

# OSRAM KB DELPS2.DI

## Datasheet

**Published by ams-OSRAM AG**

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## TOPLED® E1608

# KB DELPS2.DI

The TOPLED E1608 expands ams OSRAM' low power portfolio by offering one of the smallest LED Industry standard footprints in a highly reliable and well proved package concept.

Its outstanding performance is suitable for a huge variety of applications especially automotive interior where a small package design with excellent reliability is needed. The TOPLED E1608 is available in different colors and brightness levels.



## Applications

- Ambient Lighting
- Automotive Aftermarket
- Display Backlighting
- Functional Illumination
- Projection

## Features

- Package: white SMT package, colored diffused silicone resin
- Chip technology: Volume emitter on Sapphire (AlInGaN)
- Typ. Radiation: 120° (Lambertian emitter)
- Color: Cx = 0.2, Cy = 0.3 acc. to CIE 1931 (● color on demand 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	Luminous Intensity <sup>1)</sup> $I_F = 10\text{ mA}$ $I_v$	Ordering Code
KB DELPS2.DI-THVG-2J8L-Z555	330 ... 820 mcd	Q65111A8693

## Maximum Ratings

Parameter	Symbol		Values
Operating Temperature	$T_{op}$	min.	-40 °C
		max.	110 °C
Storage Temperature	$T_{stg}$	min.	-40 °C
		max.	110 °C
Junction Temperature	$T_j$	max.	125 °C
Forward current $T_s = 25\text{ °C}$	$I_F$	min.	1 mA
		max.	20 mA
Forward current pulsed $D = 0.005$ ; $T_s = 25\text{ °C}$	$I_{F\ pulse}$	max.	40 mA
Reverse voltage <sup>2)</sup> $T_s = 25\text{ °C}$	$V_R$	max.	5 V
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)	$V_{ESD}$		2 kV

Characteristics

$I_F = 10\text{ mA}$ ;  $T_s = 25\text{ °C}$

Parameter	Symbol		Values
Chromaticity Coordinate <sup>3)</sup>	Cx	typ.	0.2
	Cy	typ.	0.3
Viewing angle at 50% $I_V$	$2\phi$	typ.	120 °
Forward Voltage <sup>4)</sup> $I_F = 10\text{ mA}$	$V_F$	min.	2.70 V
		typ.	2.90 V
		max.	3.20 V
Reverse current <sup>2)</sup> $V_R = 5\text{ V}$	$I_R$	typ.	0.01 $\mu\text{A}$
		max.	10 $\mu\text{A}$
Real thermal resistance junction/ambient <sup>5)6)</sup>	$R_{thJA\text{ real}}$	max.	570 K / W
Real thermal resistance junction/solderpoint <sup>5)</sup>	$R_{thJS\text{ real}}$	typ.	120 K / W
		max.	210 K / W

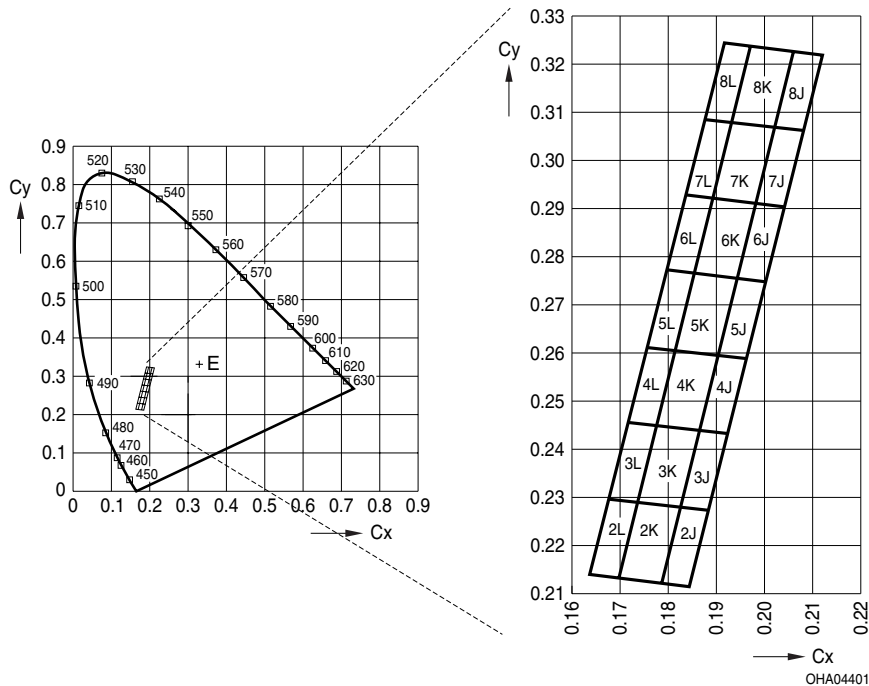
## Brightness Groups

Group	Luminous Intensity <sup>1)</sup> $I_F = 10 \text{ mA}$ min. $I_v$	Luminous Intensity <sup>1)</sup> $I_F = 10 \text{ mA}$ max. $I_v$	Luminous Flux <sup>7)</sup> $I_F = 10 \text{ mA}$ typ. $\Phi_v$
TH	330 mcd	390 mcd	1080 mlm
TI	390 mcd	450 mcd	1260 mlm
UG	450 mcd	520 mcd	1460 mlm
UH	520 mcd	610 mcd	1700 mlm
UI	610 mcd	710 mcd	1980 mlm
VG	710 mcd	820 mcd	2300 mlm

## Forward Voltage Groups

Group	Forward Voltage <sup>4)</sup> $I_F = 10 \text{ mA}$ min. $V_F$	Forward Voltage <sup>4)</sup> $I_F = 10 \text{ mA}$ max. $V_F$
Z5	2.70 V	2.95 V
55	2.95 V	3.20 V

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



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

Group	Cx	Cy	Group	Cx	Cy	Group	Cx	Cy
2J	0.1823	0.2280	3K	0.1775	0.2447	4L	0.1756	0.2611
	0.1882	0.2273		0.1862	0.2437		0.1814	0.2605
	0.1842	0.2116		0.1823	0.2280		0.1775	0.2447
	0.1784	0.2122		0.1735	0.2290		0.1716	0.2454
2K	0.1735	0.2290	3L	0.1716	0.2454	5J	0.1941	0.2753
	0.1823	0.2280		0.1775	0.2447		0.2000	0.2746
	0.1784	0.2122		0.1735	0.2290		0.1960	0.2588
	0.1696	0.2132		0.1677	0.2296		0.1902	0.2595
2L	0.1677	0.2296	4J	0.1902	0.2595	5K	0.1853	0.2762
	0.1735	0.2290		0.1960	0.2588		0.1941	0.2753
	0.1696	0.2132		0.1921	0.2431		0.1902	0.2595
	0.1637	0.2139		0.1862	0.2437		0.1814	0.2605
3J	0.1862	0.2437	4K	0.1814	0.2605	5L	0.1795	0.2769
	0.1921	0.2431		0.1902	0.2595		0.1853	0.2762
	0.1882	0.2273		0.1862	0.2437		0.1814	0.2605
	0.1823	0.2280		0.1775	0.2447		0.1756	0.2611

Group	Cx	Cy	Group	Cx	Cy	Group	Cx	Cy
6J	0.1980	0.2910	7J	0.2020	0.3068	8J	0.2059	0.3225
	0.2039	0.2904		0.2078	0.3061		0.2118	0.3219
	0.2000	0.2746		0.2039	0.2904		0.2078	0.3061
	0.1941	0.2753		0.1980	0.2910		0.2020	0.3068
6K	0.1893	0.2920	7K	0.1932	0.3078	8K	0.1971	0.3235
	0.1980	0.2910		0.2020	0.3068		0.2059	0.3225
	0.1941	0.2753		0.1980	0.2910		0.2020	0.3068
	0.1853	0.2762		0.1893	0.2920		0.1932	0.3078
6L	0.1834	0.2926	7L	0.1874	0.3084	8L	0.1913	0.3242
	0.1893	0.2920		0.1932	0.3078		0.1971	0.3235
	0.1853	0.2762		0.1893	0.2920		0.1932	0.3078
	0.1795	0.2769		0.1834	0.2926		0.1874	0.3084



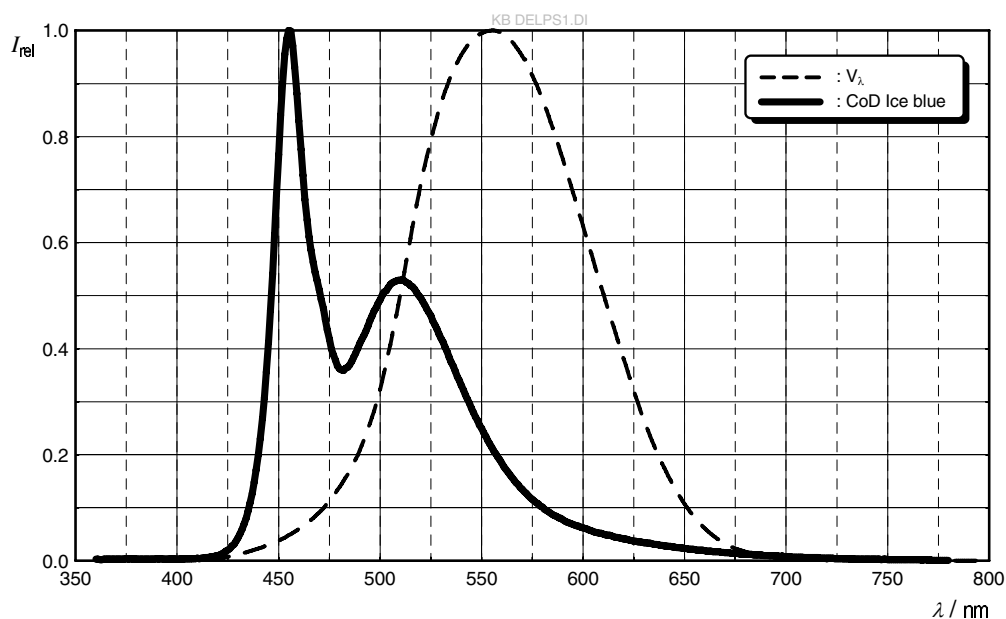
Group Name on Label

Example: TH-2J-55

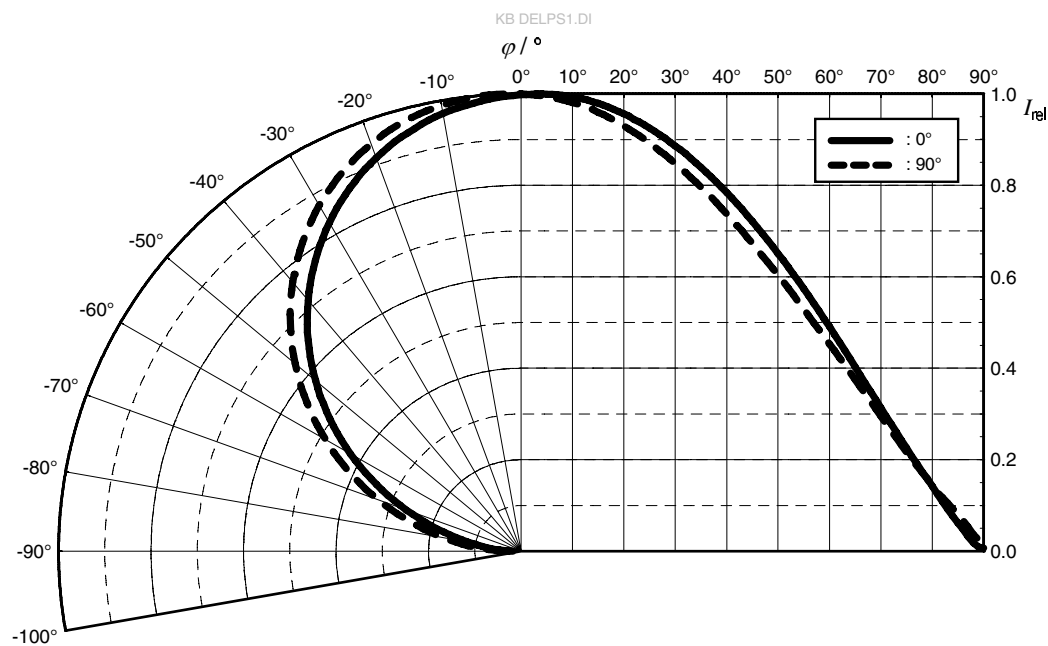
Brightness	Color Chromaticity	Forward Voltage
TH	2J	55

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

$$I_{\text{rel}} = f(\lambda); I_F = 10 \text{ mA}; T_S = 25 \text{ °C}$$

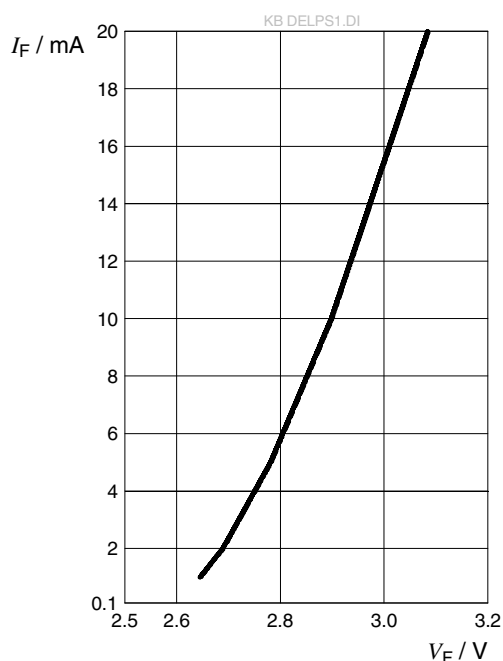
Radiation Characteristics <sup>7)</sup>

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

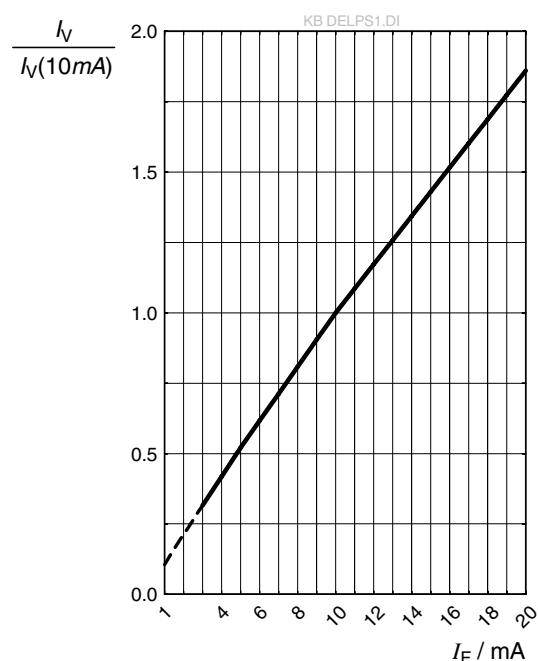


**Forward current** <sup>7)</sup>

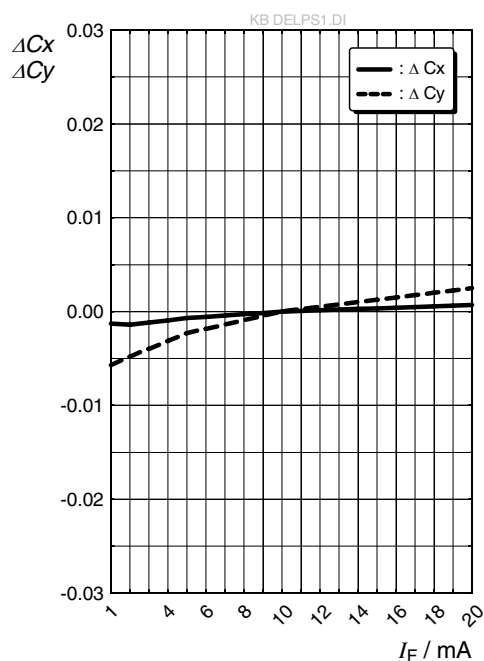
$$I_F = f(V_F); T_S = 25\text{ °C}$$

**Relative Luminous Intensity** <sup>7), 8)</sup>

$$I_V / I_V(10\text{ mA}) = f(I_F); T_S = 25\text{ °C}$$

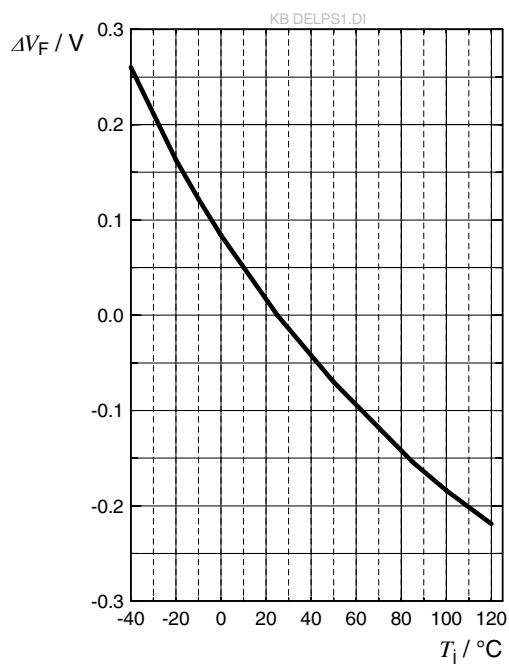
**Chromaticity Coordinate Shift** <sup>7)</sup>

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

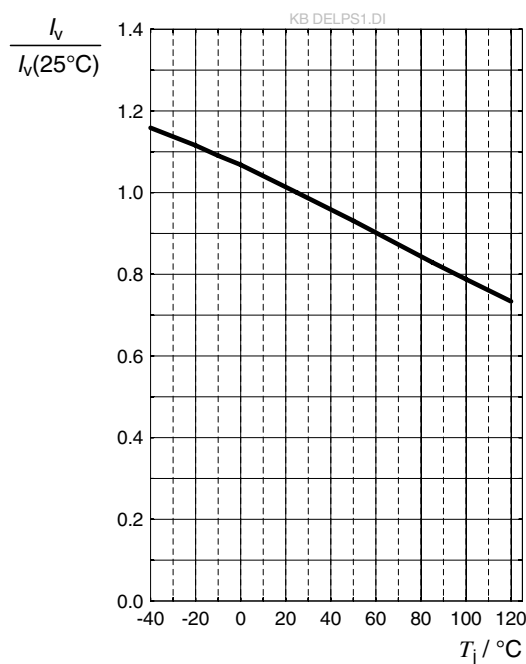


**Forward Voltage** <sup>7)</sup>

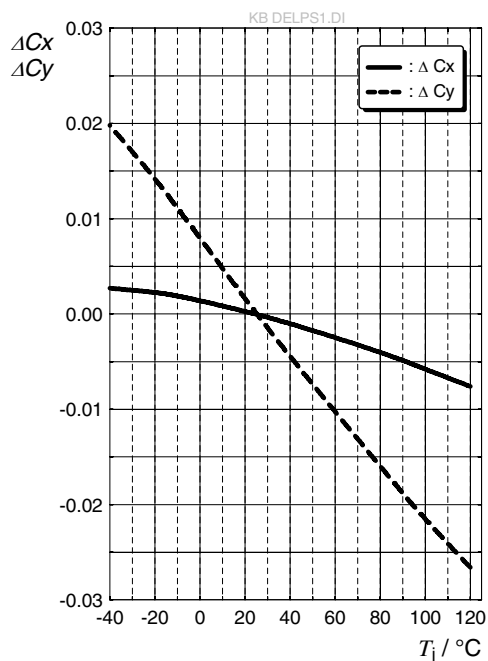
$$\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j); I_F = 10\text{ mA}$$

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

$$I_V / I_V(25^\circ\text{C}) = f(T_j); I_F = 10\text{ mA}$$

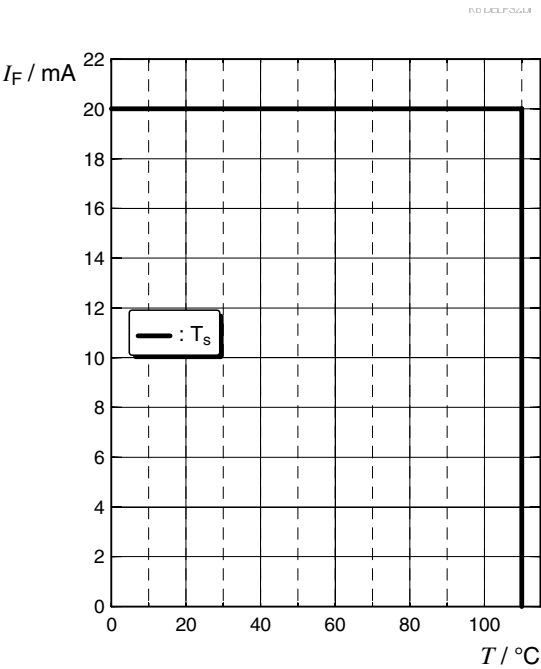
**Chromaticity Coordinate Shift** <sup>7)</sup>

$$\Delta C_x, \Delta C_y = f(T_j); I_F = 10\text{ mA}$$



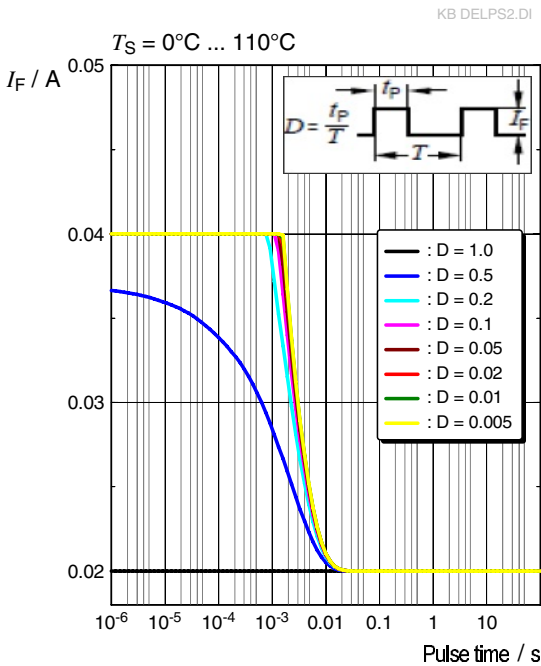
# Max. Permissible Forward Current <sup>5)</sup>

$I_F = f(T)$

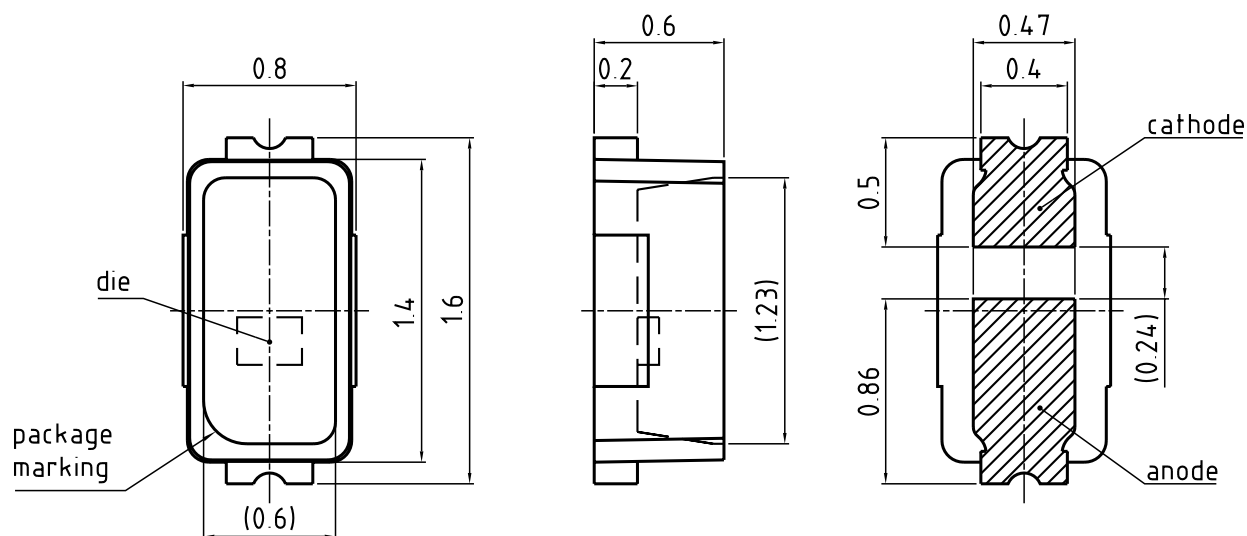


# Permissible Pulse Handling Capability

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



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



general tolerance  $\pm 0.1$   
lead finish Ag 

C63062-A4275-A1...-02

## Further Information:

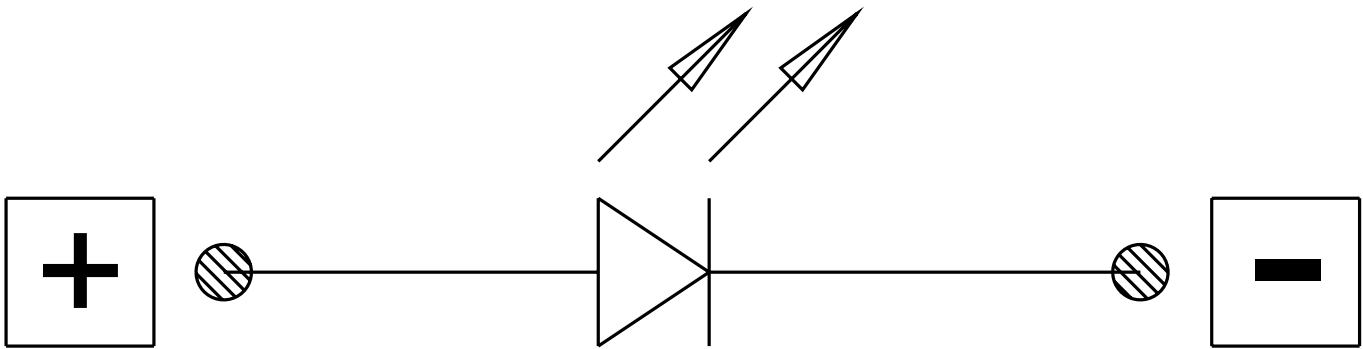
**Approximate Weight:** 2.0 mg

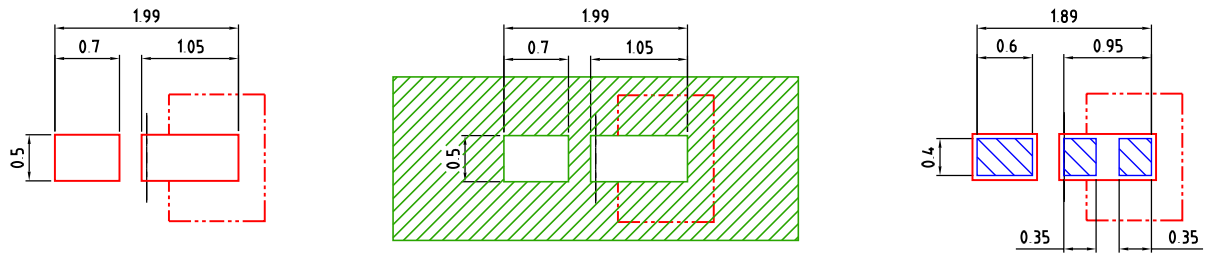
**Package marking:** Anode

**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

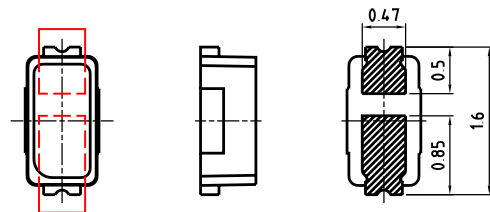


Recommended Solder Pad <sup>9)</sup>

foot print    Cu area    solder resist    solder stencil

The usage of solder resist between anode and cathode pads is mandatory for applications where water may condense

## Component Location on Pad



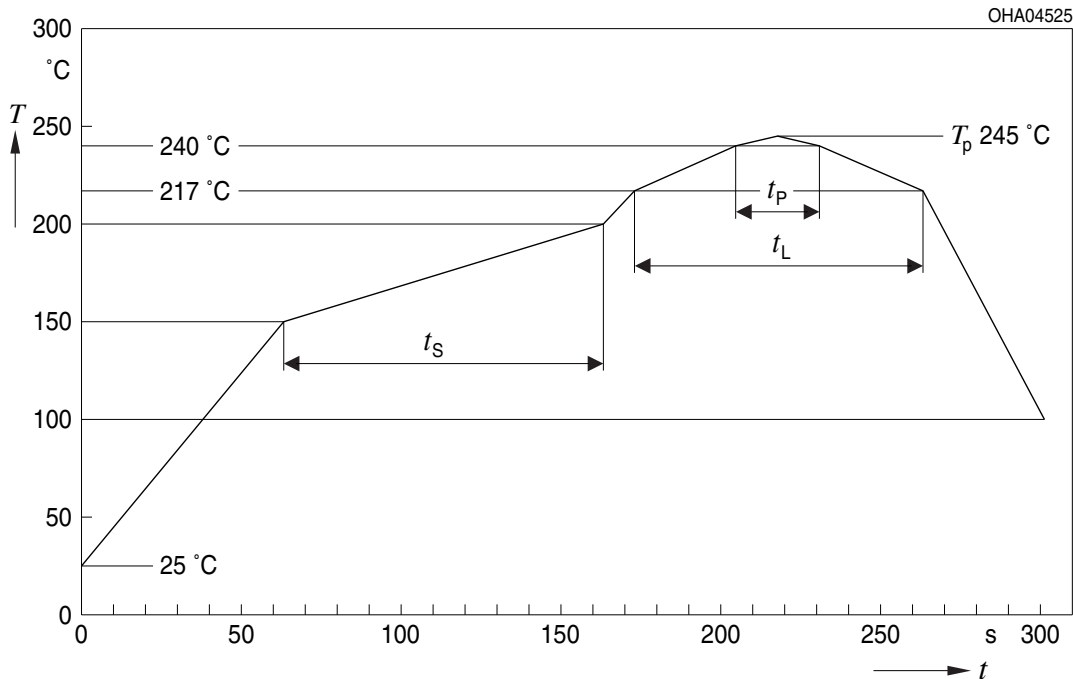
E062.3010.187 -02

All products are packed in a dry pack bag (Moisture Barrier Bag, MBB) according MIL-PRF-81705, after opening the MBB the products should go to reflow soldering process. Unused remaining LEDs should be protected from environment due to silver plated soldering terminal. In order to maintain solderability it is recommended to protect the silver plated solder terminals from corrosive environment before soldering. For superior solder joint connectivity results we recommend soldering under standard nitrogen atmosphere.



## Reflow Soldering Profile

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

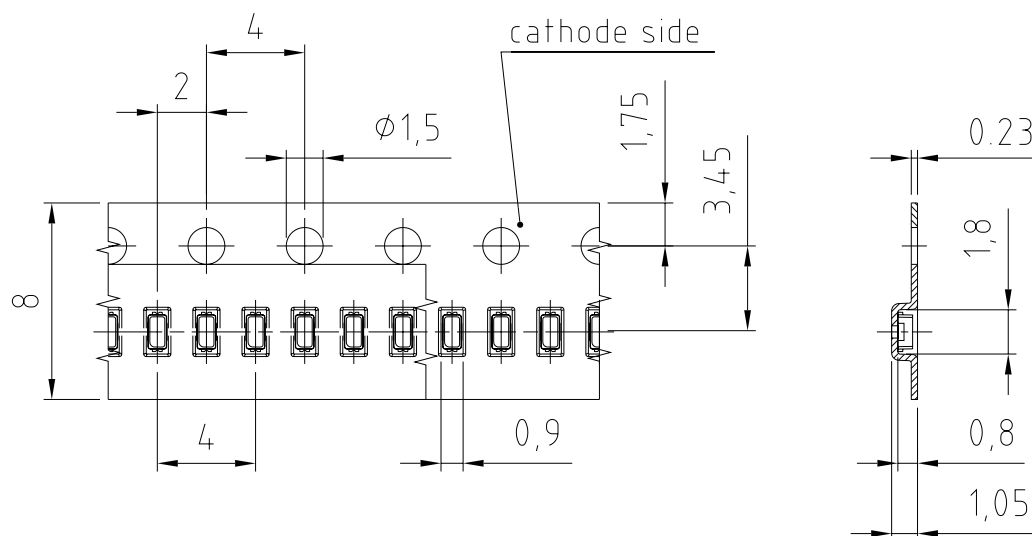


Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat <sup>*)</sup> 25 °C to 150 °C			2	3	K/s
Time $t_s$ $T_{Smin}$ to $T_{Smax}$	$t_s$	60	100	120	s
Ramp-up rate to peak <sup>*)</sup> $T_{Smax}$ to $T_p$			2	3	K/s
Liquidus temperature	$T_L$		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* $T_p$ to 100 °C			3	6	K/s
Time 25 °C to $T_p$				480	s

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

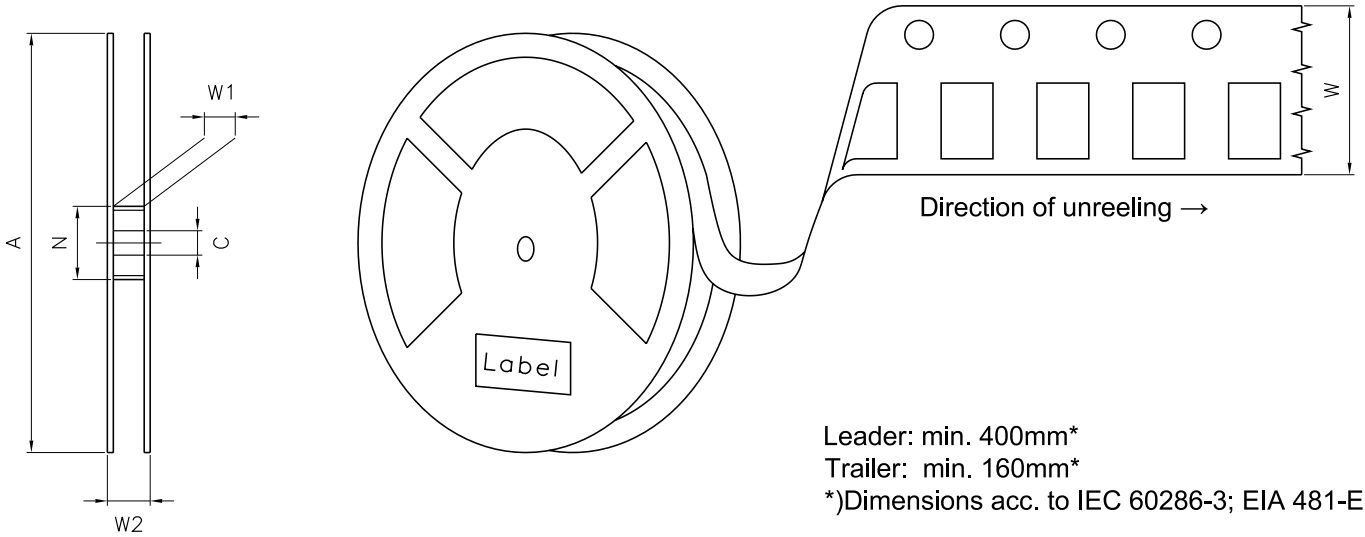
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

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



C63062-A4275-B5 -02

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



Reel Dimensions

A	W	N <sub>min</sub>	W <sub>1</sub>	W <sub>2 max</sub>	Pieces per PU
180 mm	8 + 0.3 / - 0.1 mm	60 mm	8.4 + 2 mm	14.4 mm	5000

## OSRAM

BIN1: XX-XX-X-XXX-X

(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

Moisture-sensitive label or print

Barcode label

Humidity indicator

Desiccant

Barcode label

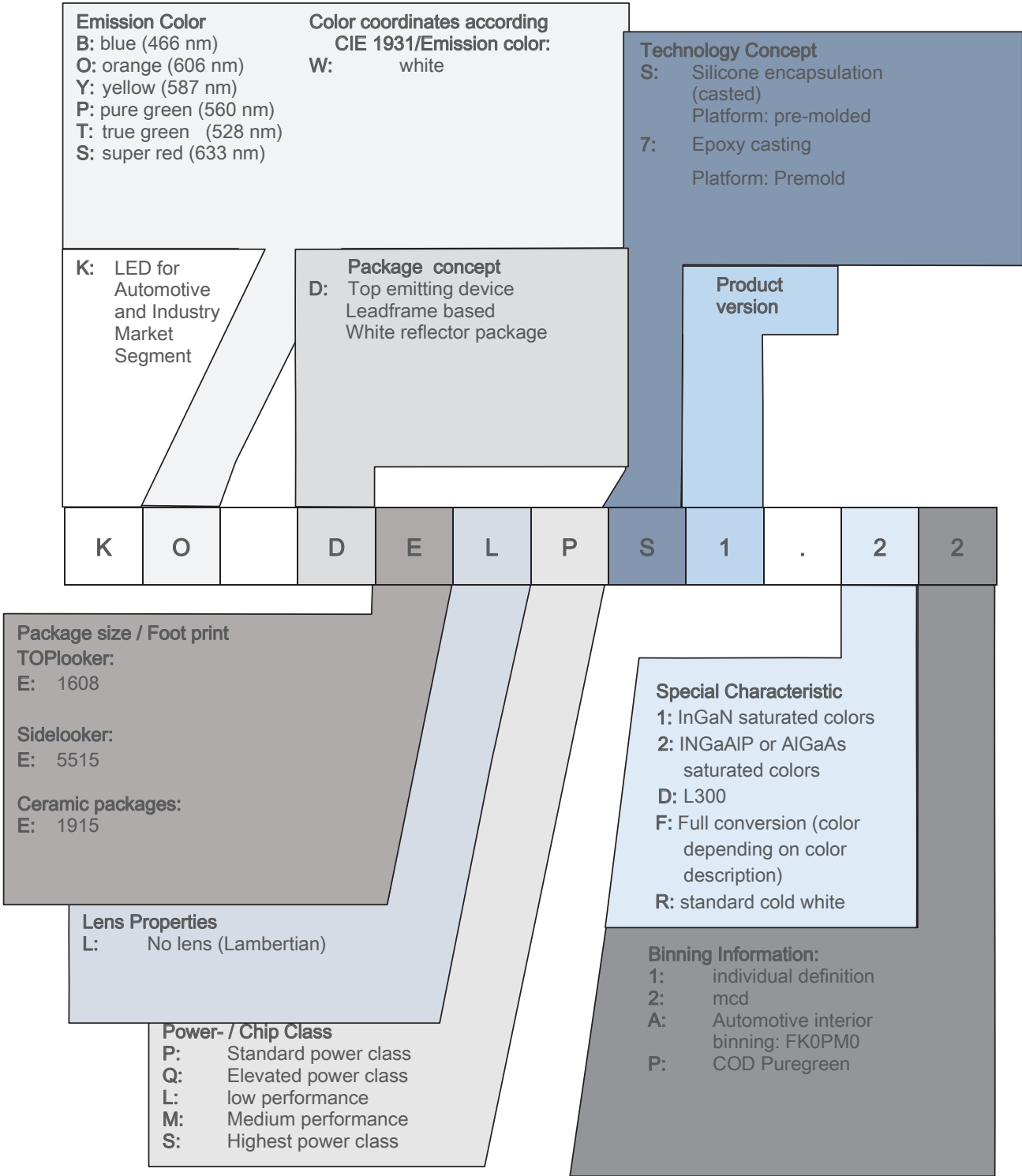
OSRAM

QHA00530

OHA00539

20 | Version 1.6 | 2024-05-16

Type Designation System



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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 **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 <https://ams-osram.com/support/application-notes>

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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.

## 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) **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:**  $R_{th\text{ max}}$  is based on statistic values ( $6\sigma$ ) used for Derating.
- 6) **Thermal Resistance:**  $R_{thJA}$  results from mounting on PC board FR 4 (pad size  $16\text{ mm}^2$  per pad)
- 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.



Revision History

Version	Date	Change
1.0	2019-05-22	Initial Version
1.1	2020-03-05	Derating (Diagrams)
1.2	2020-03-09	Schematic Transportation Box Dimensions of Transportation Box
1.3	2020-06-04	Further Information
1.4	2022-07-22	New Layout Applications
1.5	2022-11-16	Tape and Reel Reel Dimensions
1.6	2024-05-16	Applications Features



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。

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