

# KW HKL531.TE

## OSLON® Black Flat S

OSLON Black Flat S is able to meet a wide range of requirements. The SMT device is very stable, durable and can be used with standard processes. A new solder pad layout allows for high reliability and improved thermal management. The compact chips not only deliver high light output, they are also individually addressable with an ensured chip-to-chip contrast which makes this LED an ideal solution for Adaptive Driving Beam (ADB).



## Applications

- Headlamps, LED & Laser & Night Vision

## Features:

- Package: SMD epoxy package
- Chip technology: UX:3
- Typ. Radiation: 120° (Lambertian emitter)
- Color: Cx = 0.322, Cy = 0.334 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)

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## Ordering Information

| Type                              | Luminous Flux <sup>1)</sup><br>$I_F = 1000 \text{ mA}$<br>$\Phi_V$ | Ordering Code |
|-----------------------------------|--|---------------|
| KW HKL531.TE-F0F8-ebvFfcbB46-4LZL | 1310 ... 1760 lm   | Q65112A8333   |

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## Maximum Ratings

| Parameter  | Symbol    |      | Values  |
|--|-----------|------|---------|
| Operating Temperature  | $T_{op}$  | min. | -40 °C  |
|  |           | max. | 125 °C  |
| Storage Temperature  | $T_{stg}$ | min. | -40 °C  |
|  |           | max. | 125 °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 |
| Surge Current<br>$t \leq 10\ \mu\text{s}$ ; $D = 0.005$ ; $T_s = 25\text{ °C}$ | $I_{FS}$  | max. | 3000 mA |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 3B)        | $V_{ESD}$ |      | 8 kV    |
| Reverse current <sup>2)</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>3)</sup>  | Cx                      | typ. | 0.322               |
|  | Cy                      | typ. | 0.334               |
| Viewing angle at 50% $I_V$   | $2\phi$                 | typ. | 120 °               |
| Radiating surface  | $A_{\text{color}}$      | typ. | 4,4 mm <sup>2</sup> |
| Forward Voltage <sup>4)</sup><br>$I_F = 1000 \text{ mA}$   | $V_F$                   | min. | 10.90 V             |
|  |                         | typ. | 12.05 V             |
|  |                         | max. | 14.90 V             |
| Reverse voltage (ESD device)   | $V_{R\text{ESD}}$       | min. | 45 V                |
| Reverse voltage <sup>2)</sup><br>$I_R = 20 \text{ mA}$   | $V_R$                   | max. | 1.2 V               |
|  |                         |      |                     |
| Chip to Chip Contrast  | -                       | typ. | 1:200               |
| Real thermal resistance junction/solderpoint <sup>5)</sup>   | $R_{\text{thJS real}}$  | typ. | 1.00 K / W          |
|  |                         | max. | 1.20 K / W          |
| Electrical thermal resistance junction/solderpoint <sup>5)</sup><br>with efficiency $\eta_e = 37 \%$ | $R_{\text{thJS elec.}}$ | typ. | 0.63 K / W          |
|  |                         | max. | 0.76 K / W          |

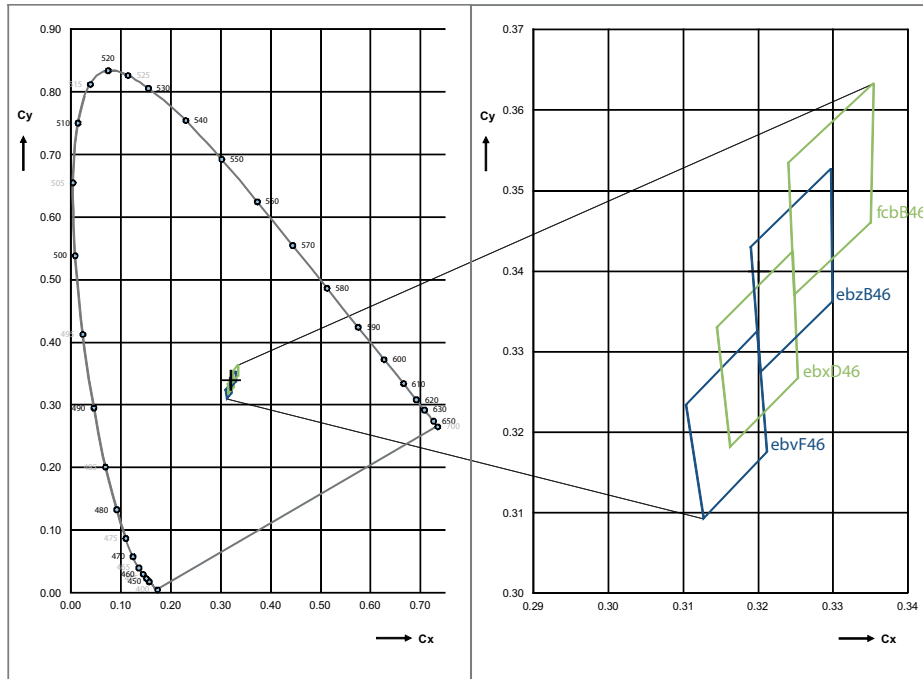
## Brightness Groups

| 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>$\Phi_V$ | Luminous Intensity <sup>6)</sup><br>$I_F = 1000 \text{ mA}$<br>typ.<br>$I_v$ |
|-------|--|--|--|
| F0    | 1310 lm  | 1355 lm  | 440 cd   |
| F1    | 1355 lm  | 1400 lm  | 450 cd   |
| F2    | 1400 lm  | 1450 lm  | 470 cd   |
| F3    | 1450 lm  | 1500 lm  | 490 cd   |
| F4    | 1500 lm  | 1550 lm  | 500 cd   |
| F5    | 1550 lm  | 1600 lm  | 520 cd   |
| F6    | 1600 lm  | 1650 lm  | 540 cd   |
| F7    | 1650 lm  | 1700 lm  | 550 cd   |
| F8    | 1700 lm  | 1760 lm  | 570 cd   |

## Forward Voltage Groups

| Group | Forward Voltage <sup>4)</sup><br>$I_F = 1000 \text{ mA}$<br>min.<br>$V_F$ | Forward Voltage <sup>4)</sup><br>$I_F = 1000 \text{ mA}$<br>max.<br>$V_F$ |
|-------|---|---|
| 4L    | 10.90 V   | 11.90 V   |
| QL    | 11.90 V   | 12.90 V   |
| ML    | 12.90 V   | 13.90 V   |
| ZL    | 13.90 V   | 14.90 V   |

### Chromaticity Coordinate Groups <sup>3)</sup>



### Chromaticity Coordinate Groups <sup>3)</sup>

| Group  | Cx     | Cy     | Group  | Cx     | Cy     |
|--------|--------|--------|--------|--------|--------|
| ebvF46 | 0.3127 | 0.3093 | ebzB46 | 0.3203 | 0.3274 |
|        | 0.3212 | 0.3175 |        | 0.3299 | 0.3361 |
|        | 0.3199 | 0.3325 |        | 0.3298 | 0.3526 |
|        | 0.3104 | 0.3234 |        | 0.3190 | 0.3430 |
| ebxD46 | 0.3163 | 0.3181 | fcbB46 | 0.3248 | 0.3370 |
|        | 0.3253 | 0.3266 |        | 0.3350 | 0.3460 |
|        | 0.3246 | 0.3424 |        | 0.3355 | 0.3633 |
|        | 0.3145 | 0.3330 |        | 0.3241 | 0.3534 |

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## Group Name on Label

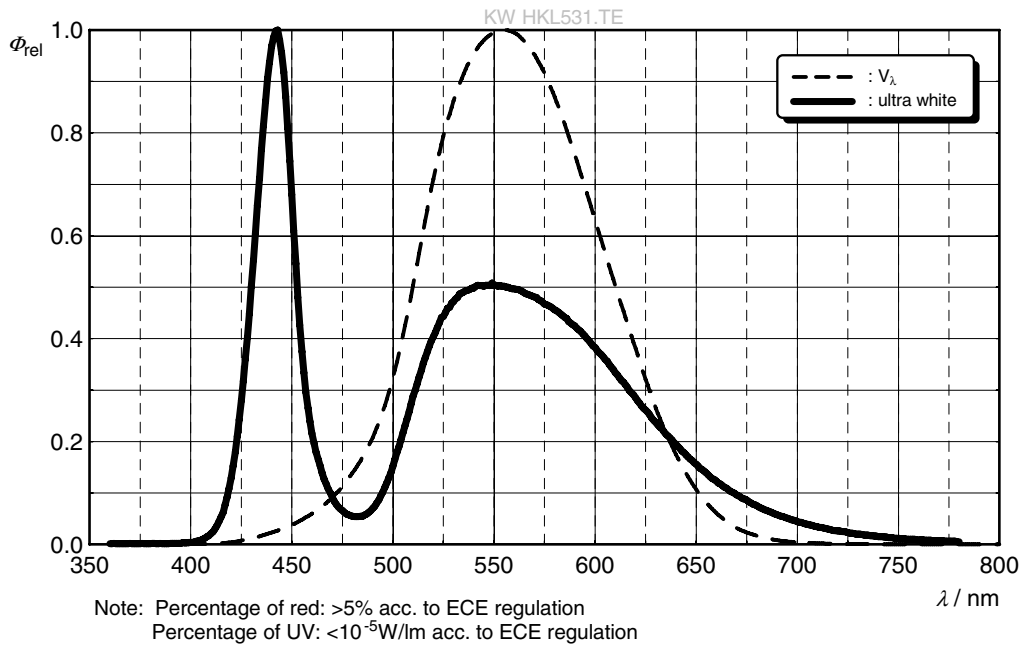
**Example: F0-ebvF46-4L**

| Brightness | Color Chromaticity | Forward Voltage |
|------------|--------------------|-----------------|
| F0         | ebvF46             | 4L              |

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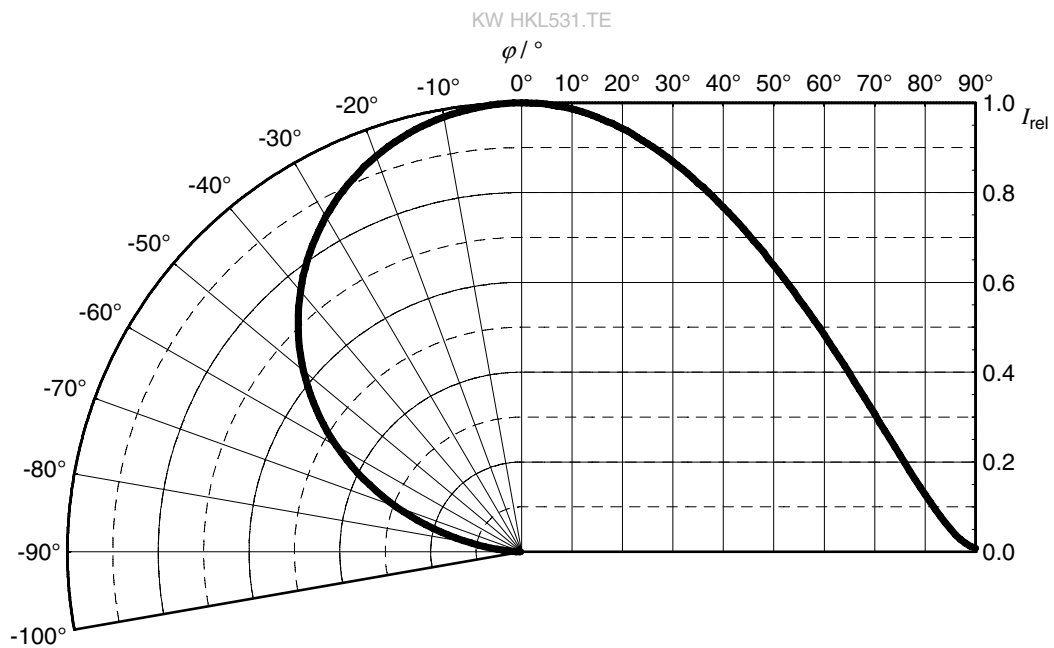
### Relative Spectral Emission <sup>6)</sup>

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



### Radiation Characteristics <sup>6)</sup>

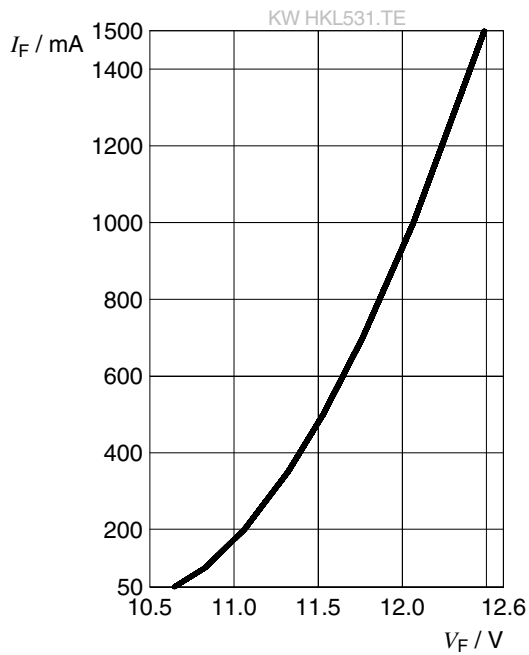
$I_{rel} = f(\phi); T_S = 25 \text{ }^\circ\text{C}$





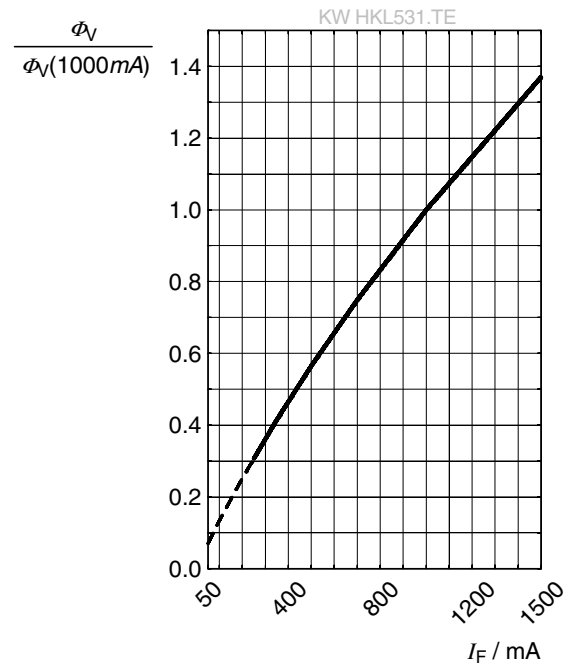
**Forward current** 6), 7)

$I_F = f(V_F); T_S = 25\text{ }^\circ\text{C}$



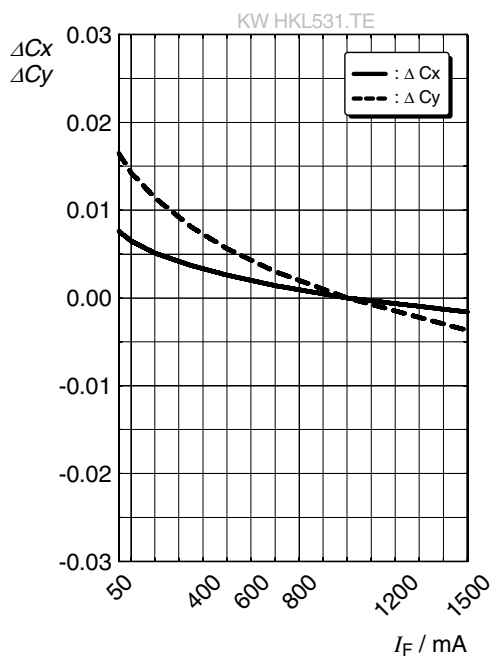
**Relative Luminous Flux** 6), 7)

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



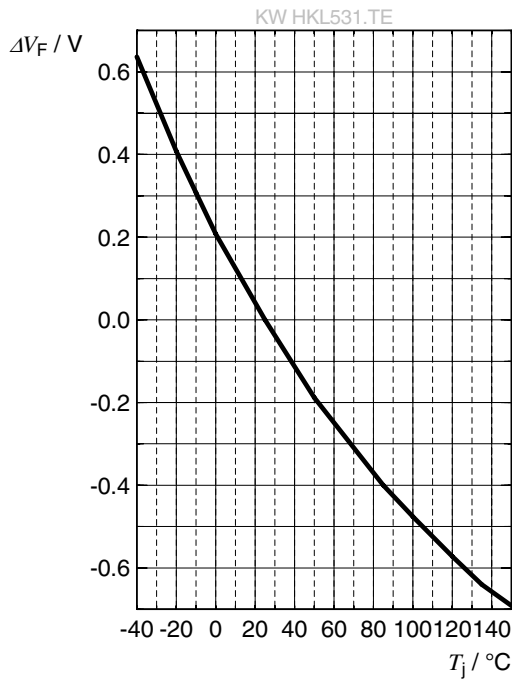
**Chromaticity Coordinate Shift** 6)

$\Delta Cx, \Delta Cy = f(I_F); T_S = 25\text{ }^\circ\text{C}$



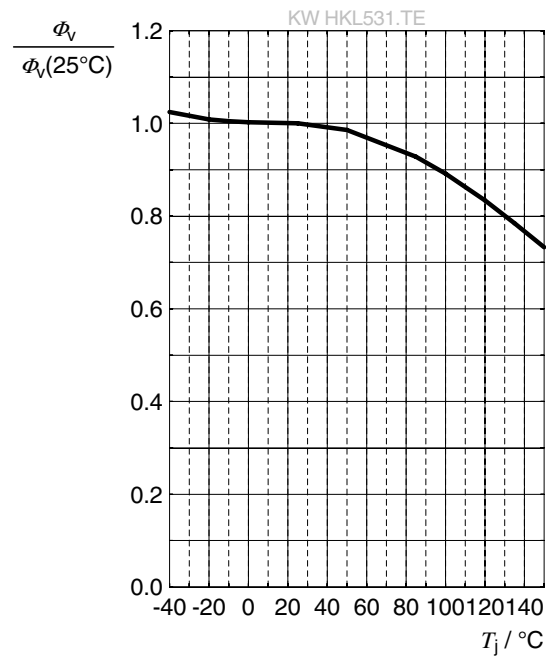
### Forward Voltage <sup>6)</sup>

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



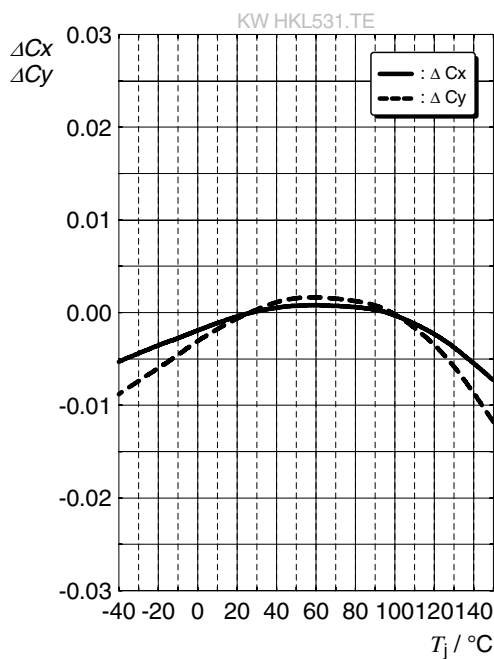
### Relative Luminous Flux <sup>6)</sup>

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



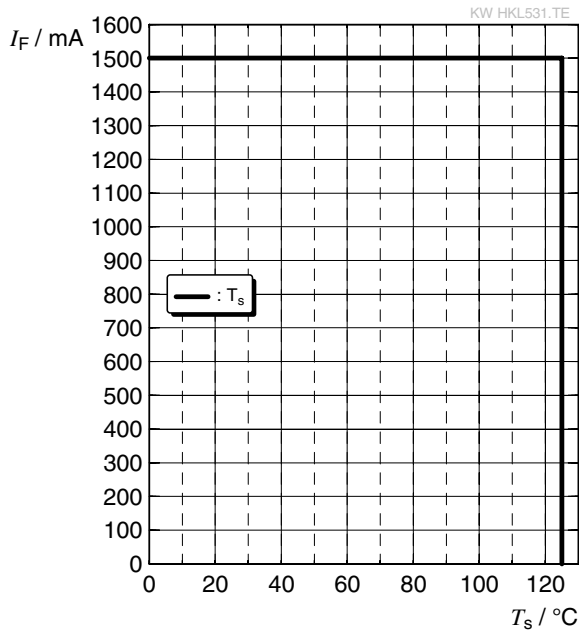
### Chromaticity Coordinate Shift <sup>6)</sup>

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



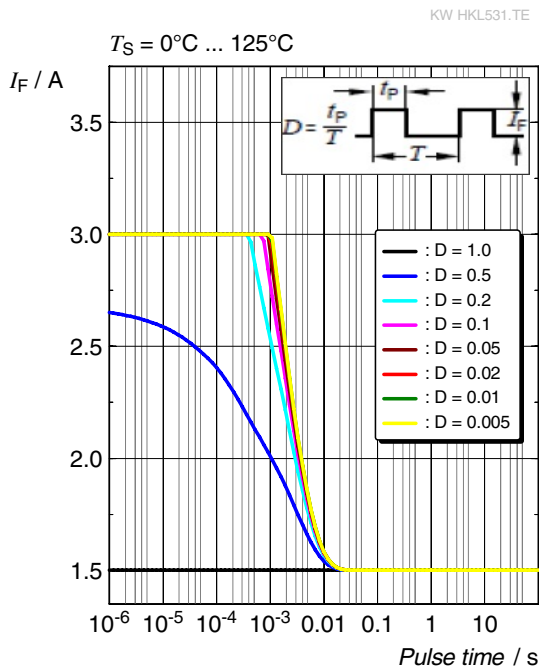
## Max. Permissible Forward Current

$I_F = f(T); 0.7 * \Phi_{V \min.}$  of bin F0;  $R_{th \text{ real max.}}$

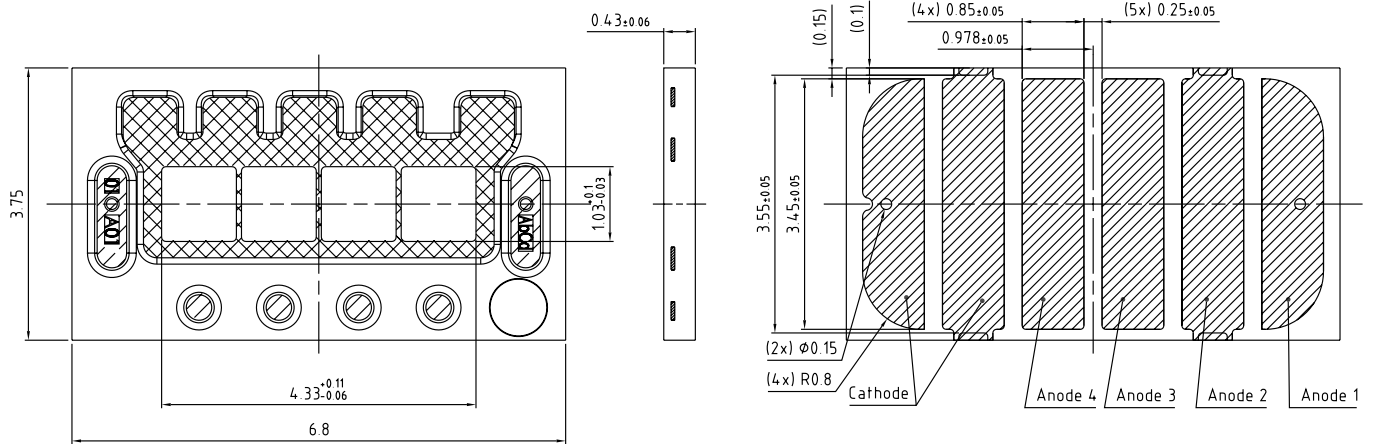


## Permissible Pulse Handling Capability

$I_F = f(t_p); D$ : Duty cycle



## Dimensional Drawing <sup>8)</sup>



general tolerance  $\pm 0.1$

 Lead finish Au

C67062-A0182-A1-04

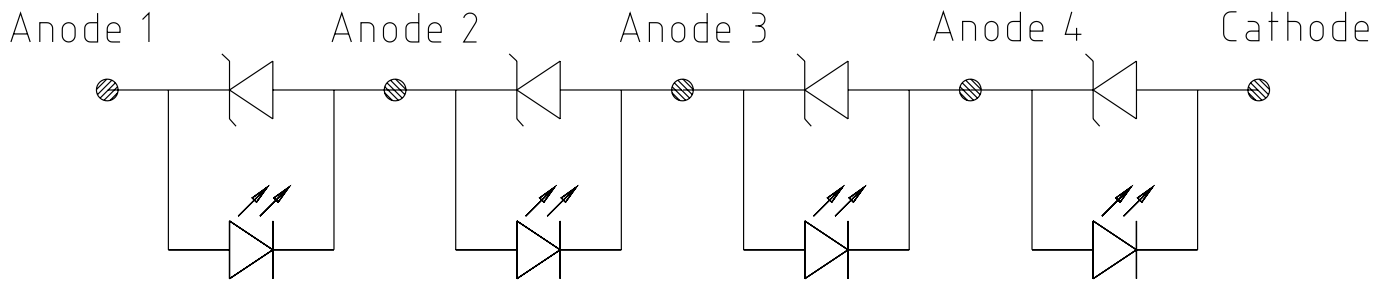
## Further Information:

**Approximate Weight:** 25.0 mg

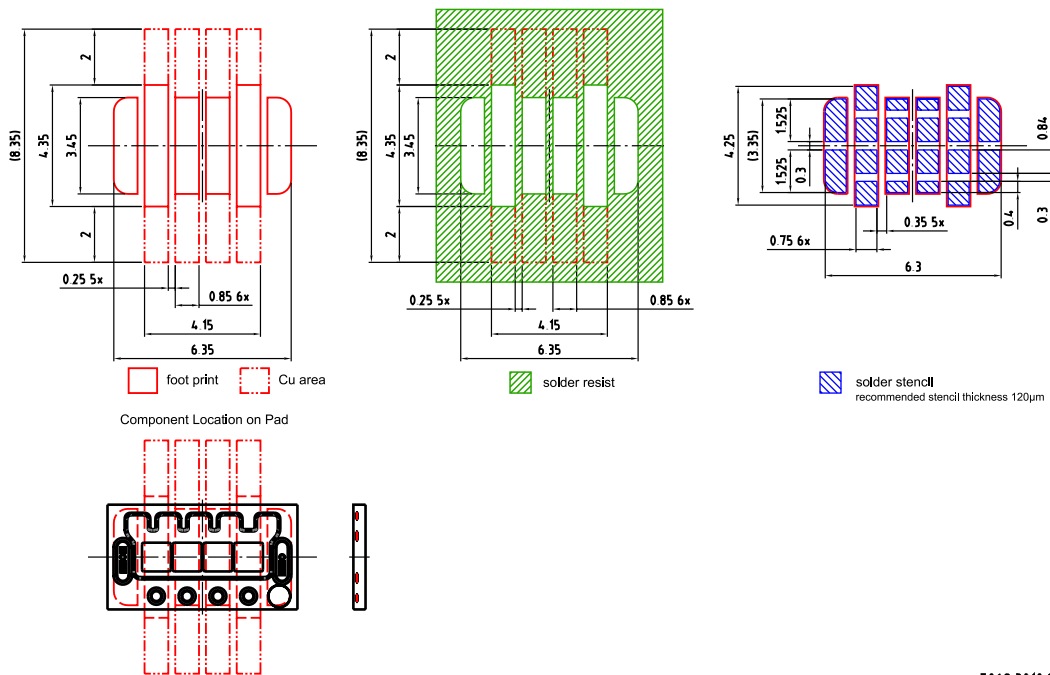
**Corrosion test:** Class: 3B  
 Test condition: 40°C / 90 % RH / 15 ppm H<sub>2</sub>S / 14 days (stricter than IEC 60068-2-43)

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

## Electrical Internal Circuit



## Recommended Solder Pad <sup>8)</sup>

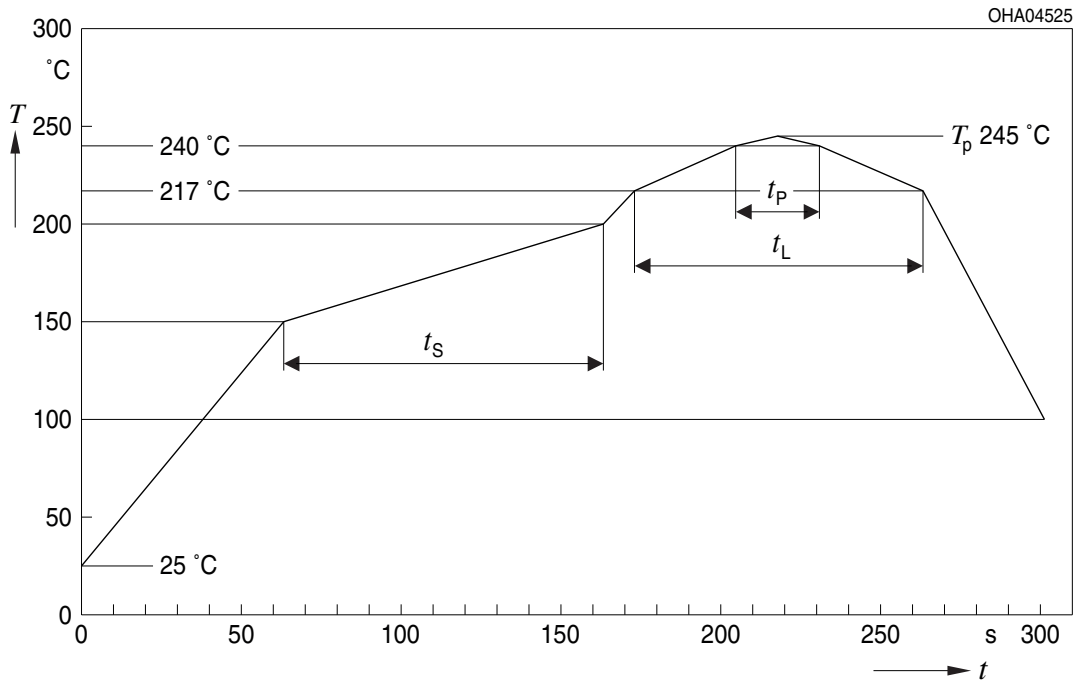


E062 3010.215 -01

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

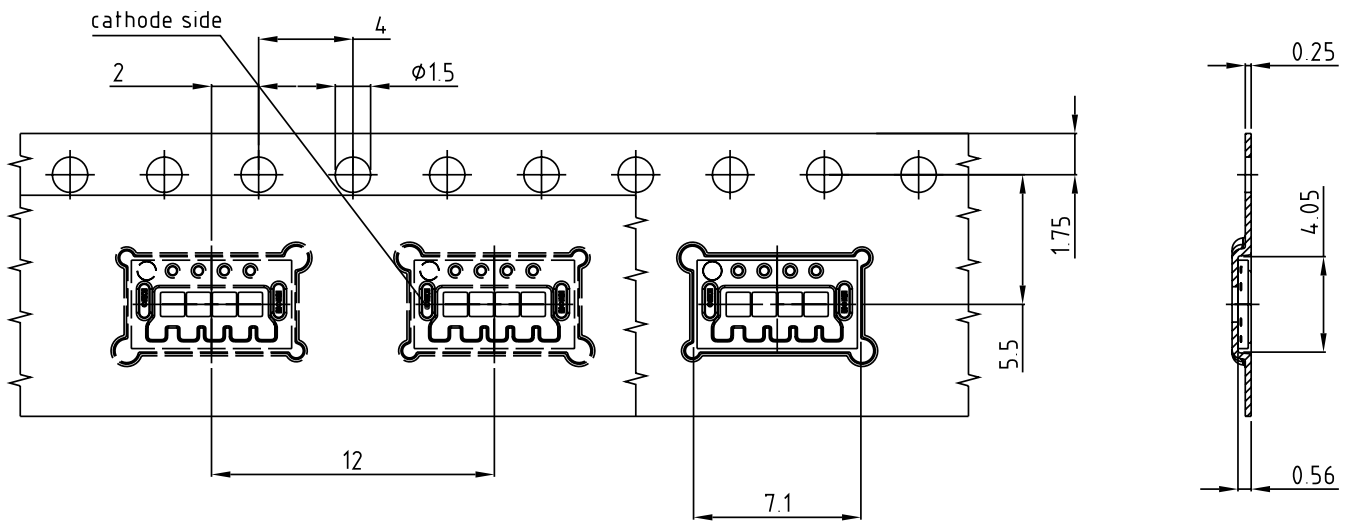
Product complies to MSL Level 2 acc. to JEDEC J-STD-020E



| 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            |         | °C   |
| Time above liquidus temperature                                | $t_L$  |                           | 80             | 100     | s    |
| Peak temperature   | $T_p$  |                           | 245            | 260     | °C   |
| Time within 5 °C of the specified peak temperature $T_p - 5$ 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>8)</sup>



C67062-A0182-B9-04

**Tape and Reel** <sup>9)</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           | 1500          |



### Barcode-Product-Label (BPL)

**OSRAM Opto Semiconductors** LX XXXX BIN1: XX-XX-X-XXX-X

RoHS Compliant

(6P) BATCH NO: 1234567890 ML Temp ST  
X XXX °C X

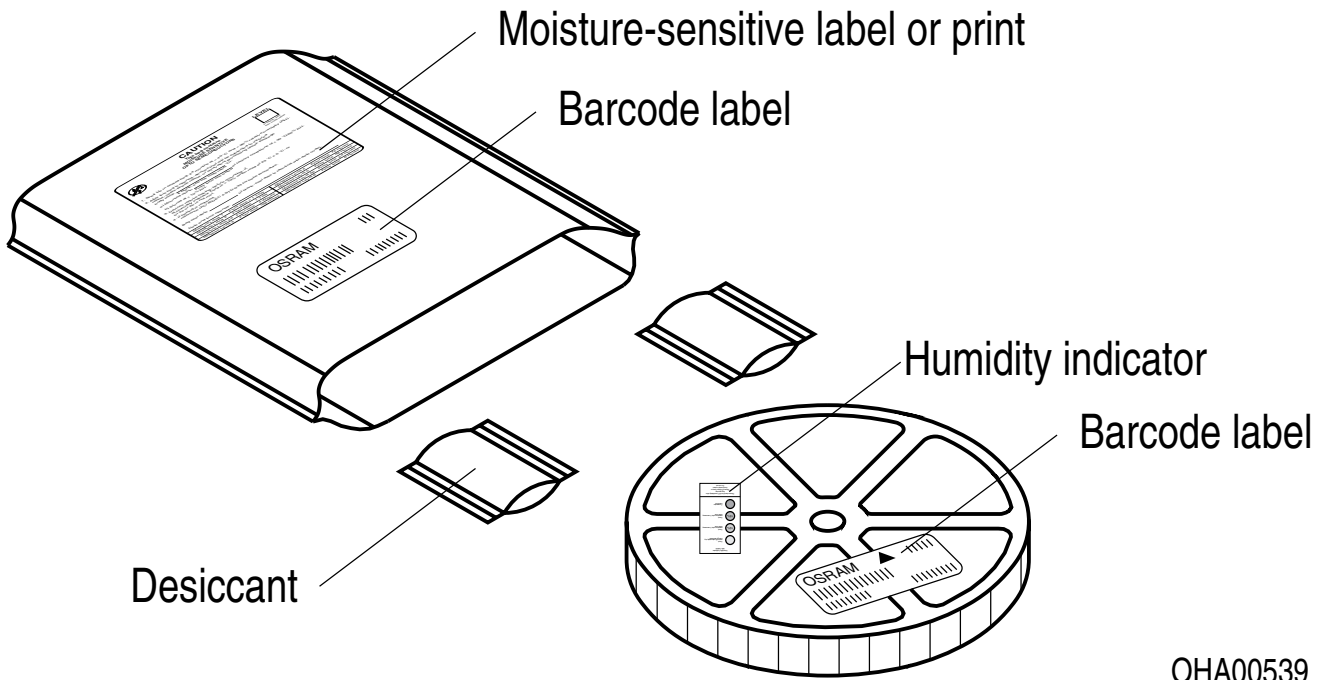
(1T) LOT NO: 1234567890 (9D) D/C: 1234 Pack: RXX  
DEMY XXX  
X\_X123\_1234.1234 X

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

The diagram shows a rectangular label with rounded corners. It contains the OSRAM logo and company name at the top left. To the right are fields for 'LX XXXX' and 'BIN1: XX-XX-X-XXX-X'. Below the logo is the text 'RoHS Compliant'. The label features three horizontal barcode sections. The first is labeled '(6P) BATCH NO: 1234567890' and is followed by a 'no liquid' symbol and 'ML Temp ST X XXX °C X'. The second is labeled '(1T) LOT NO: 1234567890' and '(9D) D/C: 1234' and is followed by 'Pack: RXX', 'DEMY XXX', and 'X\_X123\_1234.1234 X'. The third is labeled '(X) PROD NO: 123456789(Q)QTY: 9999' and '(G) GROUP: XX-XX-X-X'. A square QR code is located on the right side of the label.

OHA04563

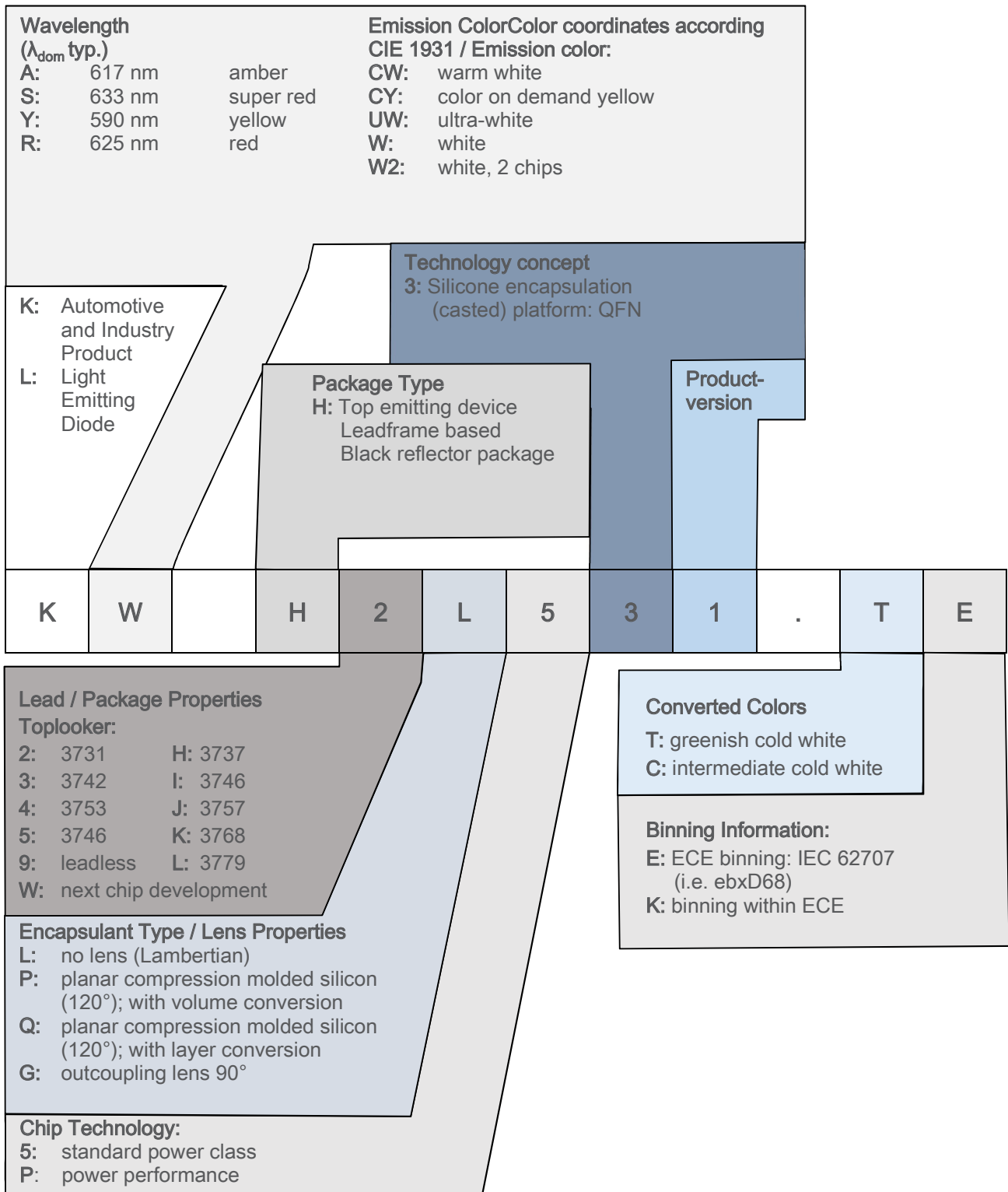
### Dry Packing Process and Materials <sup>8)</sup>



OHA00539

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.

## Type Designation System



## 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 falls 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)

## 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 the OSRAM OS 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**

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

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

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

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## Glossary

- 1) **Brightness:** Brightness values are measured during a current pulse of typically 25 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) **Reverse Operation:** Reverse Operation of 10 hours is permissible in total. Continuous reverse operation is not allowed.
- 3) **Chromaticity coordinate groups:** Chromaticity coordinates are measured during a current pulse of typically 25 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  $k = 3$ ).
- 4) **Forward Voltage:** The forward voltage is measured during a current pulse of typically 8 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  $k = 3$ ).
- 5) **Thermal Resistance:**  $R_{th\ max}$  is based on statistic values ( $6\sigma$ ).
- 6) **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.
- 7) **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.
- 8) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimensions are specified in mm.
- 9) **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  |
|---------|------------|---|
| 1.3     | 2019-02-12 | Ordering Information<br>Brightness Groups<br>Derating (Diagrams)<br>Type Designation System<br>Notes<br>Disclaimer  |
| 1.4     | 2019-08-22 | Ordering Information<br>Characteristics<br>Brightness Groups<br>Group Name on Label<br>Derating (Diagrams)<br>Recommended Solder Pad<br>Notes<br>Disclaimer |
| 1.5     | 2020-01-30 | Features<br>Schematic Transportation Box<br>Dimensions of Transportation Box  |

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