

SFH 3605

MIDLED®

Silicon NPN Phototransistor in MIDLED package



Applications

- Gesture Recognition
- Industrial Automation (Machine controls, Light barriers, Vision controls)
- Remote Control, Proximity, Ambient Light Sensing

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)
- Sidelooker
- Narrow half angle ($\pm 20^\circ$)
- Spectral range of sensitivity: (typ) 500 ... 1100 nm
- Low profile component (1,6 mm)
- Emitter in same package (SFH 46xx) available

Ordering Information

Type	Photocurrent $V_{CE} = 5 \text{ V}; \lambda = 950 \text{ nm}; E_e = 0.1 \text{ mW/cm}^2$ I_{PCE}	Ordering Code
SFH 3605-Z	100 ... 500 μA	Q65110A1574
SFH 3605-2/3	250 ... 500 μA	Q65110A2663
SFH 3605-3/4-Z	160 ... 500 μA	Q65110A2664

Only one bin within one packing unit (variation less than 2:1)

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
Collector-emitter voltage	V_{CE}	max.	35 V
Collector current	I_C	max.	15 mA
Collector surge current $\tau \leq 10\ \mu\text{s}$	I_{CS}	max.	75 mA
Emitter-collector voltage	V_{EC}	max.	7 V
Total power dissipation	P_{tot}	max.	130 mW
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)	V_{ESD}	max.	2 kV

Characteristics

$T_A = 25\text{ °C}$

Parameter	Symbol		Values
Wavelength of max sensitivity	$\lambda_{S\text{ max}}$	typ.	990 nm
Spectral range of sensitivity	$\lambda_{10\%}$	typ.	500 ... 1100 nm
Chip dimensions	L x W	typ.	0.35 x 0.35 mm x mm
Radiant sensitive area	A	typ.	0.04 mm ²
Half angle	φ	typ.	20 °
Dark current $V_{CE} = 20\text{ V}; E = 0$	I_{CE0}	typ. max.	1 nA 50 nA
Rise time $I_C = 1\text{ mA}; V_{CC} = 5\text{ V}; R_L = 1\text{ k}\Omega$	t_r	typ.	45 μ s
Fall time $I_C = 1\text{ mA}; V_{CC} = 5\text{ V}; R_L = 1\text{ k}\Omega$	t_f	typ.	45 μ s
Collector-emitter saturation voltage ¹⁾ $I_C = I_{PCE, min} \times 0.3; E_e = 0.1\text{ mW/cm}^2$	V_{CEsat}	typ.	150 mV
Capacitance $V_{CE} = 5\text{ V}; f = 1\text{ MHz}; E = 0$	C_{CE}	typ.	1.3 pF
Thermal resistance junction ambient real ²⁾	R_{thJA}	max.	340 K / W
Thermal resistance junction solder point real	R_{thJS}	max.	180 K / W

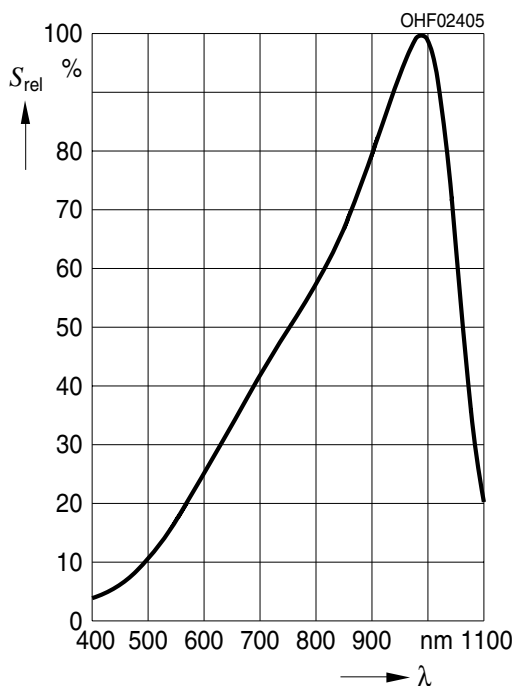
Grouping

$T_A = 25\text{ °C}$

Group	Photocurrent $V_{CE} = 5\text{ V}; \lambda = 950\text{ nm}; E_e = 0.1\text{ mW/cm}^2$ min.	Photocurrent $V_{CE} = 5\text{ V}; \lambda = 950\text{ nm}; E_e = 0.1\text{ mW/cm}^2$ max.
	I_{PCE}	I_{PCE}
2	100 μ A	200 μ A
3	160 μ A	320 μ A
4	250 μ A	500 μ A

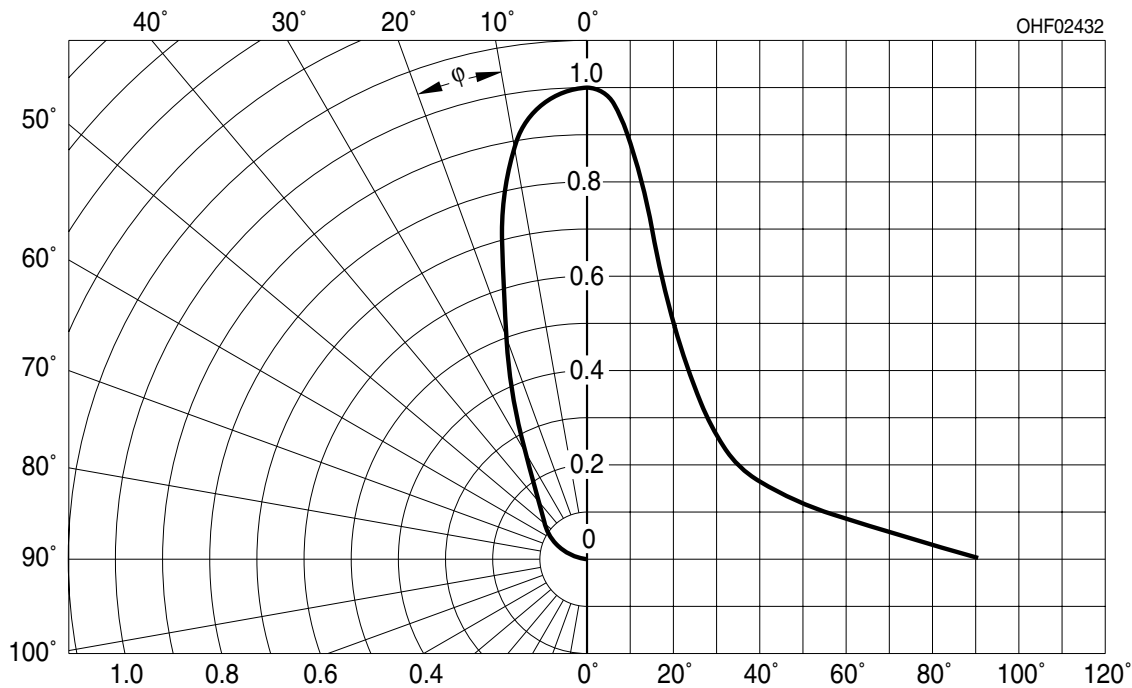
Relative Spectral Sensitivity ^{3), 4)}

$S_{rel} = f(\lambda)$, axial direction



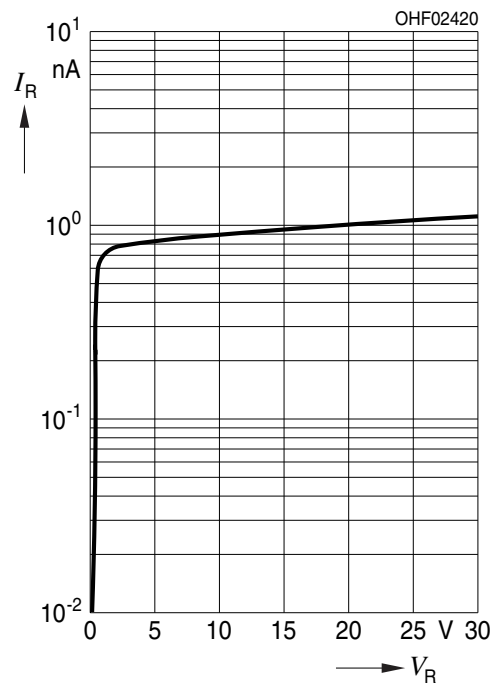
Directional Characteristics ^{3), 4)}

$S_{rel} = f(\varphi)$

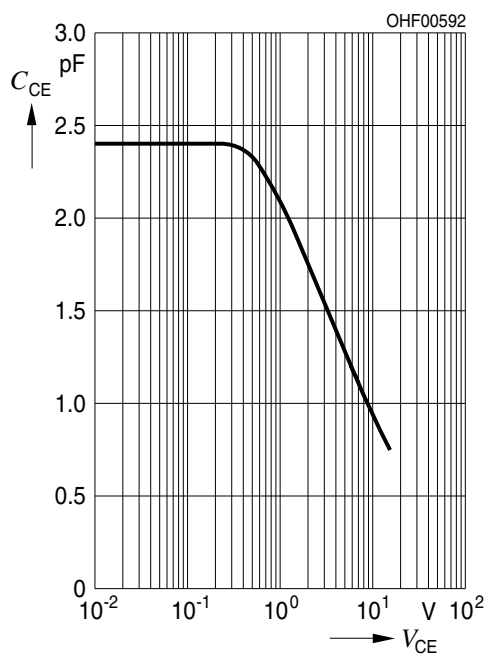


Dark Current ^{3), 4)}

$$I_{CE0} = f(V_{CE}); E = 0;$$

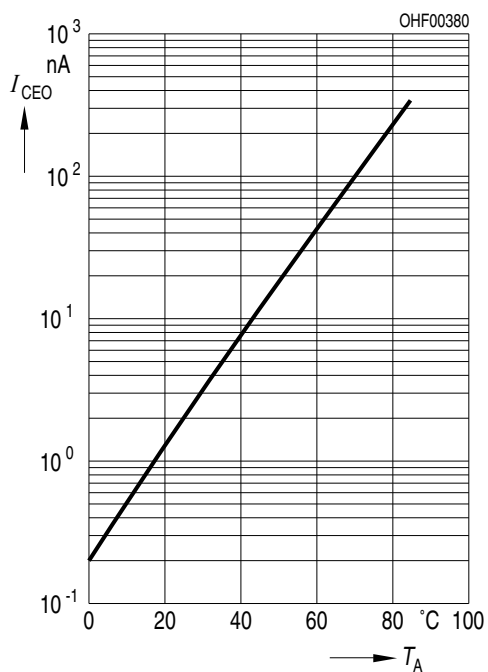
**Collector-Emitter Capacitance** ^{3), 4)}

$$C_{CE} = f(V_{CE}); f = 1 \text{ MHz}; E = 0;$$



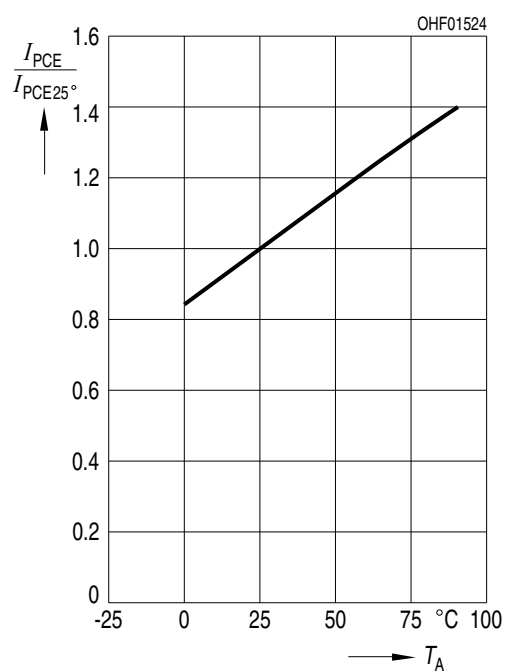
Dark Current ³⁾

$$I_{CE0} = f(T_A); V_{CE} = 20 \text{ V}; E = 0$$

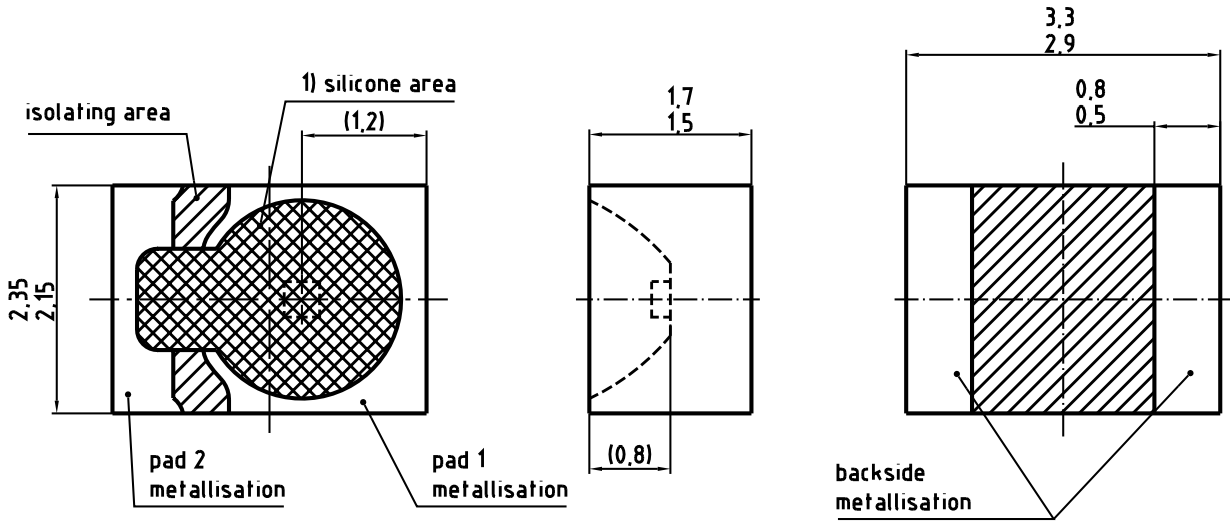


Photocurrent ³⁾

$$I_{PCE,rel} = f(T_A); V_{CE} = 5 \text{ V}$$



Dimensional Drawing ⁵⁾



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

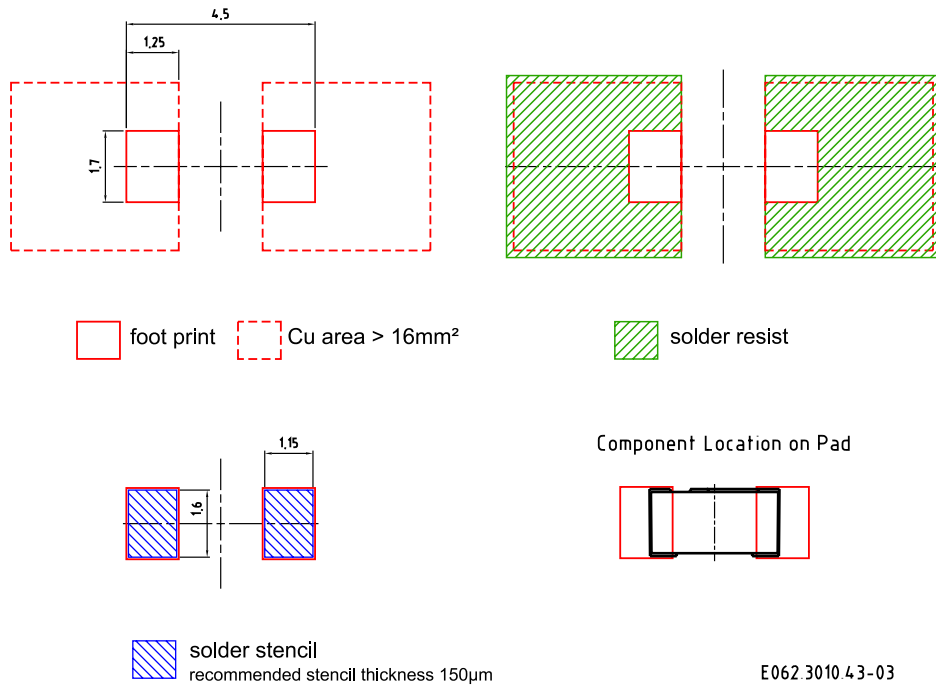
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Approximate Weight: 23.0 mg

Package marking: Emitter

Pin	Description
1	collector
2	emitter

Recommended Solder Pad ⁵⁾

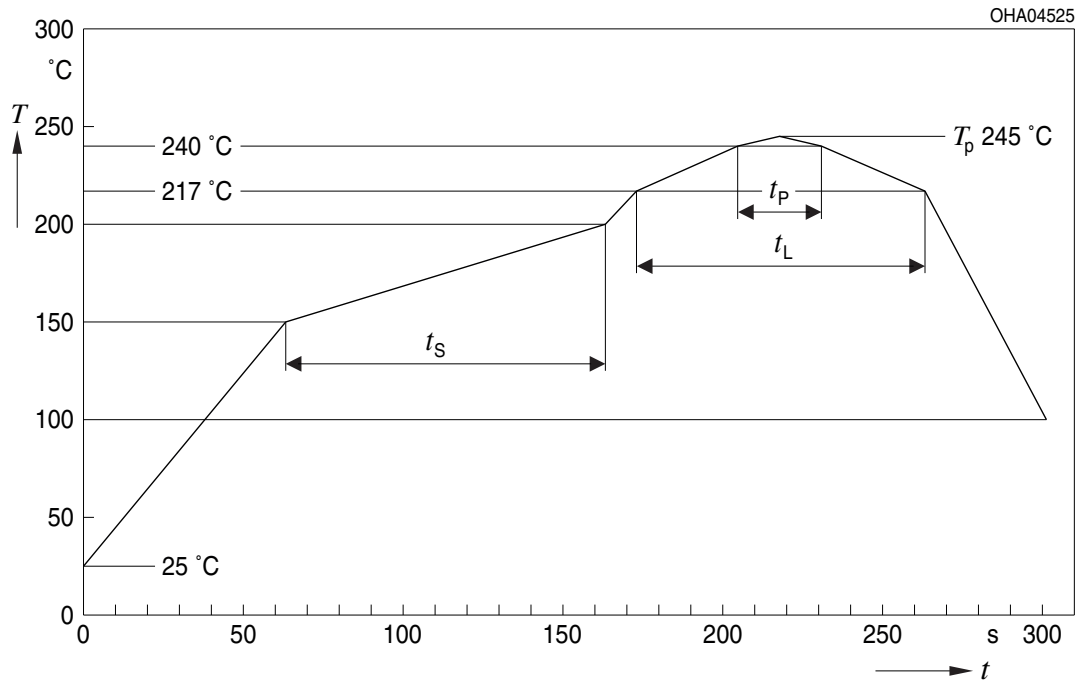


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Pad 1: collector

Reflow Soldering Profile

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

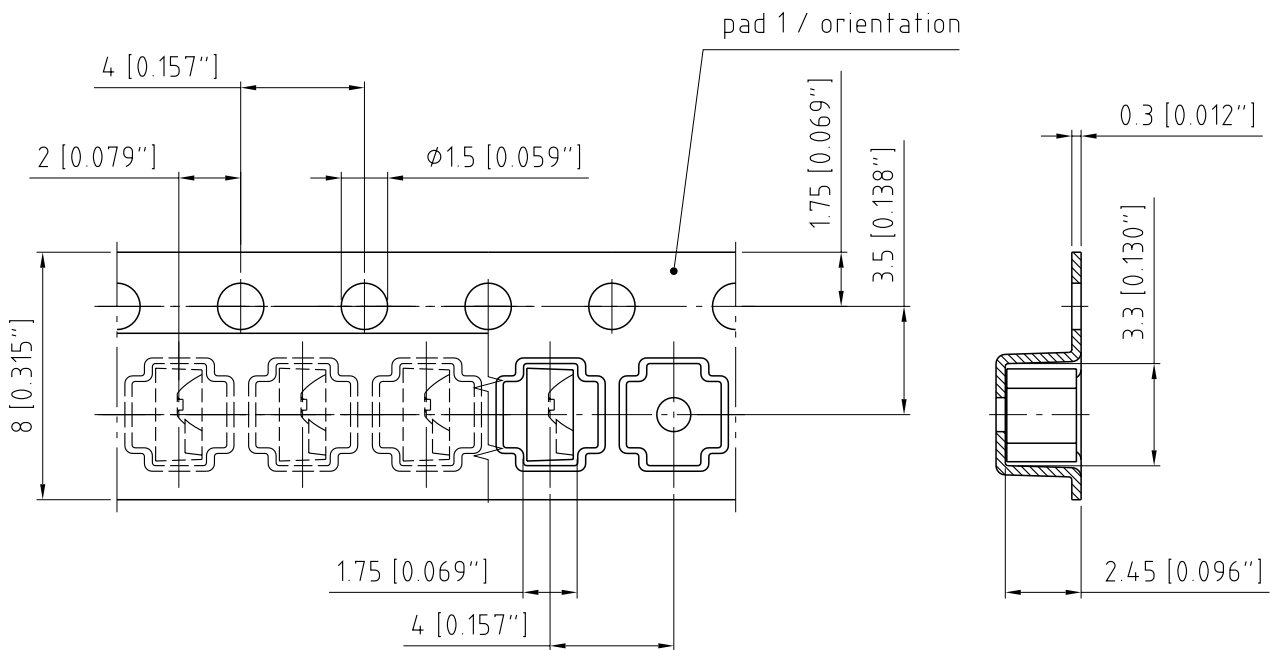


Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat*) 25 °C to 150 °C			2	3	K/s
Time t_s T_{Smin} to T_{Smax}	t_s	60	100	120	s
Ramp-up rate to peak*) T_{Smax} to T_p			2	3	K/s
Liquidus temperature	T_L		217		°C
Time above liquidus temperature	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

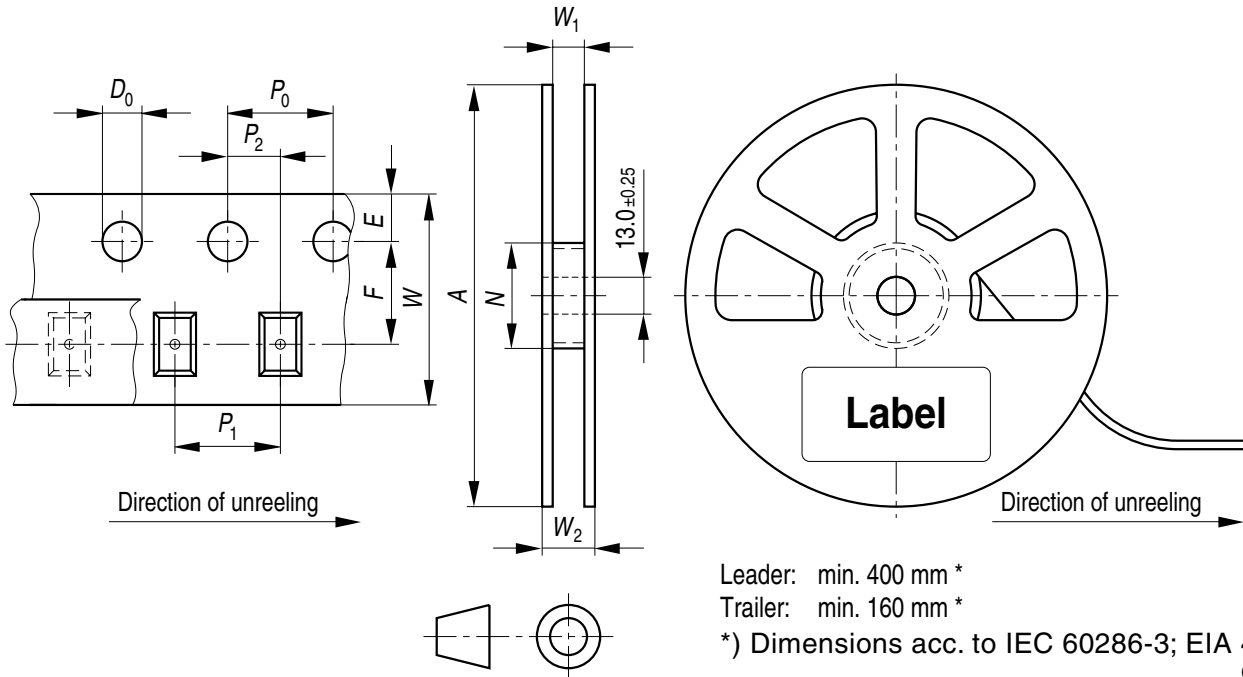
* slope calculation DT/Dt : Dt max. 5 s; fulfillment for the whole T-range

Taping ⁵⁾



C63062-A3811-B8-08

Tape and Reel ⁶⁾



Leader: min. 400 mm *
 Trailer: min. 160 mm *

*) Dimensions acc. to IEC 60286-3; EIA 481-D
 OHAY0324

Reel dimensions [mm]

A	W	N _{min}	W ₁	W _{2 max}	Pieces per PU
180 mm	8 + 0.3 / - 0.1	60	8.4 + 2	14.4	1600

Barcode-Product-Label (BPL)

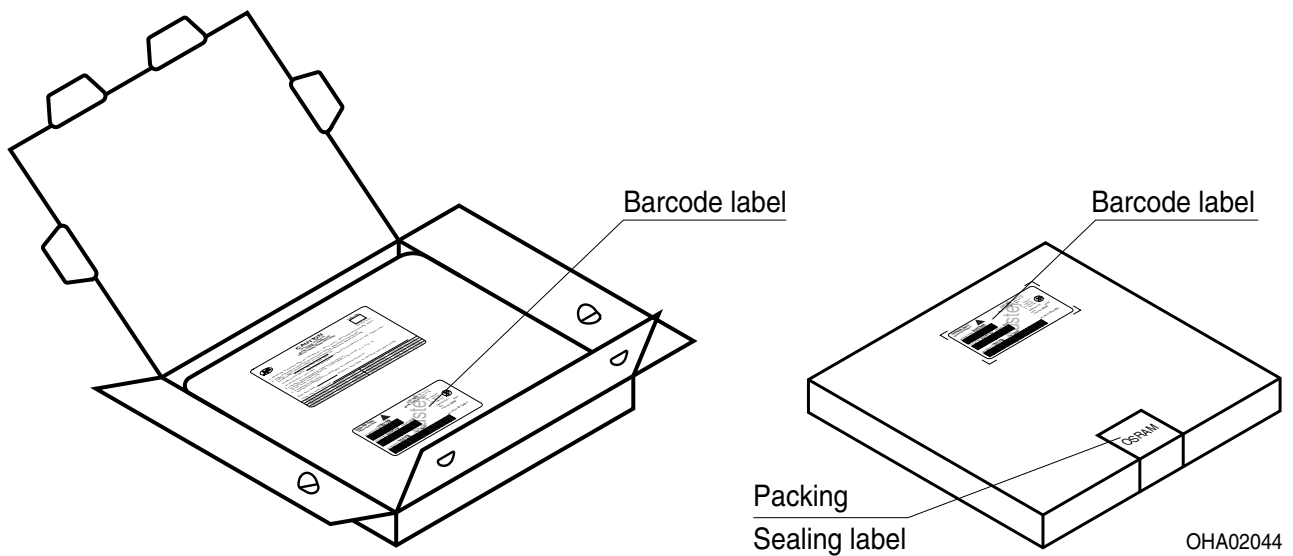


Dry Packing Process and Materials ⁵⁾



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

Transportation Packing and Materials ⁵⁾



Dimensions of transportation box in mm

Width	Length	Height
200 ± 5 mm	195 ± 5 mm	30 ± 5 mm

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 LED specified in this data sheet falls 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.

For further application related informations please visit www.osram-os.com/apnotes

Disclaimer

Disclaimer

Language english will prevail in case of any discrepancies or deviations between the two language wordings.

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 in the OSRAM OS Webside.

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.

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Glossary

- 1) **IPCEmin:** I_{PCEmin} is the min. photocurrent of the specified group.
- 2) **Thermal resistance:** junction - ambient, mounted on PC-board (FR4), padsize 16 mm² each
- 3) **Typical Values:** Due to the special conditions of the manufacturing processes of LED, 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.
- 4) **Testing temperature:** $T_A = 25^\circ\text{C}$
- 5) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ± 0.1 and dimensions are specified in mm.
- 6) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

Published by OSRAM Opto Semiconductors GmbH
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