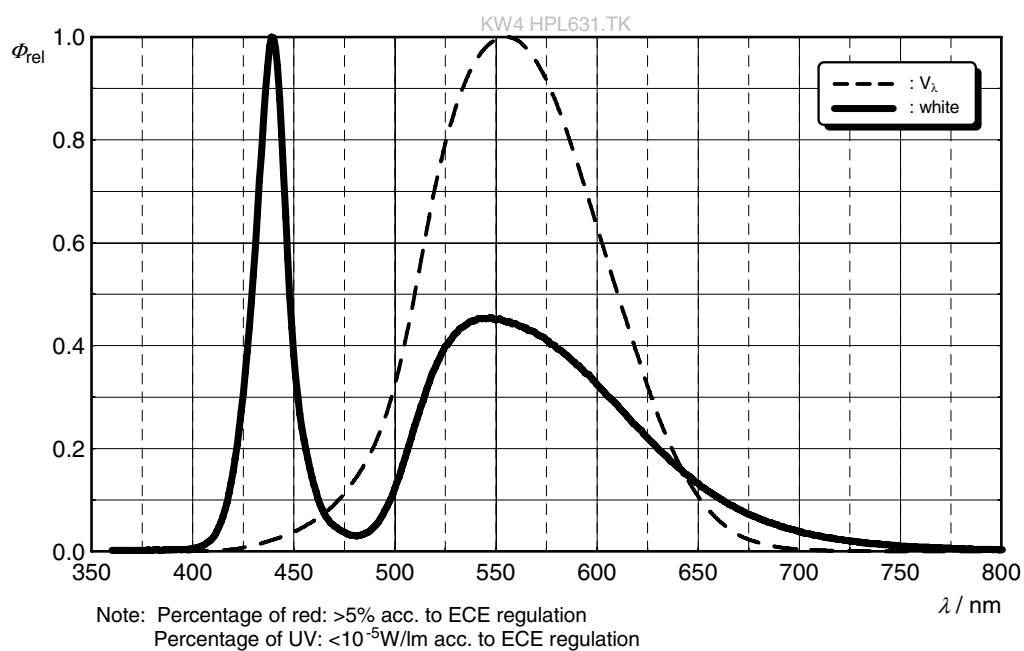
Group Name on Label

Example: BC-4L0-AE

| Brightness | Color Chromaticity | Forward Voltage |
|------------|--------------------|-----------------|
| BC         | 4L0                | AE              |

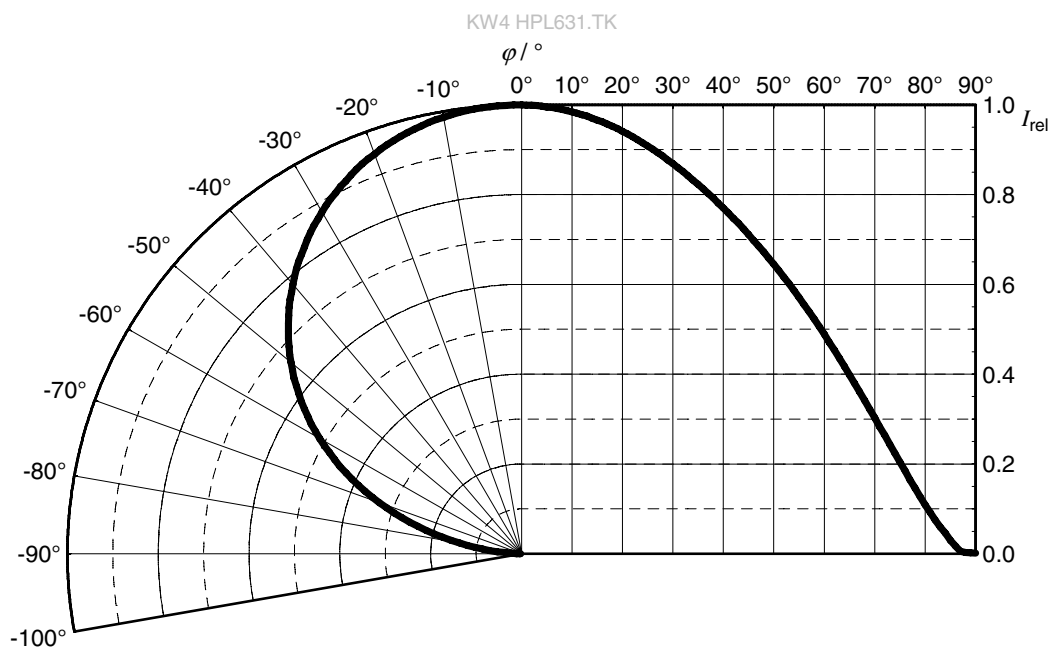
## Relative Spectral Emission <sup>7)</sup>

$\Phi_{\text{rel}} = f(\lambda)$ ;  $I_F = 1000 \text{ mA}$ ;  $T_J = 25 \text{ }^\circ\text{C}$



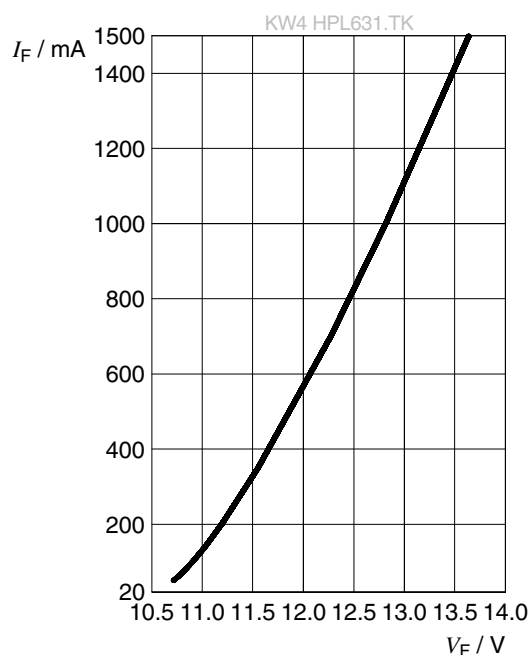
## Radiation Characteristics <sup>7)</sup>

$I_{\text{rel}} = f(\phi)$ ;  $T_J = 25 \text{ }^\circ\text{C}$



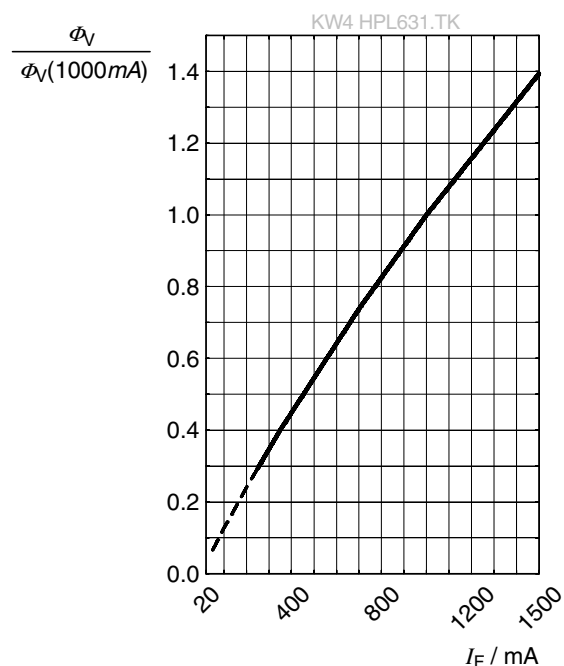
## Forward current <sup>7)</sup>

$$I_F = f(V_F); T_J = 25\text{ °C}$$



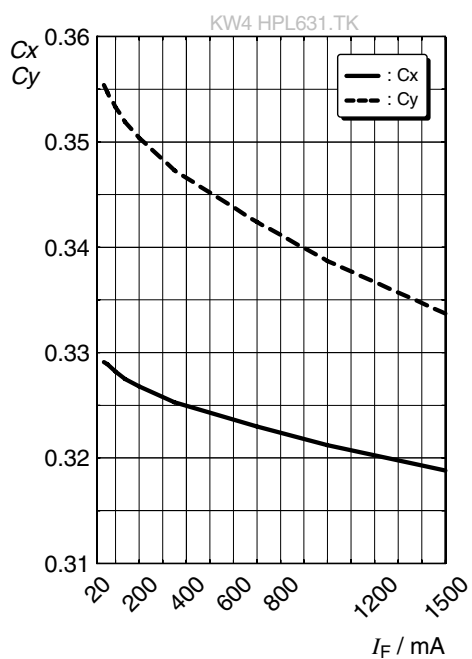
## Relative Luminous Flux <sup>7), 8)</sup>

$$\Phi_V / \Phi_V(1000\text{ mA}) = f(I_F); T_J = 25\text{ °C}$$



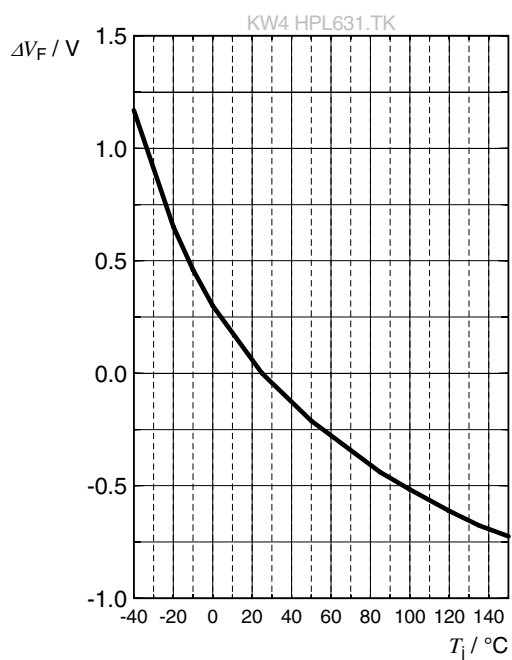
## Chromaticity Coordinate Shift <sup>7)</sup>

$$C_x, C_y = f(I_F); T_J = 25\text{ °C}$$

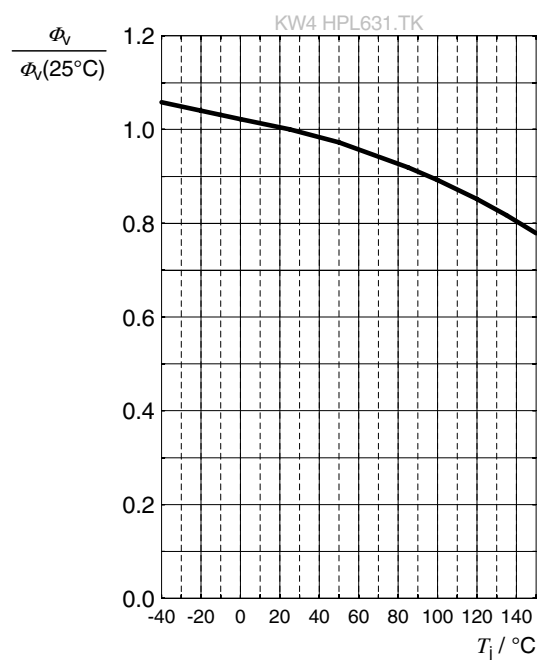


**Forward Voltage** <sup>7)</sup>

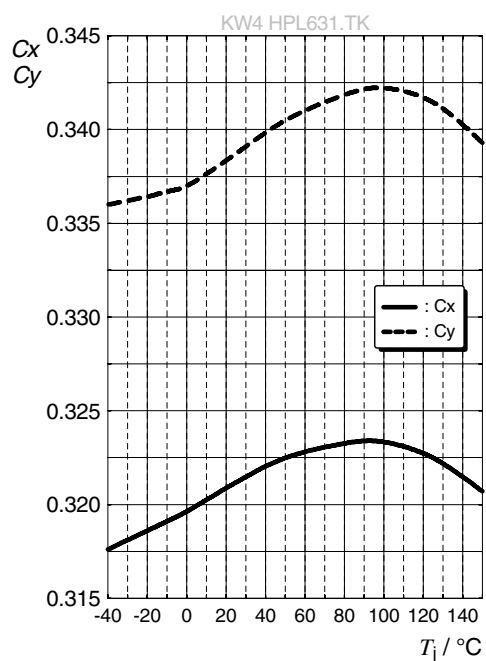
$$\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j); I_F = 1000\text{ mA}$$

**Relative Luminous Flux** <sup>7)</sup>

$$\Phi_V / \Phi_V(25^\circ\text{C}) = f(T_j); I_F = 1000\text{ mA}$$

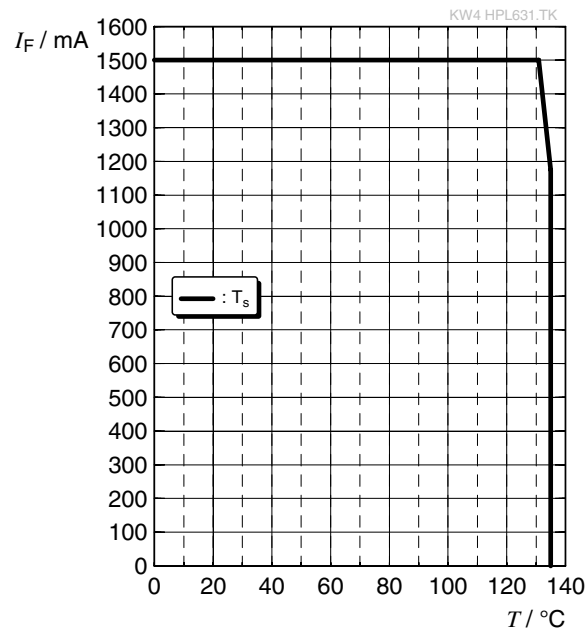
**Chromaticity Coordinate Shift** <sup>7)</sup>

$$C_x, C_y = f(T_j); I_F = 1000\text{ mA}$$

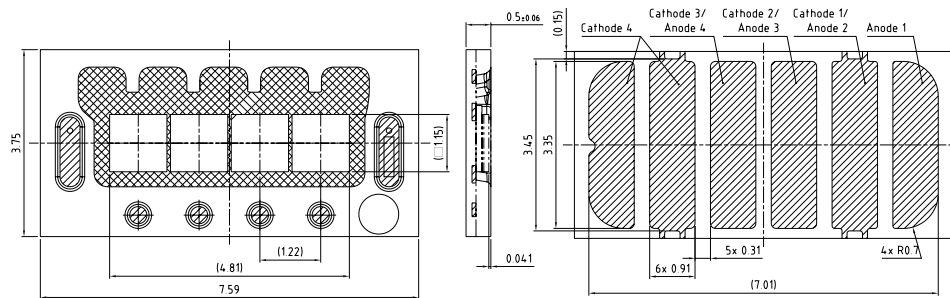


Max. Permissible Forward Current

$I_F = f(T)$



## Dimensional Drawing <sup>9)</sup>



C67062-A0349-A1-03

## Further Information:

**Approximate Weight:** 40.0 mg

**Corrosion test:** Class: 3B  
Test condition: 40°C / 90 % RH / 15 ppm H<sub>2</sub>S / 14 days (stricter than IEC 60068-2-43)

**ESD advice:** The device is protected by ESD device which is connected in parallel to the Chip.

Figure 1 illustrates the solder stencil design for the 100-pin BGA. The figure is divided into three parts: (a) Top view of the solder stencil, (b) Top view of the BGA package, and (c) Top view of the BGA package.

Part (a) shows the top view of the solder stencil. The dimensions are: 5.19 (total width), 2.75 (width of the central opening), 0.31 (width of the central opening), 0.91 (width of the central opening), 4.35 (total height), and 3.35 (height of the central opening).

Part (b) shows the top view of the BGA package. The dimensions are: 5.35 (total width), 2.91 (width of the central opening), 0.75 (width of the central opening), 0.47 (width of the central opening), 1.3 (total height), 0.3 (height of the central opening), 1.2 (height of the central opening), 0.18 (height of the central opening), and 2.07 (height of the central opening).

Part (c) shows the top view of the BGA package. The dimensions are: 5.35 (total width), 2.91 (width of the central opening), 0.75 (width of the central opening), 0.47 (width of the central opening), 1.3 (total height), 0.3 (height of the central opening), 1.2 (height of the central opening), 0.18 (height of the central opening), and 2.07 (height of the central opening).

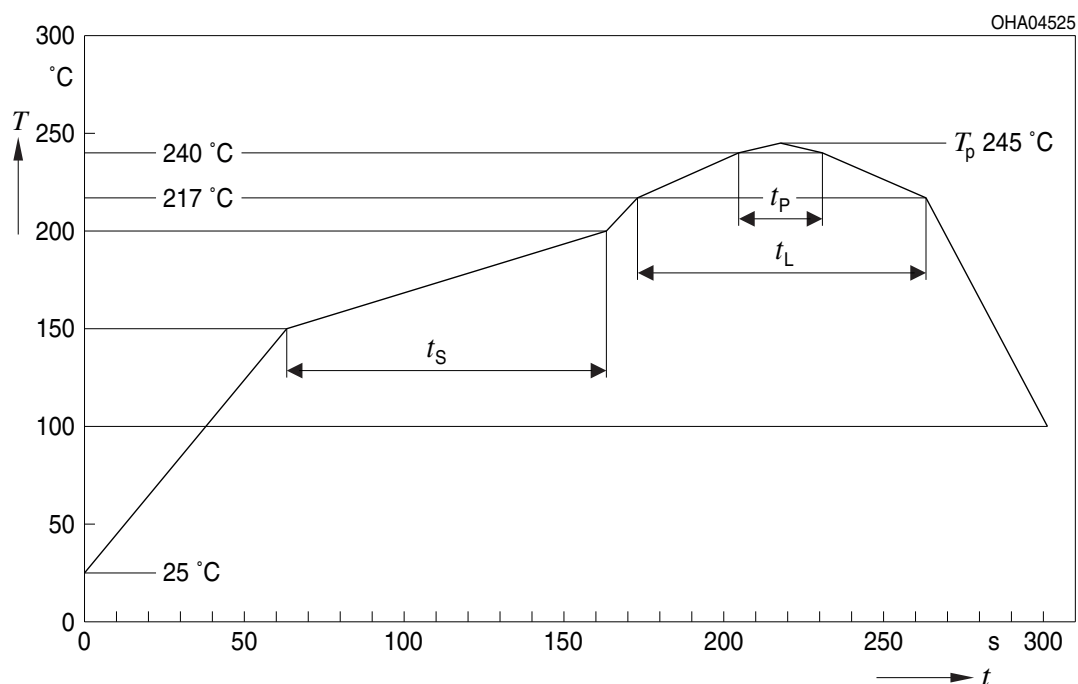
Legend:

- Foot print (red dashed line)
- Cu area (red solid line)
- solder resist (green hatched area)
- solder stencil (blue hatched area)

For superior solder joint connectivity results we recommend soldering under standard nitrogen atmosphere. Package not suitable for ultra sonic cleaning. To ensure a high solder joint reliability and to minimize the risk of solder joint cracks, the customer is responsible to evaluate the combination of PCB board and solder paste material for his application.

## Reflow Soldering Profile

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E

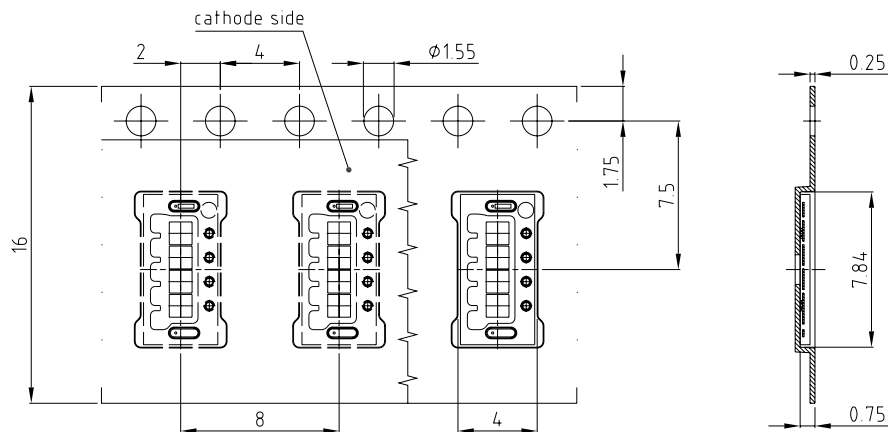


| Profile Feature                                                          | Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit               |
|--------------------------------------------------------------------------|--------|---------------------------|----------------|---------|--------------------|
|                                                                          |        | Minimum                   | Recommendation | Maximum |                    |
| Ramp-up rate to preheat <sup>*)</sup><br>25 °C to 150 °C                 |        |                           | 2              | 3       | K/s                |
| Time $t_s$<br>$T_{Smin}$ to $T_{Smax}$                                   | $t_s$  | 60                        | 100            | 120     | s                  |
| Ramp-up rate to peak <sup>*)</sup><br>$T_{Smax}$ to $T_p$                |        |                           | 2              | 3       | K/s                |
| Liquidus temperature                                                     | $T_L$  |                           | 217            |         | $^{\circ}\text{C}$ |
| Time above liquidus temperature                                          | $t_L$  |                           | 80             | 100     | s                  |
| Peak temperature                                                         | $T_p$  |                           | 245            | 260     | $^{\circ}\text{C}$ |
| Time within 5 °C of the specified peak<br>temperature $T_p - 5\text{ K}$ | $t_p$  | 10                        | 20             | 30      | s                  |
| Ramp-down rate*<br>$T_p$ to 100 °C                                       |        |                           | 3              | 6       | K/s                |
| Time<br>25 °C to $T_p$                                                   |        |                           |                | 480     | s                  |

All temperatures refer to the center of the package, measured on the top of the component

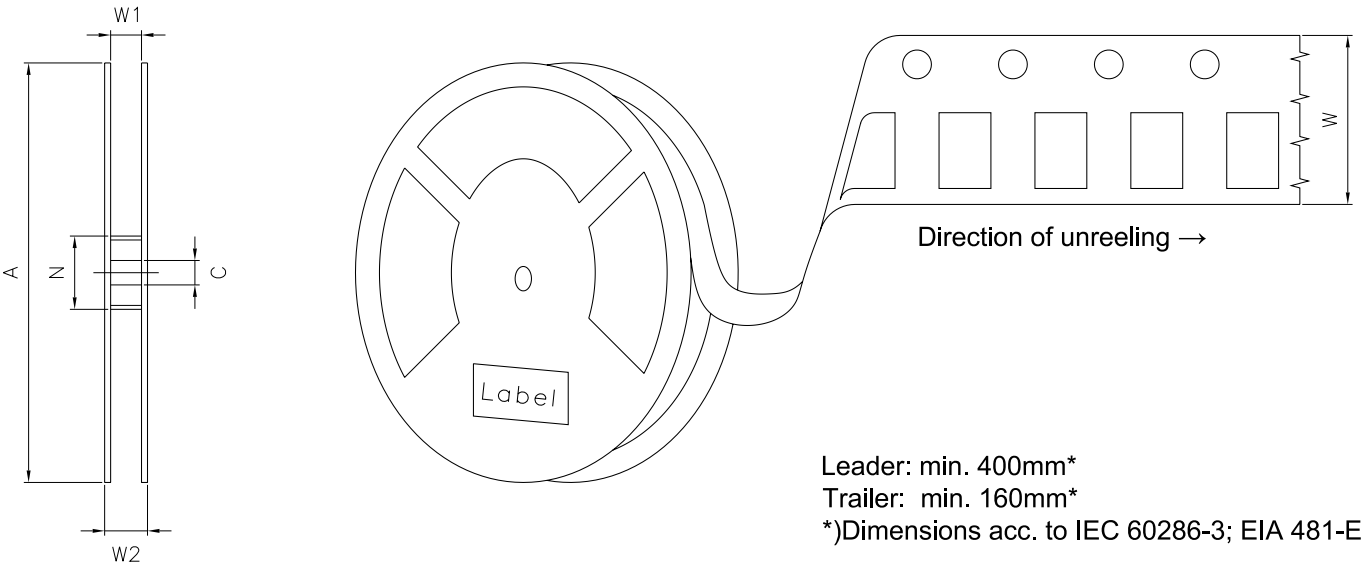
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

## Taping <sup>9)</sup>



C67062-A0349-B1-03

Tape and Reel <sup>10)</sup>



Reel Dimensions

| A      | W                   | N <sub>min</sub> | W <sub>1</sub> | W <sub>2max</sub> | Pieces per PU |
|--------|---------------------|------------------|----------------|-------------------|---------------|
| 180 mm | 12 + 0.3 / - 0.1 mm | 60 mm            | 12.4 + 2 mm    | 18.4 mm           | 2000          |

# OSRAM Opto Semiconductors

BIN1: XX-XX-X-XXX-X

RoHS Compliant

(6P) BATCH NO: 1234567890



(1T) LOT NO: 1234567890

(9D) D/C: 1234



ML Temp ST  
X XXX °C X



Pack: RXX

DEMY XXX

X X123 1234.1234 X

(X) PROD NO: 123456789 (Q) QTY: 9999 (G) GROUP: XX-XX-X-X



OHA04563

The diagram illustrates the components of a moisture-sensitive product packaging, showing a box and a reel with labels and desiccant.

- Moisture-sensitive label or print:** A label on the box and a label on the reel, both indicating moisture sensitivity.
- Barcode label:** A label on the box and a label on the reel, both indicating the product's barcode.
- Humidity indicator:** A small indicator on the reel, used to monitor humidity levels.
- Desiccant:** Two small packets shown separately, used to absorb moisture and protect the product.

QHA00530

OHA00539

19 | Version 1.0 | 2022-03-04

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## Notes

The evaluation of eye safety occurs according to the standard IEC 62471:2006 (photo biological safety of lamps and lamp systems). Within the risk grouping system of this IEC standard, the device specified in this data sheet fall into the class **moderate risk (exposure time 0.25 s)**. Under real circumstances (for exposure time, conditions of the eye pupils, observation distance), it is assumed that no endangerment to the eye exists from these devices. As a matter of principle, however, it should be mentioned that intense light sources have a high secondary exposure potential due to their blinding effect. When looking at bright light sources (e.g. headlights), temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents, depending on the situation.

Subcomponents of this device contain, in addition to other substances, metal filled materials including silver. Metal filled materials can be affected by environments that contain traces of aggressive substances. Therefore, we recommend that customers minimize device exposure to aggressive substances during storage, production, and use. Devices that showed visible discoloration when tested using the described tests above did show no performance deviations within failure limits during the stated test duration. Respective failure limits are described in the IEC60810.

For further application related information please visit [www.osram-os.com/appnotes](http://www.osram-os.com/appnotes)

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## Disclaimer

### Attention please!

The information describes the type of component and shall not be considered as assured characteristics. Terms of delivery and rights to change design reserved. Due to technical requirements components may contain dangerous substances.

For information on the types in question please contact our Sales Organization.

If printed or downloaded, please find the latest version on our website.

### Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

### Product and functional safety devices/applications or medical devices/applications

Our components are not developed, constructed or tested for the application as safety relevant component or for the application in medical devices.

Our products are not qualified at module and system level for such application.

In case buyer – or customer supplied by buyer – considers using our components in product safety devices/ applications or medical devices/applications, buyer and/or customer has to inform our local sales partner immediately and we and buyer and /or customer will analyze and coordinate the customer-specific request between us and buyer and/or customer.

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## Glossary

- 1) **Brightness:** Brightness values are measured during a current pulse of typically 1 ms, with an internal reproducibility of  $\pm 8\%$  and an expanded uncertainty of  $\pm 11\%$  (acc. to GUM with a coverage factor of  $k = 3$ ).
- 2) **Operating Temperature:** The Operating Temperature  $T_{op}$  is referenced to the Solderpoint  $T_s$  of this device. Proper current derating must be observed to maintain junction temperature below the maximum.
- 3) **Reverse Operation:** This product is intended to be operated applying a forward current within the specified range. Applying any continuous reverse bias or forward bias below the voltage range of light emission shall be avoided because it may cause migration which can change the electro-optical characteristics or damage the LED.
- 4) **Chromaticity coordinate groups:** Chromaticity coordinates are measured during a current pulse of typically 1 ms, with an internal reproducibility of  $\pm 0.005$  and an expanded uncertainty of  $\pm 0.01$  (acc. to GUM with a coverage factor of  $k = 3$ ).
- 5) **Forward Voltage:** The forward voltage is measured during a current pulse of typically 1 ms, with an internal reproducibility of  $\pm 0.05\text{ V}$  and an expanded uncertainty of  $\pm 0.1\text{ V}$  (acc. to GUM with a coverage factor of  $k = 3$ ).
- 6) **Thermal Resistance:**  $R_{th\text{ max}}$  is based on statistic values ( $6\sigma$ ).
- 7) **Typical Values:** Due to the special conditions of the manufacturing processes of semiconductor devices, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typ. data will be changed without any further notice.
- 8) **Characteristic curve:** In the range where the line of the graph is broken, you must expect higher differences between single devices within one packing unit.
- 9) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimensions are specified in mm.
- 10) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

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## Revision History

| Version | Date       | Change                        |
|---------|------------|-------------------------------|
| 1.0     | 2022-02-23 | New Layout<br>Initial Version |

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EU RoHS and China RoHS compliant product

此产品符合欧盟 RoHS 指令的要求；  
按照中国的相关法规和标准，  
不含有毒有害物质或元素。

**Published by ams-OSRAM AG**

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