

# KRTB AELPS1.32

## OSIRE® E5515

The OSRAM OSIRE KRTB AELPS1.32 RGB side-looker device is specifically designed for automotive interior applications. It offers individually addressable LED chips for a maximum of flexibility in terms of color point, driver selection and interconnection. Due to the low profile, the OSIRE KRTB AELPS1.32 is ideally suited for coupling into thin lightguides and enables ultra compact designs.



## Applications

- Interior Illumination (e.g. Ambient Map)

## Features:

- Package: white SMT package, colorless clear silicone resin
- Chip technology: Thinfilm / UX:3
- Typ. Radiation: 120° (Lambertian emitter)
- Color:  $\lambda_{\text{dom}} = 625 \text{ nm}$  (● red);  $\lambda_{\text{dom}} = 528 \text{ nm}$  (● true green);  $\lambda_{\text{dom}} = 465 \text{ nm}$  (● blue)
- Corrosion Robustness Class: 2B
- Qualifications: AEC-Q102 Qualified
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)

## Ordering Information

| Type                                  | Brightness <sup>1)</sup>                                        | Ordering Code |
|---------------------------------------|-----------------------------------------------------------------|---------------|
| KRTBAELPS1.32-V1A4-JW+B4B6-D8+S6U2-7Z |                                                                 | Q65112A6747   |
| • red                                 | • $I_v = 710 \dots 1590 \text{ mcd}$ ( $I_F = 20 \text{ mA}$ )  |               |
| • true green                          | • $I_v = 2010 \dots 3200 \text{ mcd}$ ( $I_F = 20 \text{ mA}$ ) |               |
| • blue                                | • $I_v = 250 \dots 710 \text{ mcd}$ ( $I_F = 20 \text{ mA}$ )   |               |

## Maximum Ratings

| Parameter                                                                            | Symbol    |      | Values | Values       | Values |
|--------------------------------------------------------------------------------------|-----------|------|--------|--------------|--------|
|                                                                                      |           |      | ● red  | ● true green | ● blue |
| Operating Temperature                                                                | $T_{op}$  | min. | -40 °C | -40 °C       | -40 °C |
|                                                                                      |           | max. | 110 °C | 110 °C       | 110 °C |
| Storage Temperature                                                                  | $T_{stg}$ | min. | -40 °C | -40 °C       | -40 °C |
|                                                                                      |           | max. | 110 °C | 110 °C       | 110 °C |
| Junction Temperature                                                                 | $T_j$     | max. | 125 °C | 125 °C       | 125 °C |
| Forward Current<br>$T_s = 25\text{ °C}$                                              | $I_F$     | min. | 5 mA   | 5 mA         | 5 mA   |
|                                                                                      |           | max. | 50 mA  | 50 mA        | 50 mA  |
| Surge Current<br>$t \leq 10\text{ }\mu\text{s}$ ; $D = 0.005$ ; $T_s = 25\text{ °C}$ | $I_{FS}$  | max. | 100 mA | 300 mA       | 300 mA |
| Reverse voltage <sup>2)</sup><br>$T_s = 25\text{ °C}$                                | $V_R$     | max. | 12 V   | 5 V          | 5 V    |
| ESD withstand voltage<br>acc. to ANSI/ESDA/JEDEC JS-001<br>(HBM, Class 2)            | $V_{ESD}$ |      | 2 kV   | 2 kV         | 2 kV   |

## Characteristics

$I_F = 20 \text{ mA}$ ;  $T_s = 25 \text{ °C}$

| Parameter                                                                            | Symbol                  |      | Values             | Values             | Values             |
|--------------------------------------------------------------------------------------|-------------------------|------|--------------------|--------------------|--------------------|
|                                                                                      |                         |      | ● red              | ● true green       | ● blue             |
| Peak Wavelength                                                                      | $\lambda_{\text{peak}}$ | typ. | 632 nm             | 523 nm             | 455 nm             |
| Dominant Wavelength <sup>3)</sup>                                                    | $\lambda_{\text{dom}}$  | min. | 620 nm             | 519 nm             | 447 nm             |
|                                                                                      |                         | typ. | 625 nm             | 528 nm             | 465 nm             |
|                                                                                      |                         | max. | 632 nm             | 546 nm             | 476 nm             |
| Spectral bandwidth at 50% $I_{\text{rel,max}}$                                       | $\Delta\lambda$         | typ. | 18 nm              | 33 nm              | 25 nm              |
| Viewing angle at 50% $I_v$                                                           | $2\phi$                 | typ. | 120 °              | 120 °              | 120 °              |
| Forward Voltage <sup>4)</sup><br>$I_F = 20 \text{ mA}$                               | $V_F$                   | min. | 1.60 V             | 2.10 V             | 2.50 V             |
|                                                                                      |                         | typ. | 1.95 V             | 2.60 V             | 2.85 V             |
|                                                                                      |                         | max. | 2.30 V             | 3.00 V             | 3.20 V             |
| Reverse current <sup>2)</sup><br>$V_R = 5 \text{ V}$ (blue / true green); 12 V (red) | $I_R$                   | typ. | 0.01 $\mu\text{A}$ | 0.01 $\mu\text{A}$ | 0.01 $\mu\text{A}$ |
|                                                                                      |                         | max. | 10 $\mu\text{A}$   | 10 $\mu\text{A}$   | 10 $\mu\text{A}$   |
| Real thermal resistance junction/solderpoint <sup>5)</sup>                           | $R_{\text{thJS real}}$  | typ. | 53 K / W           | 38 K / W           | 30 K / W           |
|                                                                                      |                         | max. | 78 K / W           | 52 K / W           | 48 K / W           |

## Brightness Groups

| Color of emission | Group | Luminous Intensity <sup>1)</sup><br>$I_F = 20 \text{ mA}$<br>min.<br>$I_v$ | Luminous Intensity <sup>1)</sup><br>$I_F = 20 \text{ mA}$<br>max.<br>$I_v$ |
|-------------------|-------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| • red             | V1    | 710 mcd                                                                    | 900 mcd                                                                    |
| • red             | V4    | 800 mcd                                                                    | 1000 mcd                                                                   |
| • red             | V2    | 900 mcd                                                                    | 1120 mcd                                                                   |
| • red             | V6    | 1000 mcd                                                                   | 1250 mcd                                                                   |
| • red             | AA    | 1120 mcd                                                                   | 1400 mcd                                                                   |
| • red             | A4    | 1250 mcd                                                                   | 1590 mcd                                                                   |
| • true green      | B4    | 2010 mcd                                                                   | 2500 mcd                                                                   |
| • true green      | BB    | 2240 mcd                                                                   | 2800 mcd                                                                   |
| • true green      | B6    | 2500 mcd                                                                   | 3200 mcd                                                                   |
| • blue            | S6    | 250 mcd                                                                    | 320 mcd                                                                    |
| • blue            | T1    | 280 mcd                                                                    | 355 mcd                                                                    |
| • blue            | T4    | 315 mcd                                                                    | 400 mcd                                                                    |
| • blue            | T2    | 355 mcd                                                                    | 450 mcd                                                                    |
| • blue            | T6    | 400 mcd                                                                    | 500 mcd                                                                    |
| • blue            | U1    | 450 mcd                                                                    | 560 mcd                                                                    |
| • blue            | U4    | 500 mcd                                                                    | 630 mcd                                                                    |
| • blue            | U2    | 560 mcd                                                                    | 710 mcd                                                                    |

## Wavelength Groups

- red

| Group | Dominant Wavelength <sup>3)</sup><br>min.<br>$\lambda_{\text{dom}}$ | Dominant Wavelength <sup>3)</sup><br>max.<br>$\lambda_{\text{dom}}$ |
|-------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| JP    | 620 nm                                                              | 625 nm                                                              |
| MT    | 623 nm                                                              | 629 nm                                                              |
| RW    | 627 nm                                                              | 632 nm                                                              |

## Wavelength Groups

- true green

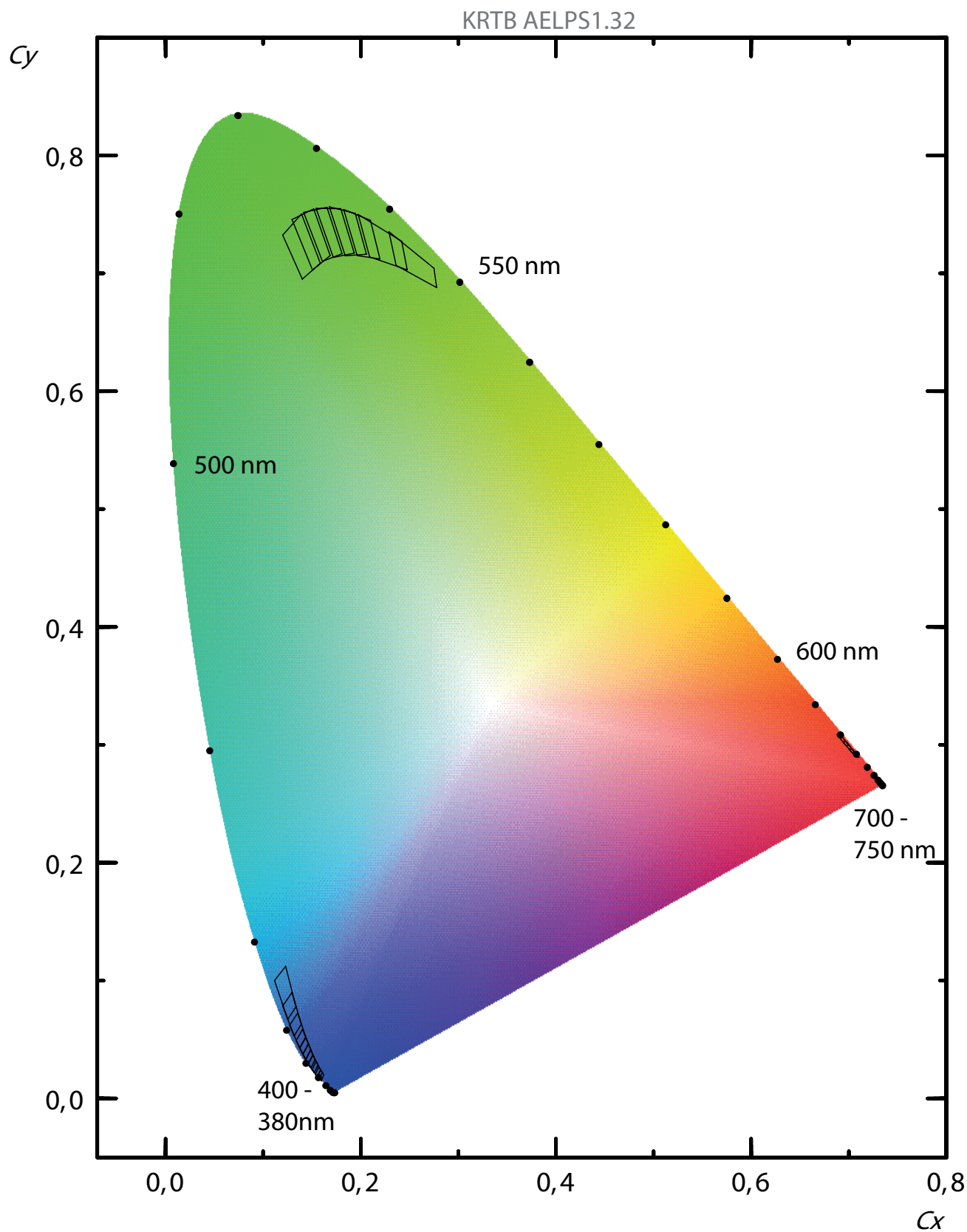
| Group | Dominant Wavelength <sup>3)</sup><br>min.<br>$\lambda_{\text{dom}}$ | Dominant Wavelength <sup>3)</sup><br>max.<br>$\lambda_{\text{dom}}$ |
|-------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| DJ    | 519 nm                                                              | 524 nm                                                              |
| FL    | 521 nm                                                              | 526 nm                                                              |
| JP    | 524 nm                                                              | 529 nm                                                              |
| LR    | 526 nm                                                              | 531 nm                                                              |
| PU    | 529 nm                                                              | 534 nm                                                              |
| RW    | 531 nm                                                              | 536 nm                                                              |
| U3    | 534 nm                                                              | 541 nm                                                              |
| 18    | 539 nm                                                              | 546 nm                                                              |

## Wavelength Groups

- blue

| Group | Dominant Wavelength <sup>3)</sup><br>min.<br>$\lambda_{\text{dom}}$ | Dominant Wavelength <sup>3)</sup><br>max.<br>$\lambda_{\text{dom}}$ |
|-------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| 73    | 447 nm                                                              | 451 nm                                                              |
| 51    | 449 nm                                                              | 453 nm                                                              |
| 3C    | 451 nm                                                              | 456 nm                                                              |
| AF    | 454 nm                                                              | 459 nm                                                              |
| DH    | 457 nm                                                              | 461 nm                                                              |
| FK    | 459 nm                                                              | 463 nm                                                              |
| HM    | 461 nm                                                              | 465 nm                                                              |
| KP    | 463 nm                                                              | 467 nm                                                              |
| MS    | 465 nm                                                              | 470 nm                                                              |
| QV    | 468 nm                                                              | 473 nm                                                              |
| TZ    | 471 nm                                                              | 476 nm                                                              |

## Chromaticity Coordinate Groups



Chromaticity Coordinate Groups

• red

| Group | Cx     | Cy     |
|-------|--------|--------|
| JP    | 0.6879 | 0.3086 |
|       | 0.6915 | 0.3083 |
|       | 0.7006 | 0.2993 |
|       | 0.6969 | 0.2996 |
| MT    | 0.6936 | 0.3030 |
|       | 0.6972 | 0.3027 |
|       | 0.7066 | 0.2934 |
|       | 0.7028 | 0.2938 |
| RW    | 0.7000 | 0.2966 |
|       | 0.7037 | 0.2962 |
|       | 0.7105 | 0.2895 |
|       | 0.7067 | 0.2899 |

## Chromaticity Coordinate Groups

● true green

| Group | Cx     | Cy     |
|-------|--------|--------|
| 18    | 0.2362 | 0.7067 |
|       | 0.2288 | 0.7353 |
|       | 0.2752 | 0.7042 |
|       | 0.2776 | 0.6881 |
| DJ    | 0.1401 | 0.6951 |
|       | 0.1201 | 0.7325 |
|       | 0.1415 | 0.7518 |
|       | 0.1606 | 0.7102 |
| FL    | 0.1486 | 0.7014 |
|       | 0.1273 | 0.7439 |
|       | 0.1517 | 0.7547 |
|       | 0.1698 | 0.7127 |
| JP    | 0.1606 | 0.7102 |
|       | 0.1415 | 0.7518 |
|       | 0.1679 | 0.7565 |
|       | 0.1831 | 0.7174 |
| LR    | 0.1694 | 0.7136 |
|       | 0.1517 | 0.7547 |
|       | 0.1794 | 0.7549 |
|       | 0.1933 | 0.7170 |
| PU    | 0.1831 | 0.7174 |
|       | 0.1678 | 0.7565 |
|       | 0.1973 | 0.7500 |
|       | 0.2091 | 0.7142 |
| RW    | 0.1932 | 0.7170 |
|       | 0.1794 | 0.7549 |
|       | 0.2098 | 0.7449 |
|       | 0.2196 | 0.7122 |
| U3    | 0.2091 | 0.7142 |
|       | 0.1974 | 0.7500 |
|       | 0.2419 | 0.7273 |
|       | 0.2474 | 0.7029 |

## Chromaticity Coordinate Groups

• blue

| Group | Cx     | Cy     |
|-------|--------|--------|
| 3C    | 0.1588 | 0.0243 |
|       | 0.1556 | 0.0186 |
|       | 0.1500 | 0.0246 |
|       | 0.1543 | 0.0317 |
| 51    | 0.1606 | 0.0222 |
|       | 0.1576 | 0.0168 |
|       | 0.1534 | 0.0206 |
|       | 0.1570 | 0.0268 |
| 73    | 0.1622 | 0.0203 |
|       | 0.1595 | 0.0152 |
|       | 0.1556 | 0.0186 |
|       | 0.1588 | 0.0243 |
| AF    | 0.1562 | 0.0285 |
|       | 0.1524 | 0.0219 |
|       | 0.1462 | 0.0293 |
|       | 0.1509 | 0.0370 |
| DH    | 0.1532 | 0.0332 |
|       | 0.1489 | 0.0262 |
|       | 0.1436 | 0.0332 |
|       | 0.1487 | 0.0414 |
| FK    | 0.1509 | 0.0370 |
|       | 0.1462 | 0.0293 |
|       | 0.1407 | 0.0376 |
|       | 0.1463 | 0.0463 |
| HM    | 0.1487 | 0.0414 |
|       | 0.1436 | 0.0332 |
|       | 0.1375 | 0.0428 |
|       | 0.1436 | 0.0519 |
| KP    | 0.1463 | 0.0463 |
|       | 0.1407 | 0.0376 |
|       | 0.1338 | 0.0493 |
|       | 0.1404 | 0.0588 |

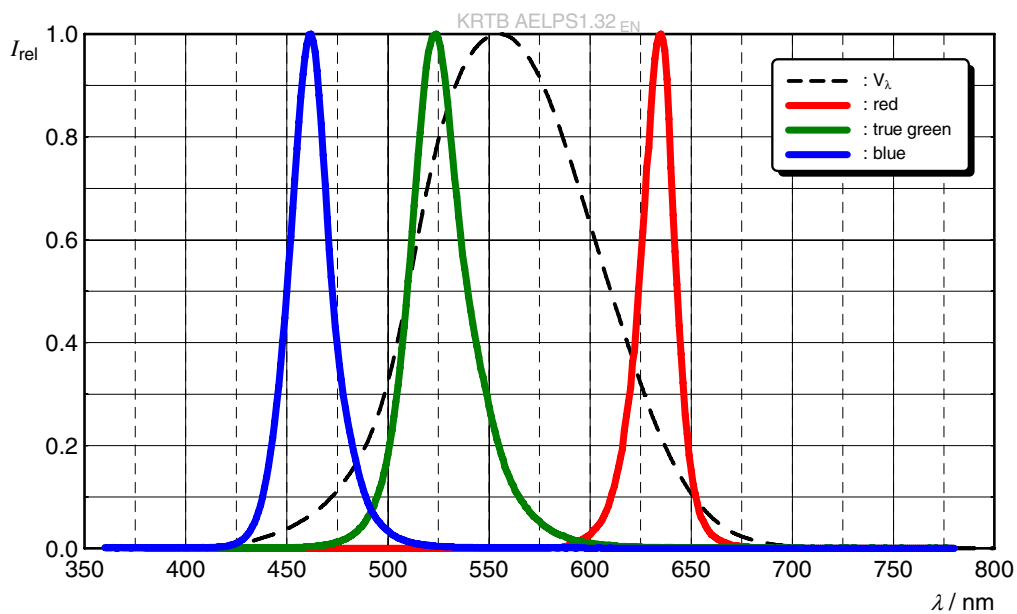
Chromaticity Coordinate Groups

• blue

| Group | Cx     | Cy     |
|-------|--------|--------|
| MS    | 0.1436 | 0.0519 |
|       | 0.1375 | 0.0428 |
|       | 0.1272 | 0.0620 |
|       | 0.1354 | 0.0727 |
| QV    | 0.1389 | 0.0631 |
|       | 0.1317 | 0.0532 |
|       | 0.1199 | 0.0785 |
|       | 0.1295 | 0.0899 |
| TZ    | 0.1335 | 0.0779 |
|       | 0.1251 | 0.0672 |
|       | 0.1115 | 0.1000 |
|       | 0.1231 | 0.1122 |

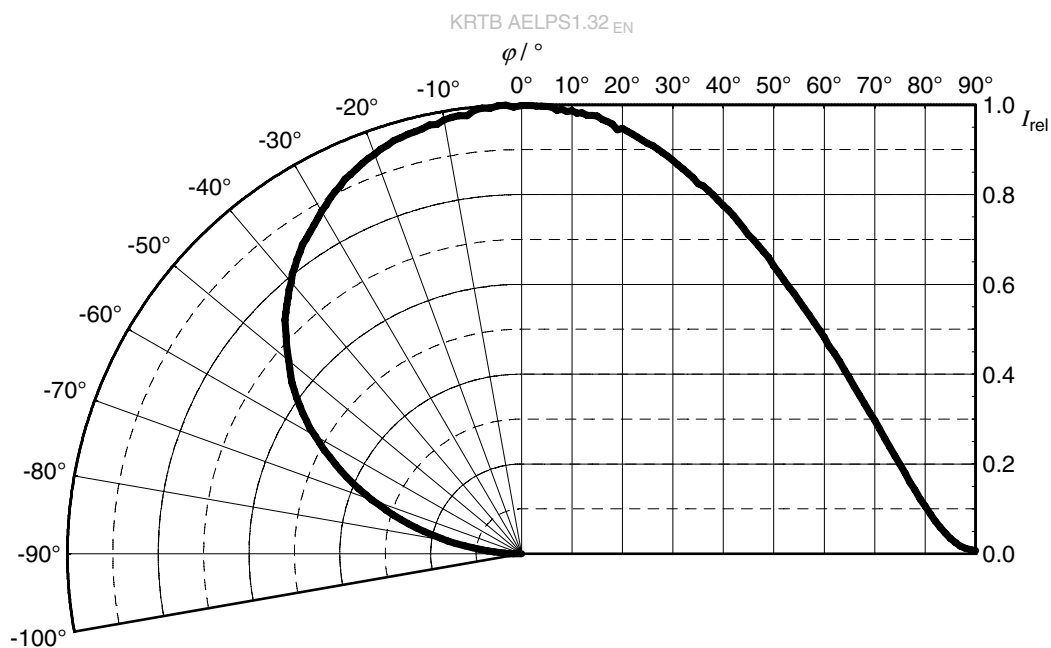
## Relative Spectral Emission <sup>6)</sup>

$I_{\text{rel}} = f(\lambda)$ ;  $I_F = 20 \text{ mA}$ ;  $T_S = 25 \text{ °C}$



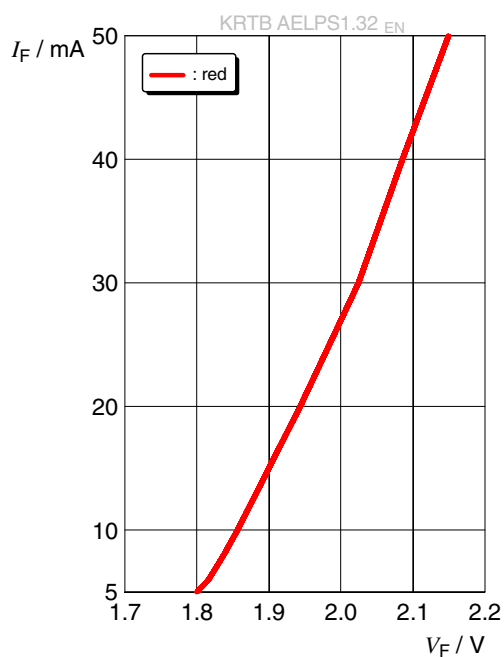
## Radiation Characteristics <sup>6)</sup>

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

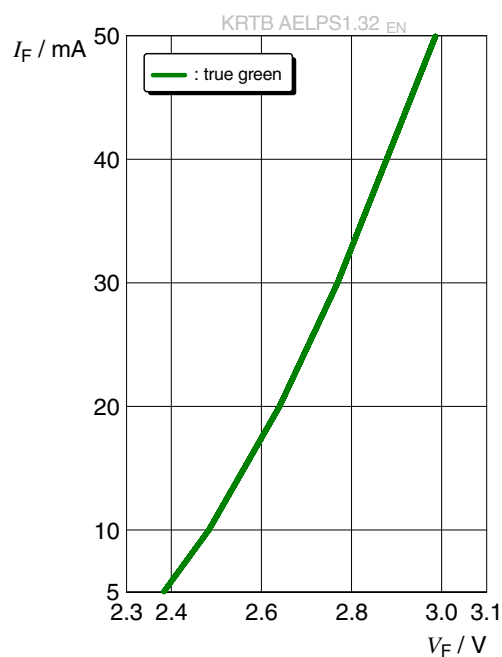


**Forward current** <sup>6)</sup>

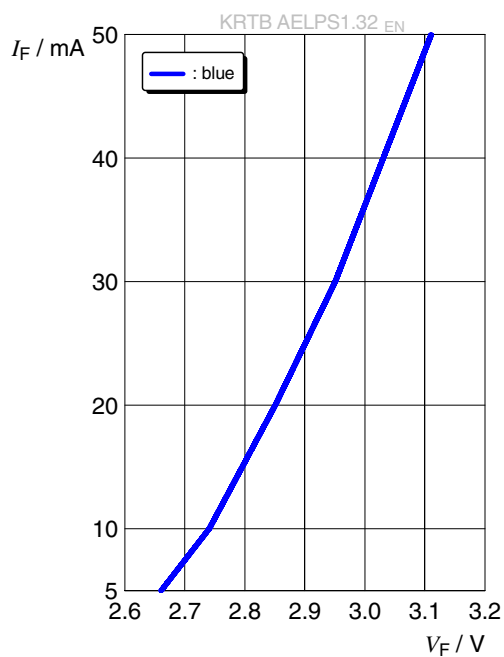
$$I_F = f(V_F); T_S = 25\text{ °C}$$

**Forward current** <sup>6)</sup>

$$I_F = f(V_F); T_S = 25\text{ °C}$$

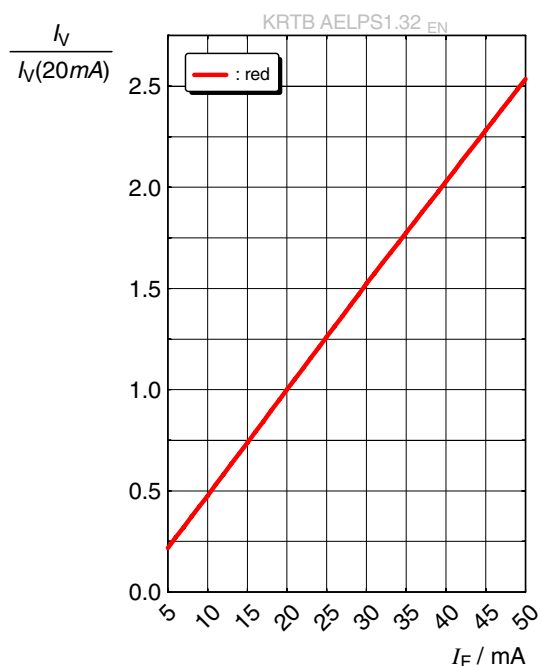
**Forward current** <sup>6)</sup>

$$I_F = f(V_F); T_S = 25\text{ °C}$$

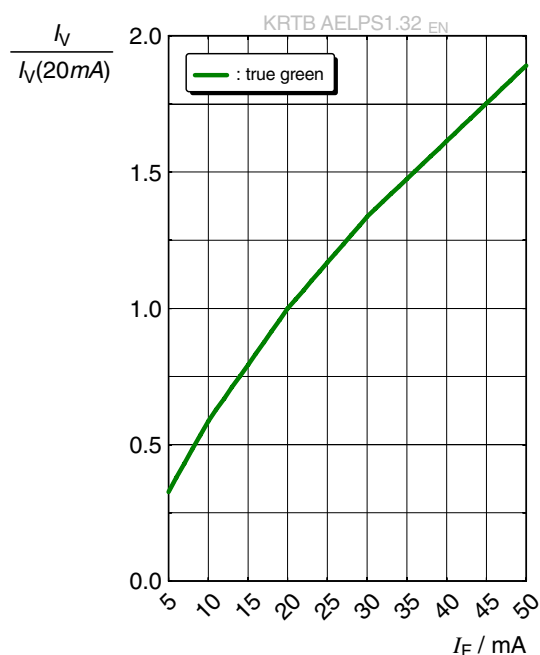


**Relative Luminous Intensity** <sup>6)</sup>

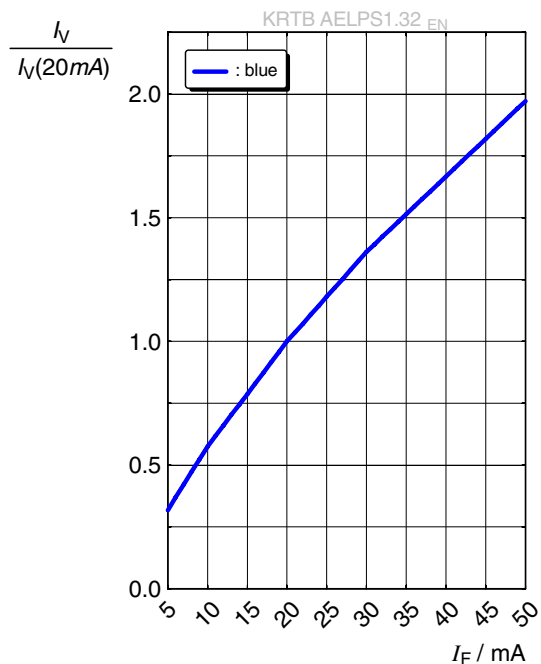
$$I_V/I_V(20\text{ mA}) = f(I_F); T_s = 25\text{ °C}$$

**Relative Luminous Intensity** <sup>6)</sup>

$$I_V/I_V(20\text{ mA}) = f(I_F); T_s = 25\text{ °C}$$

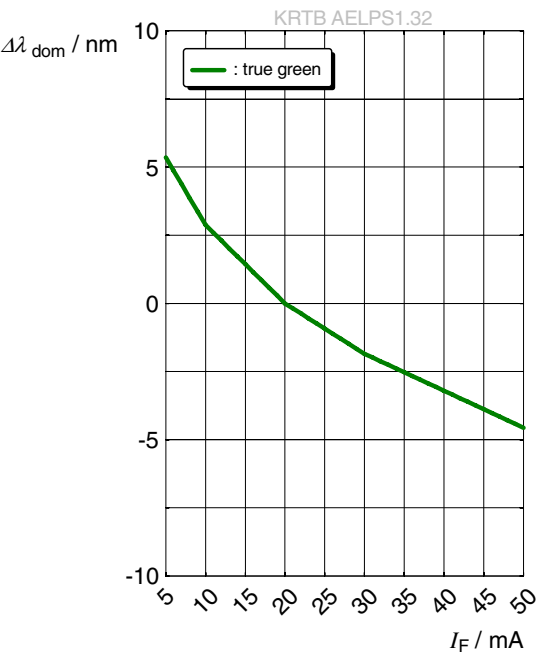
**Relative Luminous Intensity** <sup>6)</sup>

$$I_V/I_V(20\text{ mA}) = f(I_F); T_s = 25\text{ °C}$$



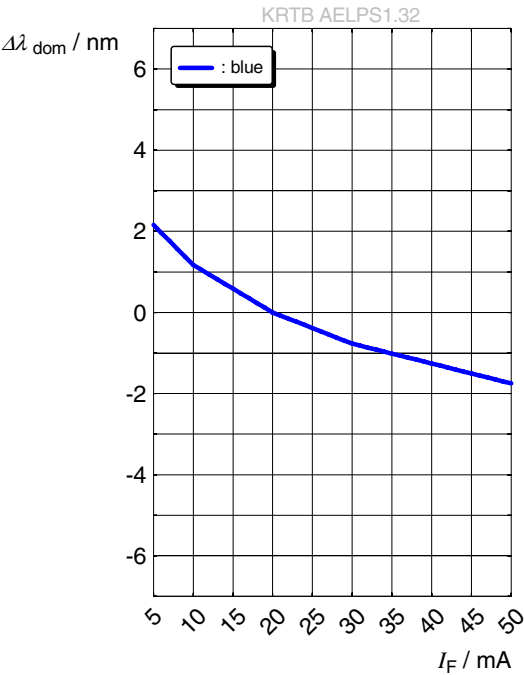
Dominant Wavelength <sup>6)</sup>

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



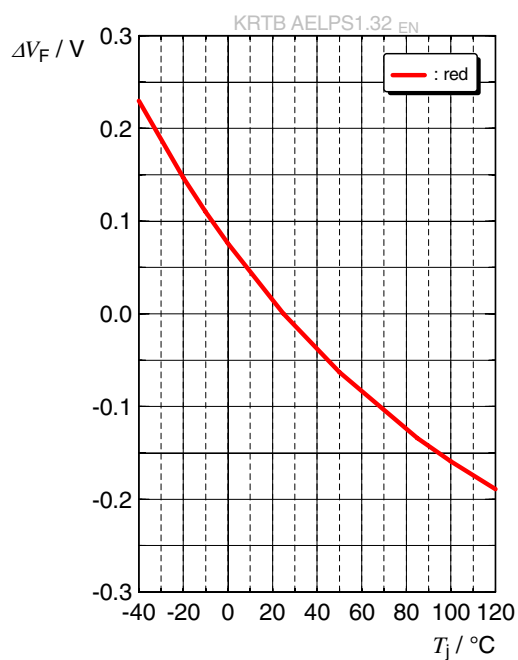
Dominant Wavelength <sup>6)</sup>

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

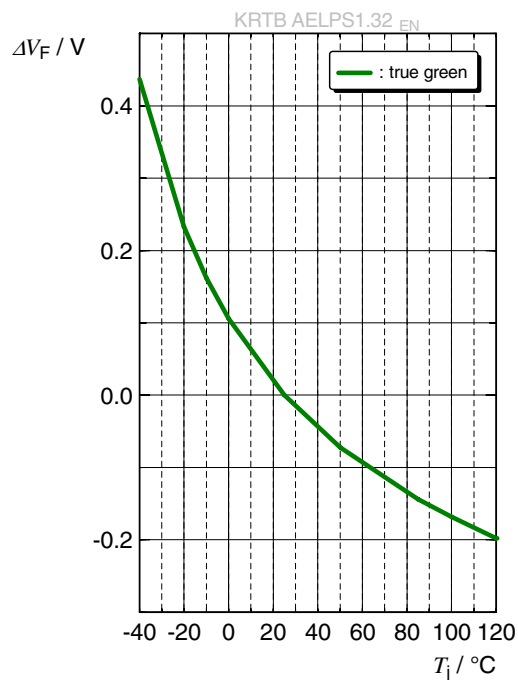


**Forward Voltage** <sup>6)</sup>

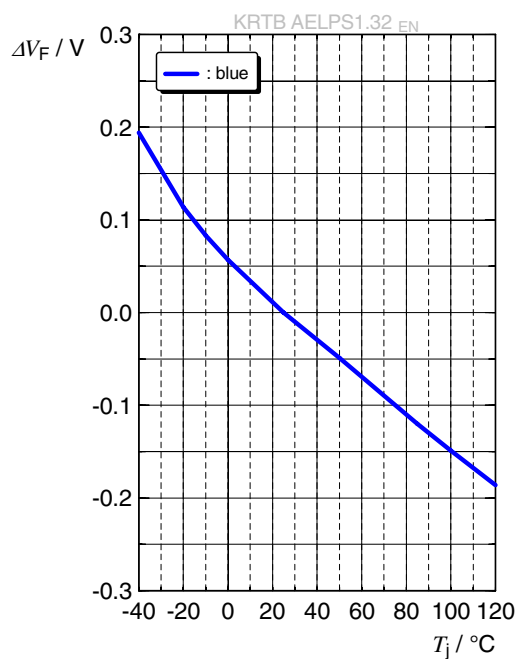
$$\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j); I_F = 20\text{ mA}$$

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

$$\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j); I_F = 20\text{ mA}$$

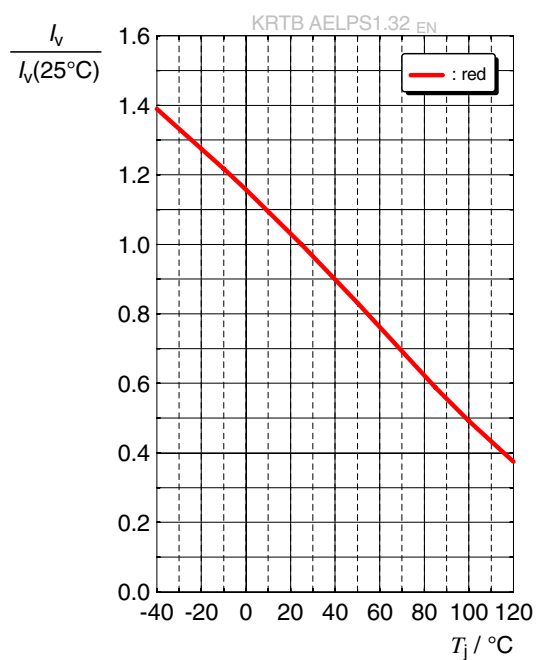
**Forward Voltage** <sup>6)</sup>

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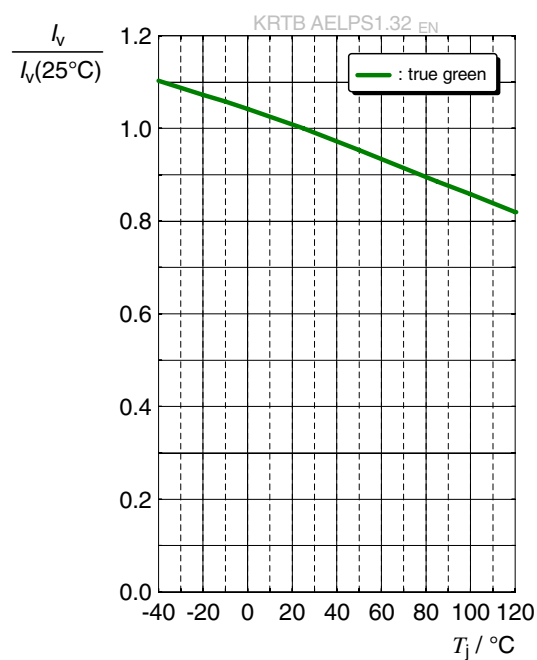


**Relative Luminous Intensity** <sup>6)</sup>

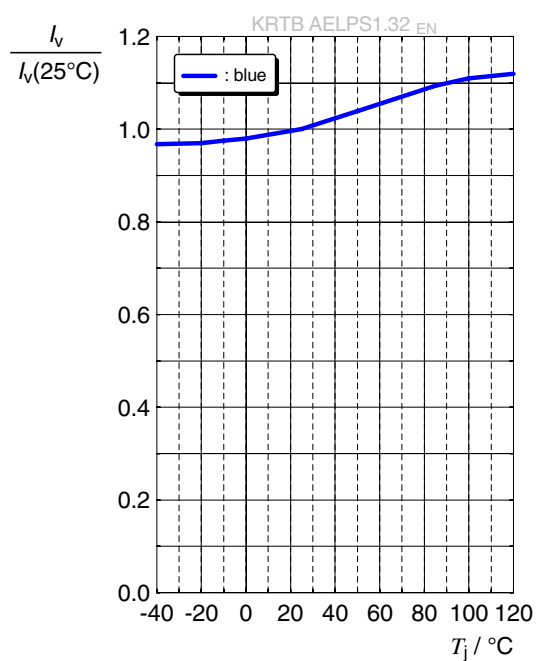
$$I_V/I_V(25\text{ °C}) = f(T_j); I_F = 20\text{ mA}$$

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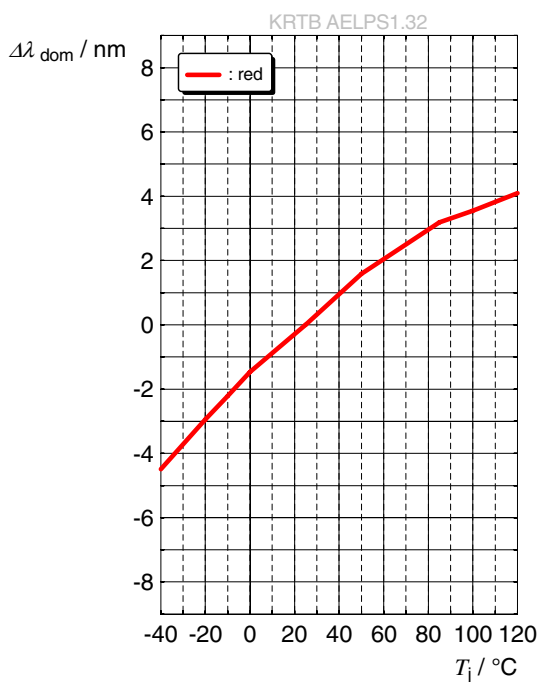
**Relative Luminous Intensity** <sup>6)</sup>

$$I_V/I_V(25\text{ °C}) = f(T_j); I_F = 20\text{ mA}$$



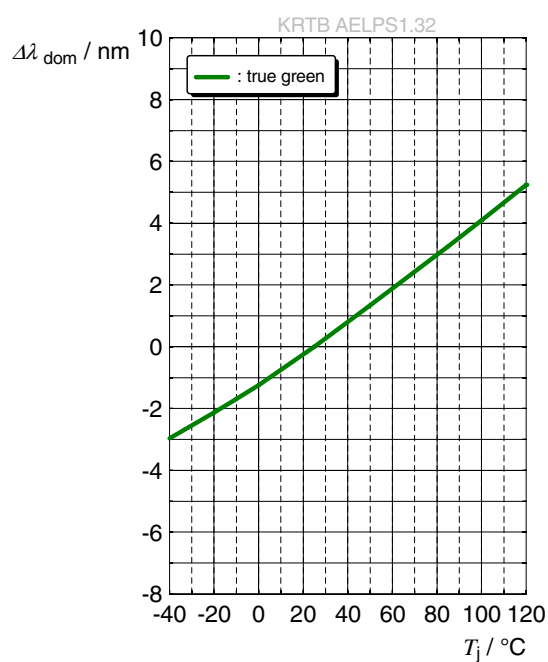
## Dominant Wavelength <sup>6)</sup>

$$\Delta\lambda_{\text{dom}} = \lambda_{\text{dom}} - \lambda_{\text{dom}}(25\text{ °C}) = f(T_j); I_F = 20\text{ mA}$$



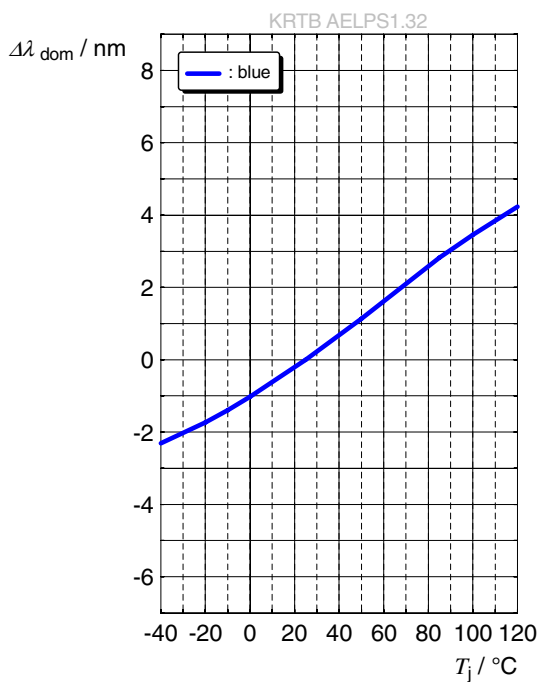
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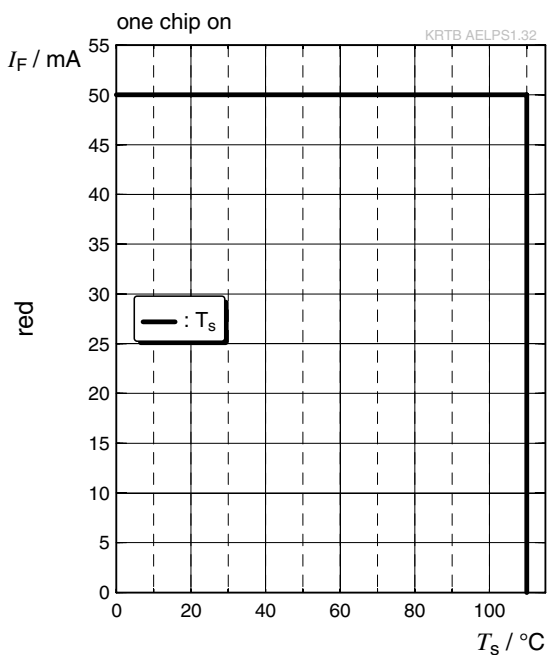
## Dominant Wavelength <sup>6)</sup>

$$\Delta\lambda_{\text{dom}} = \lambda_{\text{dom}} - \lambda_{\text{dom}}(25\text{ °C}) = f(T_j); I_F = 20\text{ mA}$$



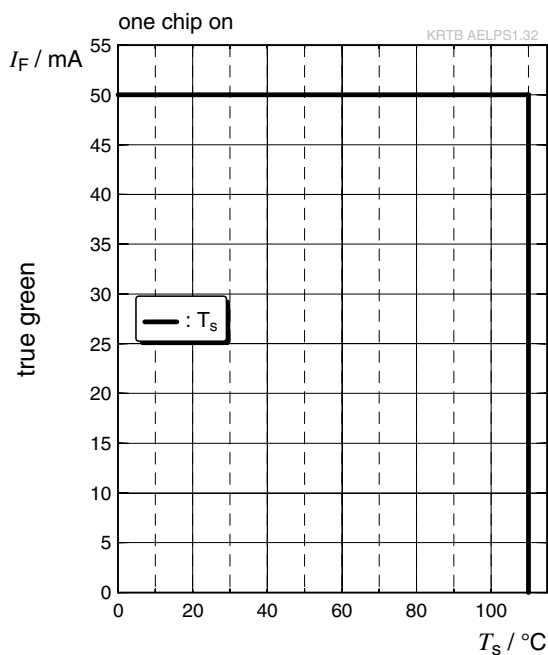
## Max. Permissible Forward Current

$I_F = f(T)$ ; • red



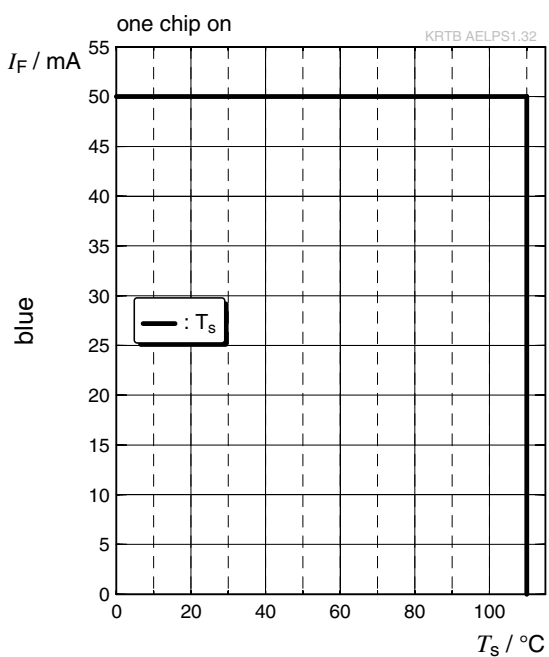
## Max. Permissible Forward Current

$I_F = f(T)$ ; • true green



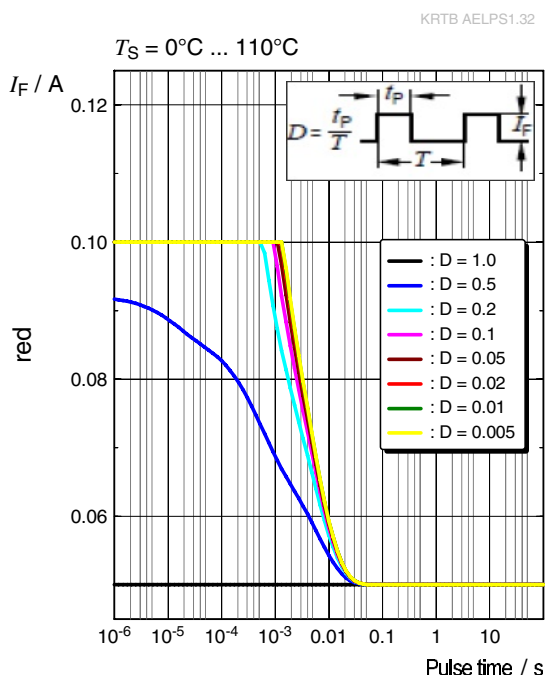
## Max. Permissible Forward Current

$I_F = f(T)$ ; • blue



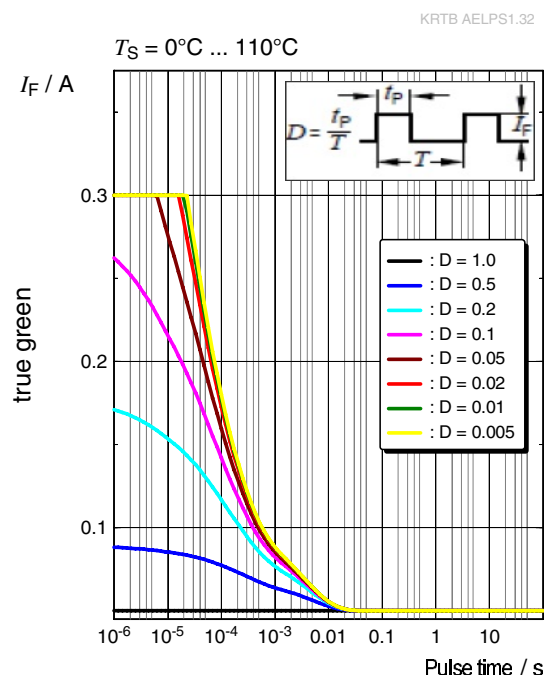
## Permissible Pulse Handling Capability

$I_F = f(t_p)$ ; D: Duty cycle;  $T_S = 25^\circ\text{C}$ ; ● red



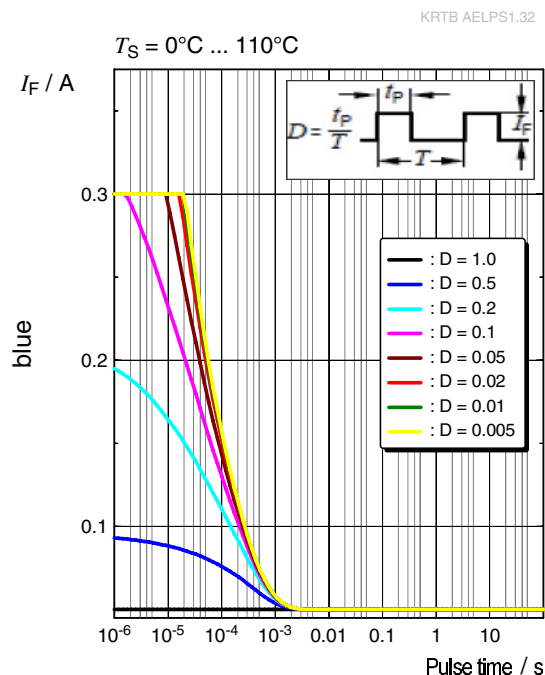
## Permissible Pulse Handling Capability

$I_F = f(t_p)$ ; D: Duty cycle;  $T_S = 25^\circ\text{C}$ ; ● true green

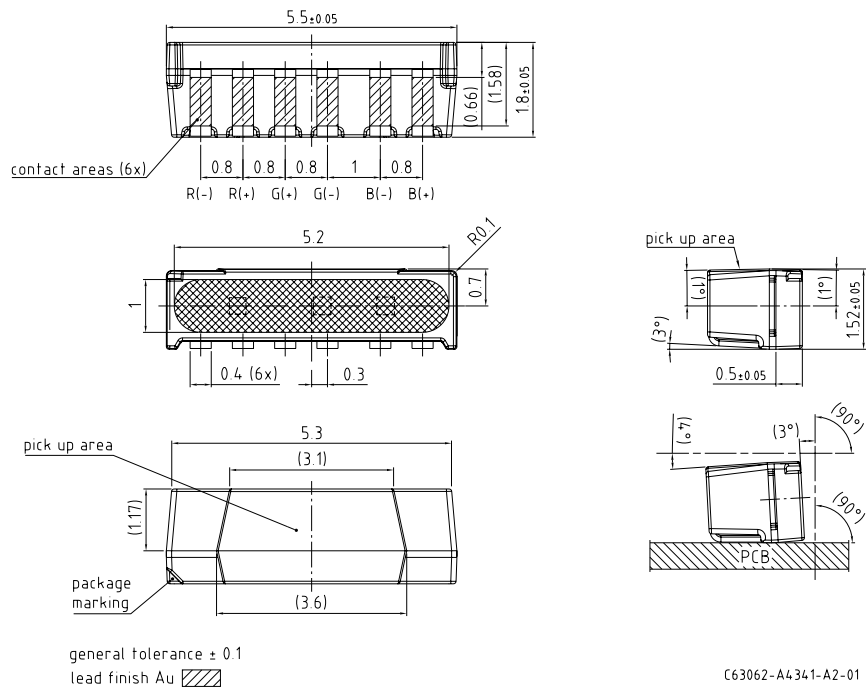


## Permissible Pulse Handling Capability

$I_F = f(t_p)$ ; D: Duty cycle;  $T_S = 25^\circ\text{C}$ ; ● blue



## Dimensional Drawing <sup>7)</sup>



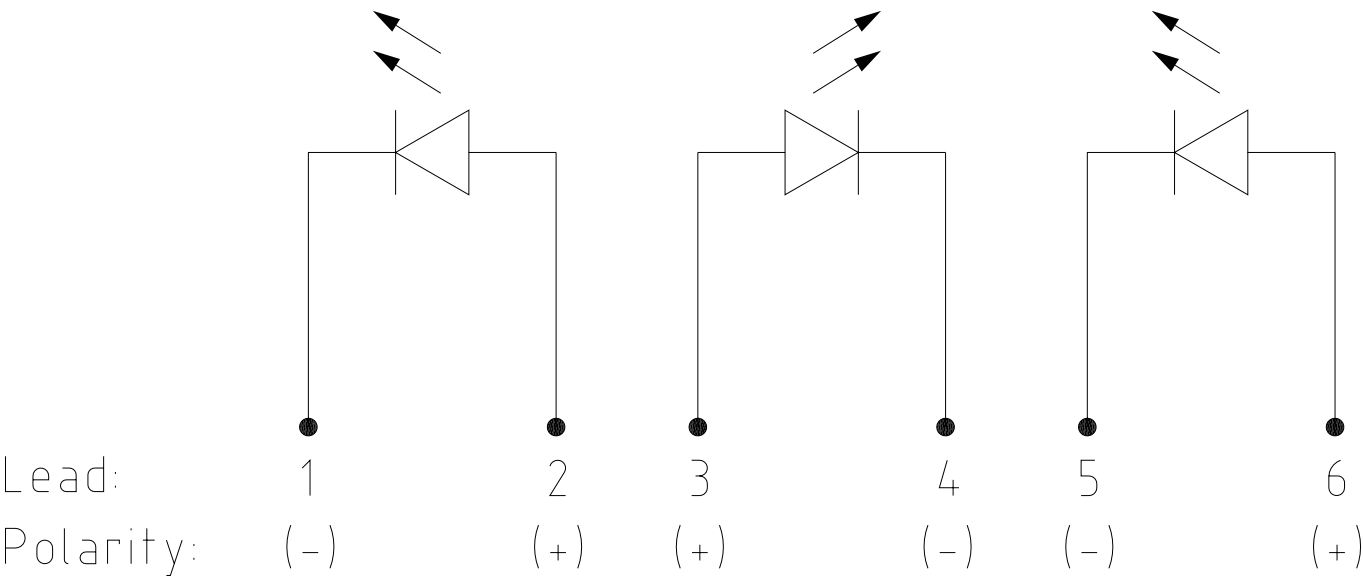
## Further Information:

**Approximate Weight:** 26.0 mg

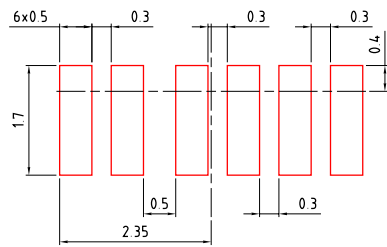
**Corrosion test:** Class: 2B  
Test condition: 25°C / 75 % RH / 10 ppm H<sub>2</sub>S / 21 days (IEC 60068-2-43)

Electrical Internal Circuit

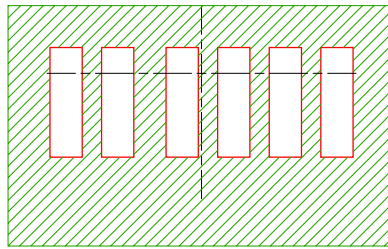
Circuit diagram



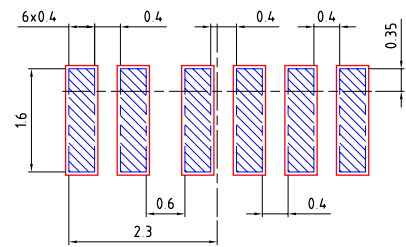
## Recommended Solder Pad <sup>7)</sup>



□ foot print

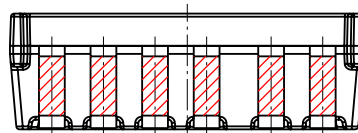
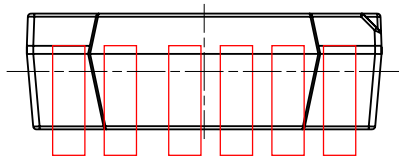


■ solder resist



■ solder stencil  
recommended stencil  
thickness 120µm

Component Location on Pad

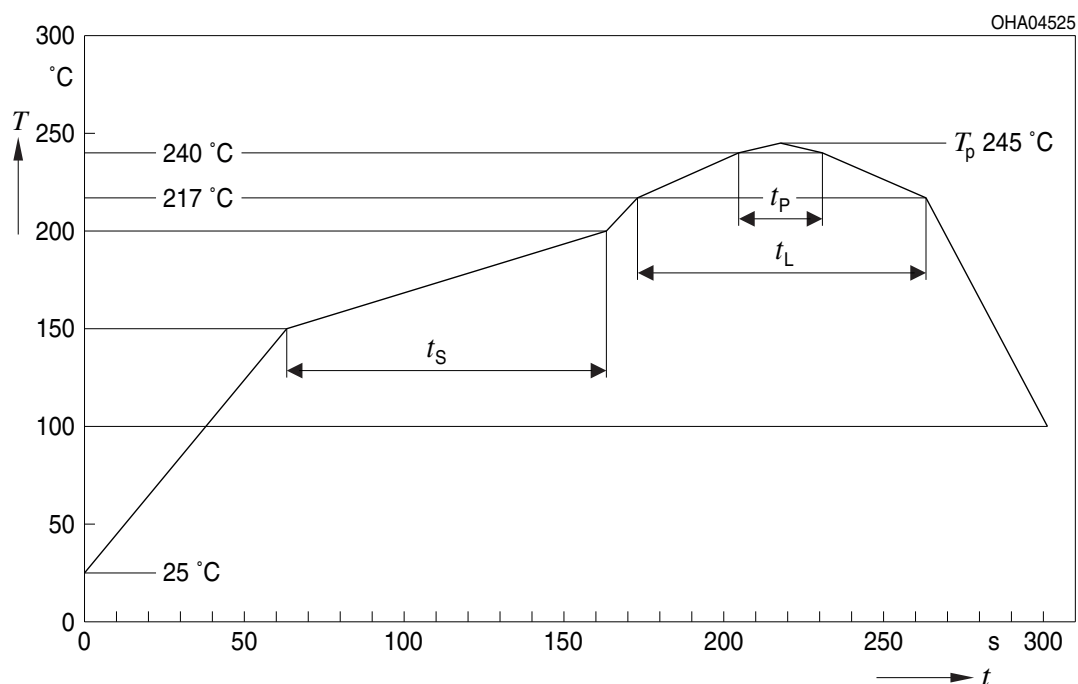


E062 3010 242 -01

For superior solder joint connectivity results we recommend soldering under standard nitrogen atmosphere. Package not suitable for any kind of wet cleaning or ultrasonic cleaning.

## Reflow Soldering Profile

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

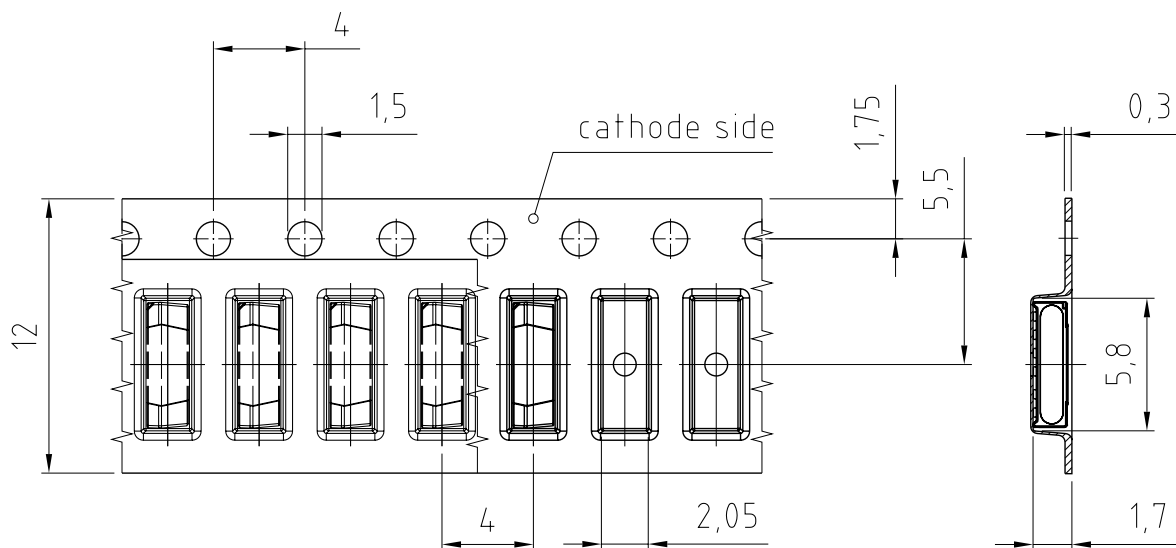


| Profile Feature                                                          | Symbol | Pb-Free (SnAgCu) Assembly |                |         | Unit               |
|--------------------------------------------------------------------------|--------|---------------------------|----------------|---------|--------------------|
|                                                                          |        | 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

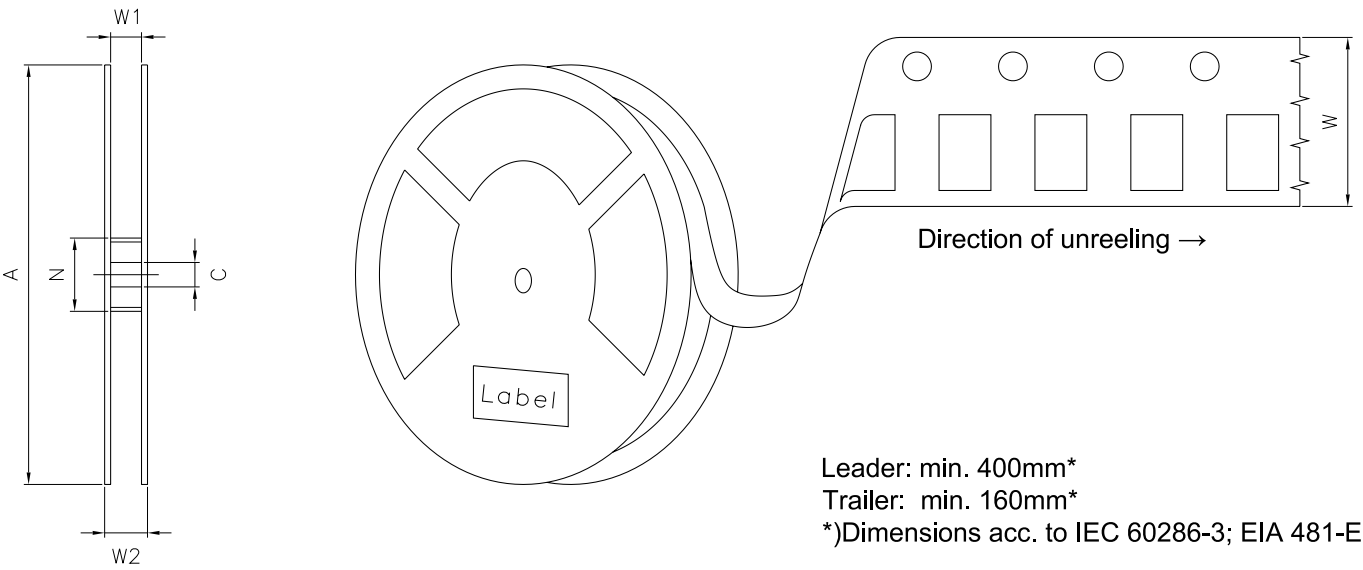
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

## Taping <sup>7)</sup>



C63062-A4341-B15-02

Tape and Reel <sup>8)</sup>



Reel Dimensions

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

Barcode-Product-Label (BPL)

OSRAM Opto Semiconductors

LX XXXX

BIN1: XX-XX-X-XXX-X

RoHS Compliant

(6P) BATCH NO: 1234567890

(1T) LOT NO: 1234567890

(X) PROD NO: 123456789

(Q) QTY: 9999

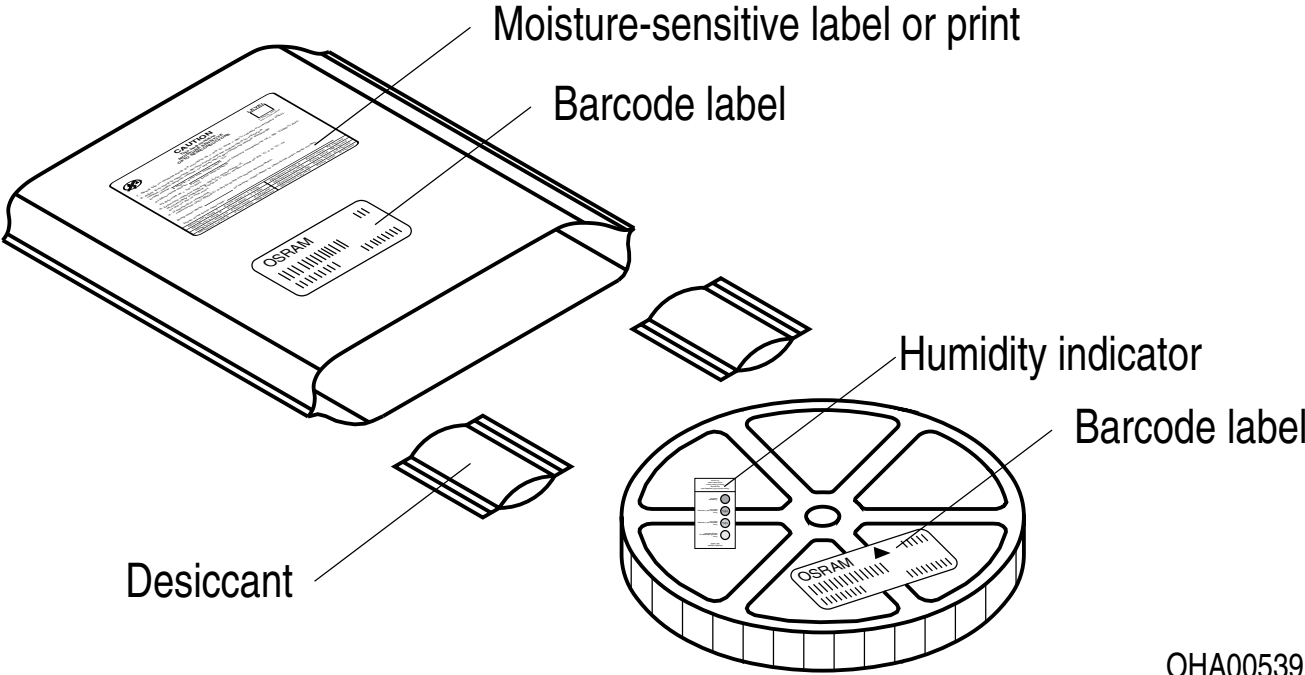
(G) GROUP: XX-XX-X-X

ML Temp ST  
X XXX °C X

Pack: RXX  
DEMY XXX  
X\_X123\_1234.1234 X

OHA04563

Dry Packing Process and Materials <sup>7)</sup>



OHA00539

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

## 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 **exempt group (exposure time 10000 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:** 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.
- 3) **Wavelength:** The wavelength is measured at a current pulse of typically 25 ms, with an internal reproducibility of  $\pm 0.5$  nm and an expanded uncertainty of  $\pm 1$  nm (acc. to GUM with a coverage factor of  $k = 3$ ).
- 4) **Forward Voltage:** Forward voltages are tested at a current pulse duration of 1 ms and a tolerance of  $\pm 0.05$  V and an expanded uncertainty of  $\pm 0.1$  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) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimensions are specified in mm.
- 8) **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     | 2019-11-20 | Initial Version                                                                          |
| 1.1     | 2021-01-18 | Features<br>Schematic Transportation Box<br>Dimensions of Transportation Box<br>Glossary |
| 1.2     | 2021-05-20 | Characteristics                                                                          |

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