

OSRAM SFH 4646

Datasheet

Published by **ams-OSRAM AG**

Tobelbader Strasse 30, 8141 Premstaetten, Austria

Phone +43 3136 500-0

ams-osram.com

© All rights reserved



MIDLED®

SFH 4646

Narrow beam LED in MIDLED package (940 nm)



Applications

- Access Control & Security
- Appliances & Tools
- Factory Automation
- Robotics

Features

- Package: clear silicone
- Qualifications: The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Short switching times
- Narrow half angle
- Taping as Sidelooker
- Also available as Toplooker (SFH4641)

Ordering Information

| Type | Radiant intensity ¹⁾²⁾ $I_F = 70 \text{ mA}; t_p = 20 \text{ ms}$ I_e | Radiant intensity ¹⁾ typ. $I_F = 70 \text{ mA}; t_p = 20 \text{ ms}$ I_e | Ordering Code |
|-------------|--|--|---------------|
| SFH 4646-TV | 28 ... 112 mW/sr | 55 mW/sr | Q65111A6148 |
| SFH 4646-Z | 28 ... 180 mW/sr | 55 mW/sr | Q65110A8099 |

Maximum Ratings

 $T_A = 25\text{ °C}$

| Parameter | Symbol | | Values |
|---|----------------------|--------------|------------------|
| Operating temperature | T_{op} | min. max. | -40 °C 100 °C |
| Storage temperature | T_{stg} | min. max. | -40 °C 100 °C |
| Junction temperature | T_j | max. | 125 °C |
| Forward current | I_F | max. | 70 mA |
| Forward current pulsed $t_p \leq 30\text{ }\mu\text{s}$; $D \leq 0.005$ | $I_{F\text{ pulse}}$ | max. | 0.7 A |
| Reverse voltage ³⁾ | V_R | max. | 5 V |
| Power consumption | P_{tot} | max. | 140 mW |
| ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2) | V_{ESD} | max. | 2 kV |

Characteristics

$I_F = 70 \text{ mA}$; $t_p = 20 \text{ ms}$; $T_A = 25 \text{ °C}$

| Parameter | Symbol | | Values |
|--|-----------------------------|--------------|--|
| Peak wavelength | λ_{peak} | typ. | 950 nm |
| Centroid wavelength | $\lambda_{\text{centroid}}$ | typ. | 940 nm |
| Spectral bandwidth at 50% $I_{\text{rel,max}}$ (FWHM) | $\Delta\lambda$ | typ. | 42 nm |
| Half angle | φ | typ. | 10 ° |
| Dimensions of active chip area | L x W | typ. | 0.2 x 0.2 mm x mm |
| Rise time (10% / 90%) $I_F = 70 \text{ mA}$; $R_L = 50 \text{ }\Omega$ | t_r | typ. | 12 ns |
| Fall time (10% / 90%) $I_F = 70 \text{ mA}$; $R_L = 50 \text{ }\Omega$ | t_f | typ. | 12 ns |
| Forward voltage ⁴⁾ | V_F | typ. max. | 1.6 V 1.9 V |
| Forward voltage ⁴⁾ $I_F = 500 \text{ mA}$; $t_p = 100 \text{ }\mu\text{s}$ | V_F | typ. max. | 2.4 V 2.9 V |
| Reverse current ³⁾ $V_R = 5 \text{ V}$ | I_R | typ. max. | 0.01 μA 10 μA |
| Radiant intensity ¹⁾ $I_F = 500 \text{ mA}$; $t_p = 25 \text{ }\mu\text{s}$ | I_e | typ. | 330 mW/sr |
| Total radiant flux ⁵⁾ $I_F = 70 \text{ mA}$; $t_p = 20 \text{ ms}$ | Φ_e | typ. | 35 mW |
| Temperature coefficient of voltage | TC_V | typ. | -1.3 mV / K |
| Temperature coefficient of brightness | TC_I | typ. | -0.5 % / K |
| Temperature coefficient of wavelength | TC_λ | typ. | 0.3 nm / K |
| Thermal resistance junction solder point real ⁶⁾ | $R_{\text{thJS real}}$ | max. | 220 K / W |
| Thermal resistance junction ambient real ⁷⁾ | R_{thJA} | max. | 380 K / W |

Brightness Groups

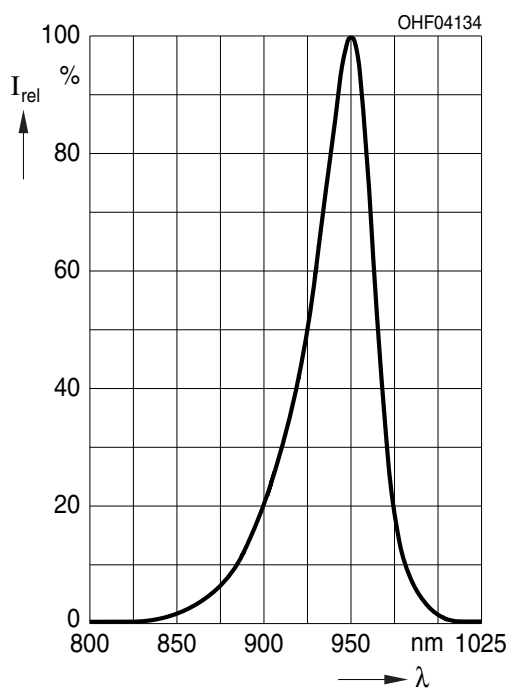
$T_A = 25\text{ °C}$

| Group | Radiant intensity ¹⁾²⁾ $I_F = 70\text{ mA}; t_p = 20\text{ ms}$ min. I_e | Radiant intensity ¹⁾²⁾ $I_F = 70\text{ mA}; t_p = 20\text{ ms}$ max. I_e |
|-------|--|--|
| | | |
| T | 28 mW/sr | 45 mW/sr |
| U | 45 mW/sr | 71 mW/sr |
| V | 71 mW/sr | 112 mW/sr |
| AW | 112 mW/sr | 180 mW/sr |

Only one group in one packing unit.

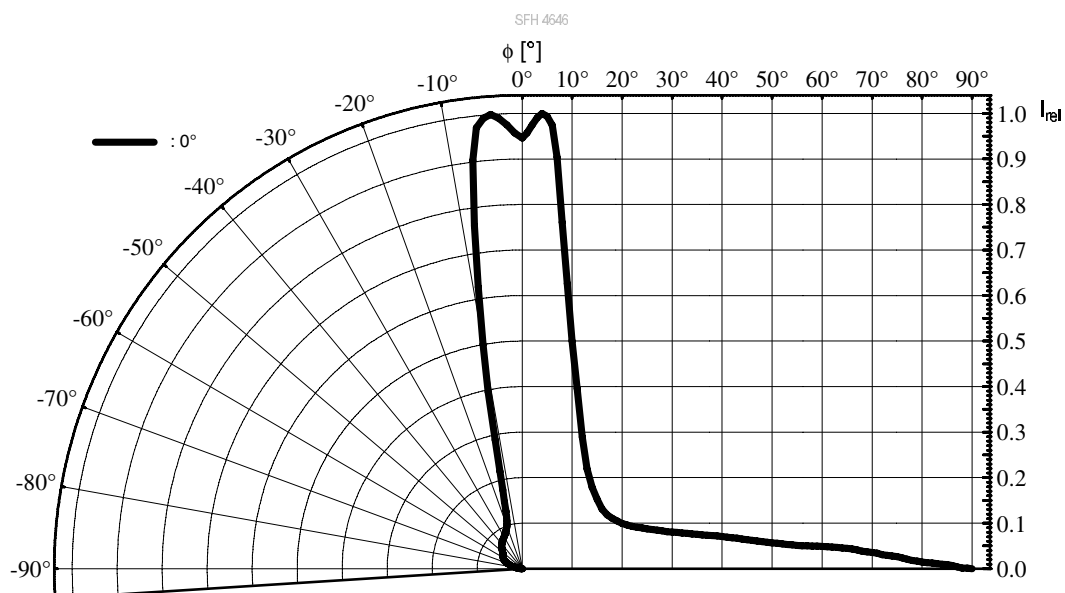
Relative Spectral Emission 8), 9)

$$I_{e,rel} = f(\lambda); I_F = 70 \text{ mA}; t_p = 20 \text{ ms}$$



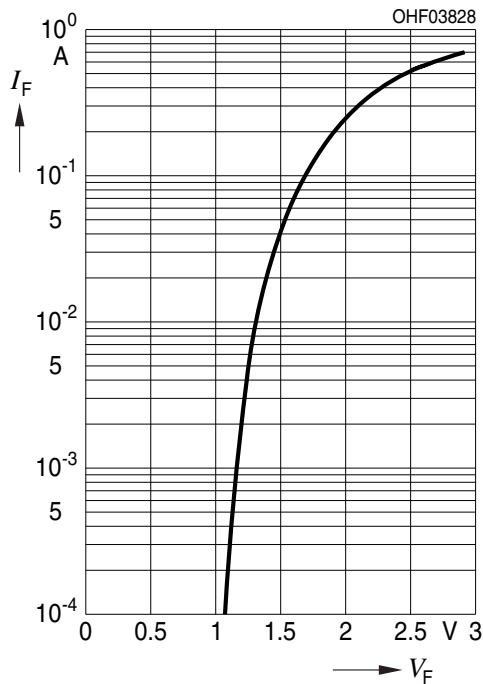
Radiation Characteristics 8), 9)

$$I_{e,rel} = f(\phi)$$



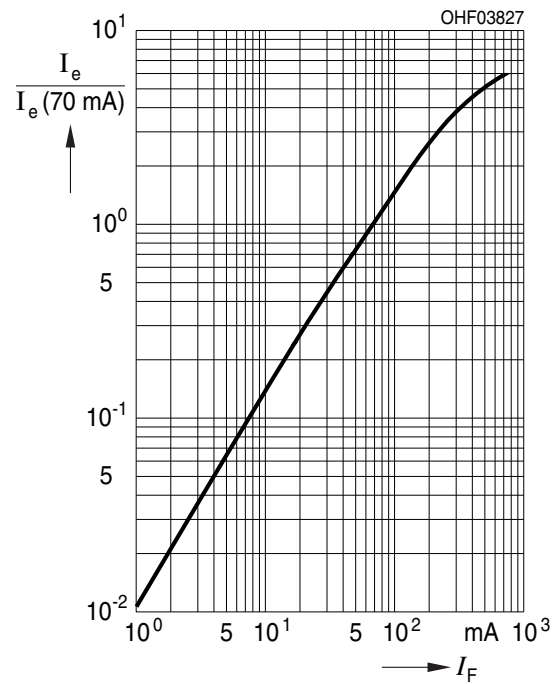
Forward current 8), 9)

$I_F = f(V_F)$; single pulse; $t_p = 100 \mu s$



Relative Radiant Intensity 8), 9)

$I_e/I_e(70mA) = f(I_F)$; single pulse; $t_p = 25 \mu s$



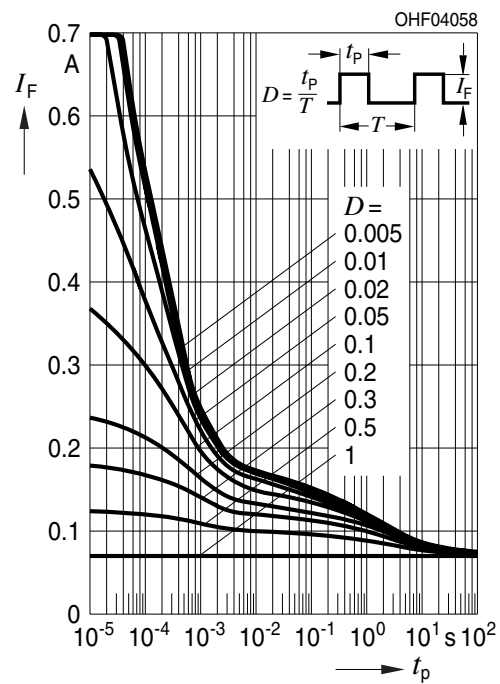
Max. Permissible Forward Current

$I_F = f(T_A)$; $R_{th_{ja}} = 380 K/W$



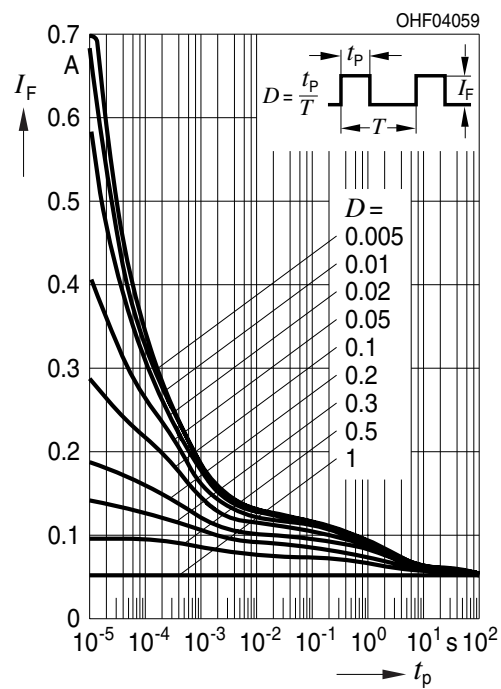
Permissible Pulse Handling Capability

$I_F = f(t_p)$; duty cycle $D = \text{parameter}$; $T_A = 25^\circ C$

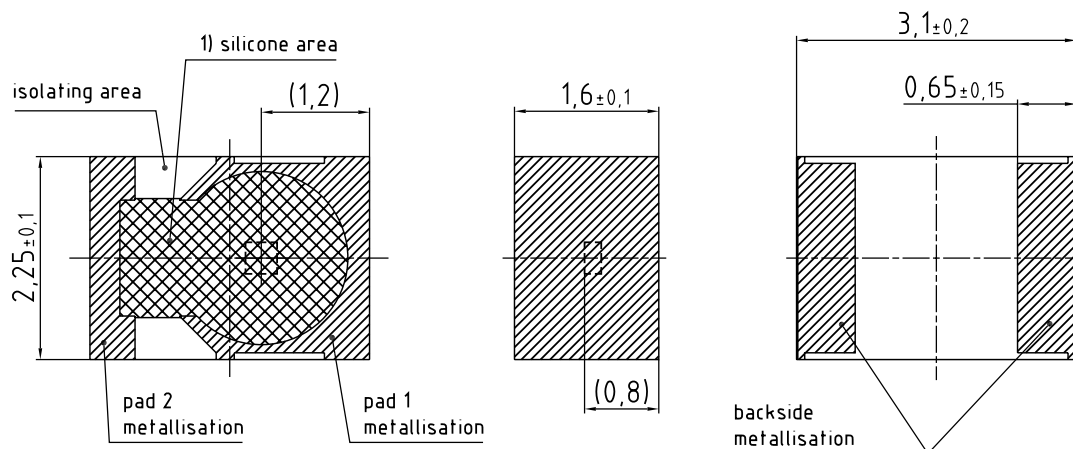


Permissible Pulse Handling Capability


$I_F = f(t_p)$; duty cycle $D =$ parameter; $T_A = 85^\circ\text{C}$



Dimensional Drawing ¹⁰⁾



1) Device casted with silicone.
Avoid mechanical stress on silicone surface.

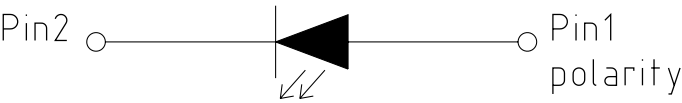
lead finish Au 
general tolerance $\pm 0,1$

C63062-A3811-A1...-18

Further Information:

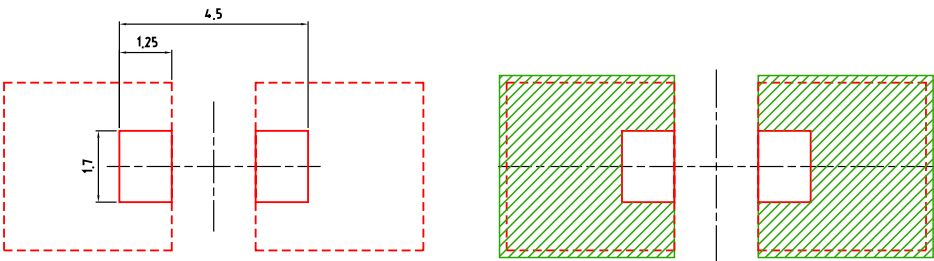
Approximate Weight: 23.0 mg

Electrical Internal Circuit




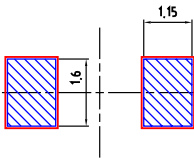
| Pin | Description |
|-----|-------------|
| 1 | Anode |
| 2 | Cathode |


Recommended Solder Pad ¹⁰⁾



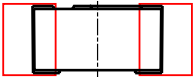
 foot print  Cu area > 16mm²

 solder resist



 solder stencil
recommended stencil thickness 150µm

Component Location on Pad

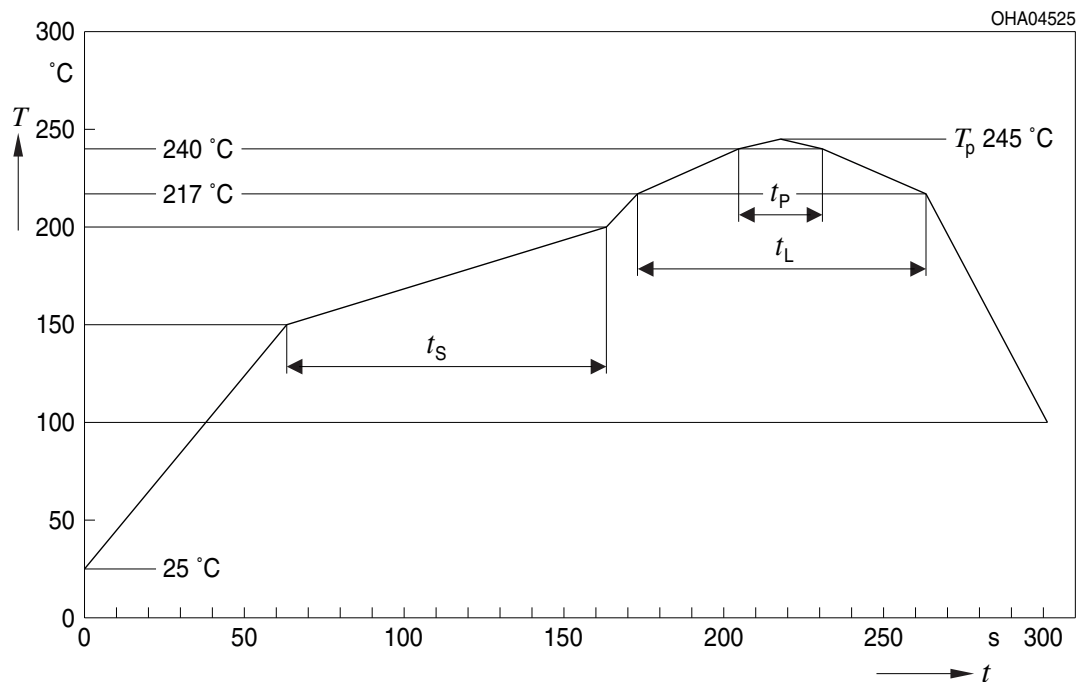


E062.3010.43-03

The package is casted with silicone. Mechanical stress at the surface of the unit should be avoided.

Reflow Soldering Profile

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

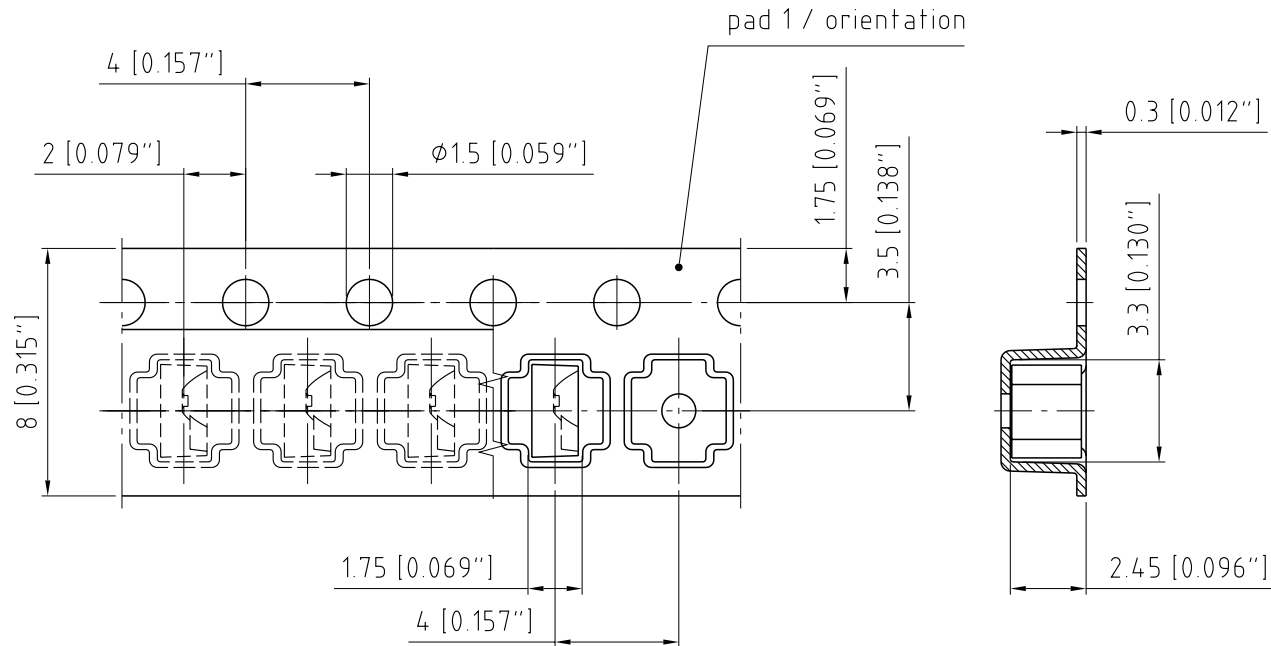


| Profile Feature | Symbol | Pb-Free (SnAgCu) Assembly | | | Unit |
|--|--------|---------------------------|----------------|---------|--------------------|
| | | Minimum | Recommendation | Maximum | |
| Ramp-up rate to preheat ^{*)} 25 °C to 150 °C | | | 2 | 3 | K/s |
| Time t_s T_{Smin} to T_{Smax} | t_s | 60 | 100 | 120 | s |
| Ramp-up rate to peak ^{*)} 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 temperature $T_p - 5\text{ K}$ | 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

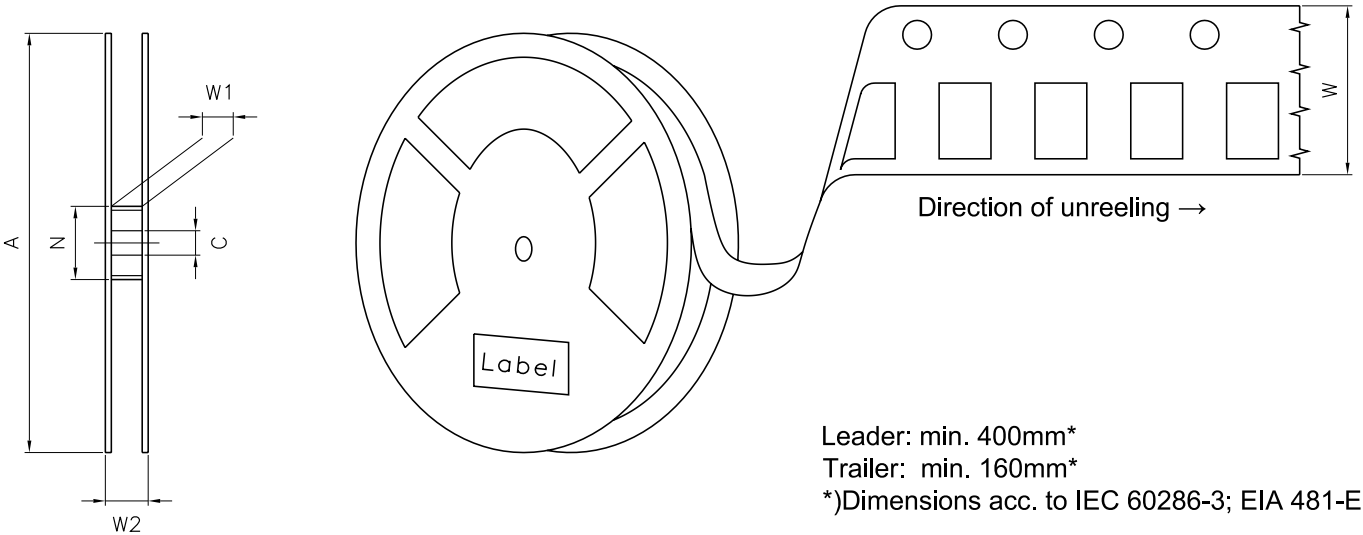
* slope calculation DT/Dt : Dt max. 5 s; fulfillment for the whole T-range

Taping ¹⁰⁾



C63062-A3811-B8-08

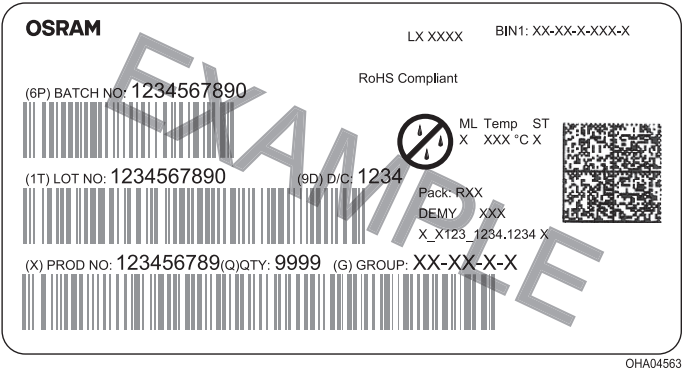
Tape and Reel ¹¹⁾



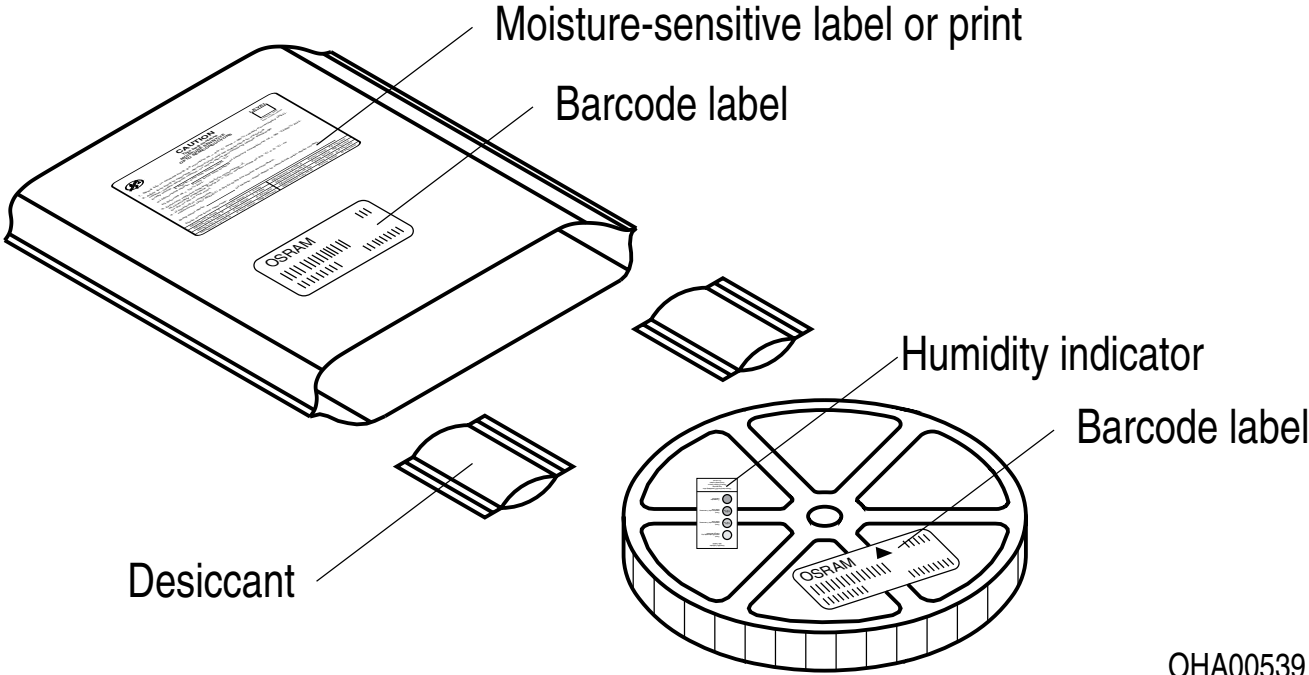
Reel Dimensions

| A | W | N _{min} | W ₁ | W _{2 max} | Pieces per PU |
|--------|--------------------|------------------|----------------|--------------------|---------------|
| 180 mm | 8 + 0.3 / - 0.1 mm | 60 mm | 8.4 + 2 mm | 14.4 mm | 2000 |

Barcode-Product-Label (BPL)



Dry Packing Process and Materials ¹⁰⁾



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 falls into **exempt risk group - Exempt**.

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

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) **Radiant intensity:** Measured at a solid angle of $\Omega = 0.01$ sr
- 2) **Brightness:** The brightness values are measured with a tolerance of $\pm 11\%$.
- 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) **Forward Voltage:** The forward voltages are measured with a tolerance of ± 0.1 V.
- 5) **Total radiant flux:** Measured with integrating sphere.
- 6) **Thermal resistance:** junction - soldering point, of the device only, mounted on an ideal heatsink (e.g. metal block)
- 7) **Thermal resistance:** junction - ambient, mounted on PC-board (FR4), padsize 16 mm² each
- 8) **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.
- 9) **Testing temperature:** TA = 25°C (unless otherwise specified)
- 10) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ± 0.1 and dimensions are specified in mm.
- 11) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

Revision History

| Version | Date | Change |
|---------|------------|---|
| 1.8 | 2020-08-21 | Schematic Transportation Box Dimensions of Transportation Box |
| 1.9 | 2021-07-21 | Electro - Optical Characteristics (Diagrams) |
| 1.10 | 2022-05-06 | Not for new design removed New Layout |
| 1.11 | 2023-05-15 | Applications Features Electro - Optical Characteristics (Diagrams) Dimensional Drawing |



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

Tobelbader Strasse 30, 8141 Premstaetten, Austria

Phone +43 3136 500-0

ams-osram.com

© All rights reserved

am

OSRAM

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[ams OSRAM:](#)

[SFH 4646-TV](#) [SFH 4646](#)