

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 ¹⁾ $V_{CE} = 5 \text{ V}; \lambda = 950 \text{ nm}; E_e = 0.1 \text{ mW/cm}^2$ I_{PCE}	Ordering Code
SFH 3605-Z	112 ... 450 μA	Q65110A1574
SFH 3605-2/3-Z	112 ... 280 μA	Q65110A2663
SFH 3605-3/4-Z	180 ... 450 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 $\tau \leq 10\text{ }\mu\text{s}$	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
Dimensions of chip area	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	I_{CE0}	typ.	1 nA
$V_{CE} = 20\text{ V}; E = 0$		max.	50 nA
Rise time	t_r	typ.	45 μs
$I_C = 1\text{ mA}; \lambda = 950\text{ nm}; V_{CE} = 5\text{ V}; R_L = 1\text{ k}\Omega$			
Fall time	t_f	typ.	45 μs
$I_C = 1\text{ mA}; \lambda = 950\text{ nm}; V_{CE} = 5\text{ V}; R_L = 1\text{ k}\Omega$			
Collector-emitter saturation voltage ²⁾	V_{CEsat}	typ.	150 mV
$I_C = I_{PCE,min} \times 0.3; E_e = 0.1\text{ mW/cm}^2$			
Capacitance	C_{CE}	typ.	1.3 pF
$V_{CE} = 5\text{ V}; f = 1\text{ MHz}; E = 0$			
Thermal resistance junction ambient real ³⁾	R_{thJA}	max.	340 K / W
Thermal resistance junction solder point real	$R_{thJS\text{ real}}$	max.	180 K / W

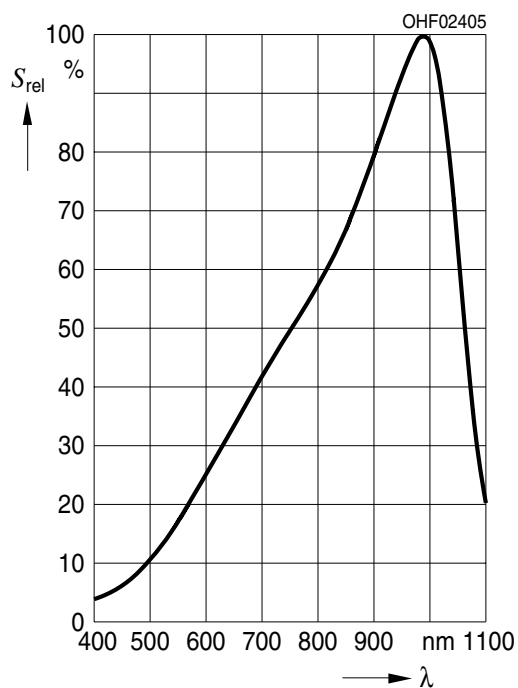
Photocurrent Groups

$T_A = 25\text{ °C}$

Group	Photocurrent ¹⁾ $V_{CE} = 5\text{ V}; \lambda = 950\text{ nm}; E_e = 0.1\text{ mW/cm}^2$ min. I_{PCE}	Photocurrent ¹⁾ $V_{CE} = 5\text{ V}; \lambda = 950\text{ nm}; E_e = 0.1\text{ mW/cm}^2$ max. I_{PCE}
2	112 μA	180 μA
3	180 μA	280 μA
4	280 μA	450 μA

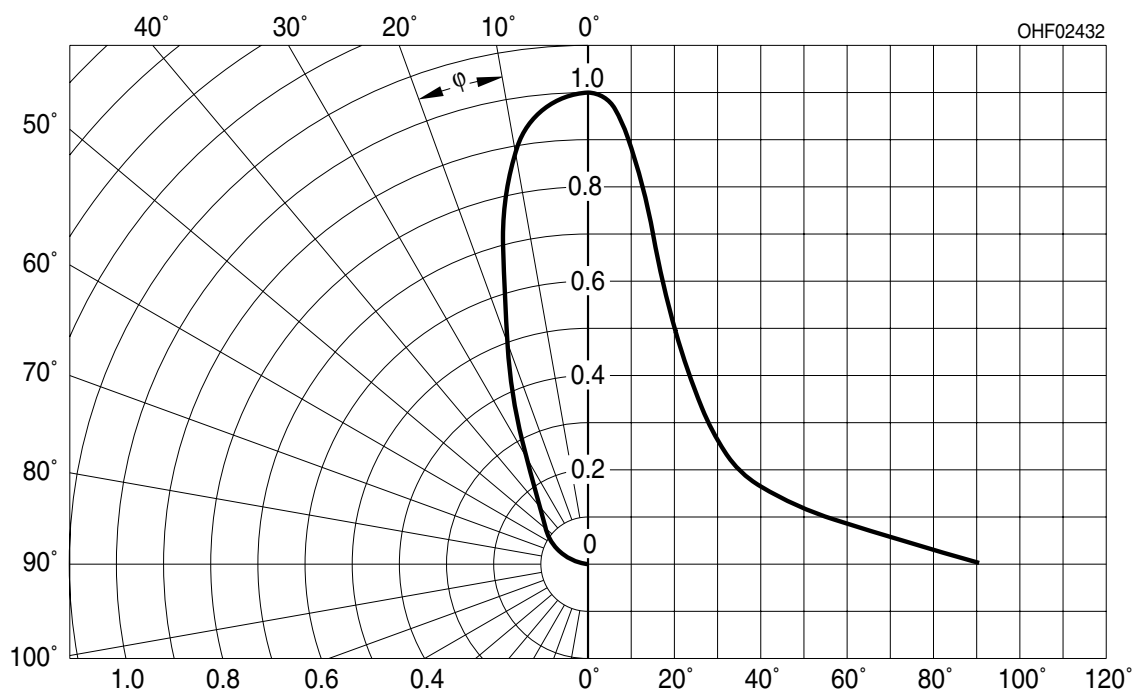
Relative Spectral Sensitivity ^{4), 5)}

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



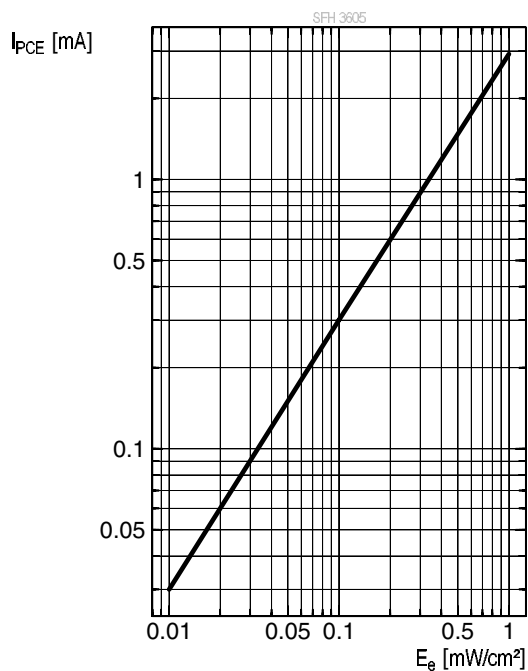
Directional Characteristics ^{4), 5)}

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



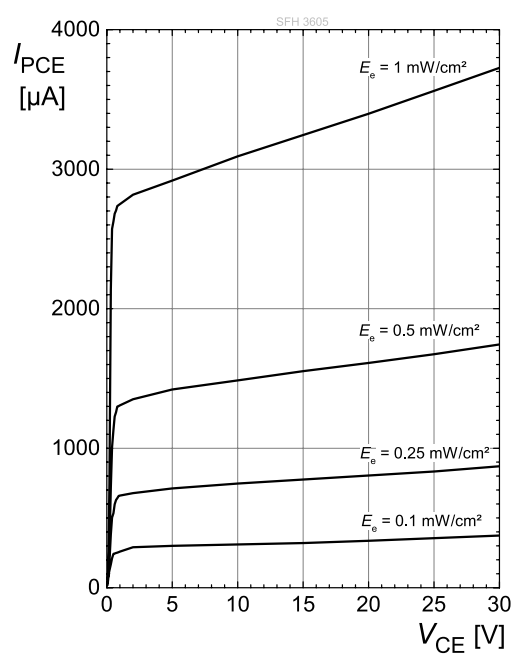
Photocurrent ^{4), 5)}

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



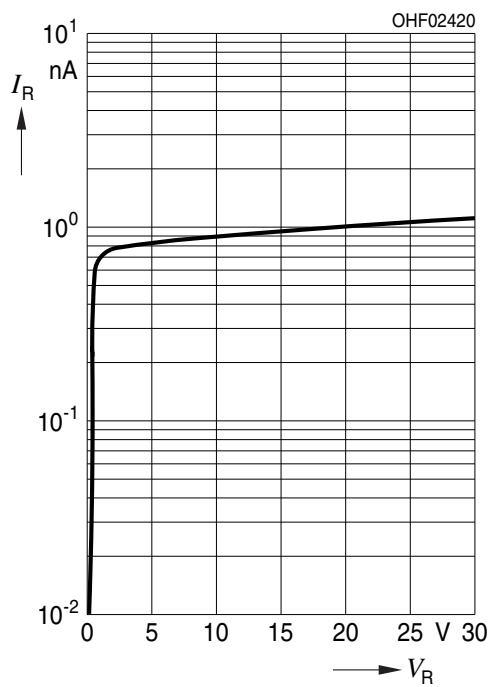
Photocurrent ^{4), 5)}

$$I_{\text{PCE}} = f(V_{\text{CE}}); E_e = \text{Parameter}$$

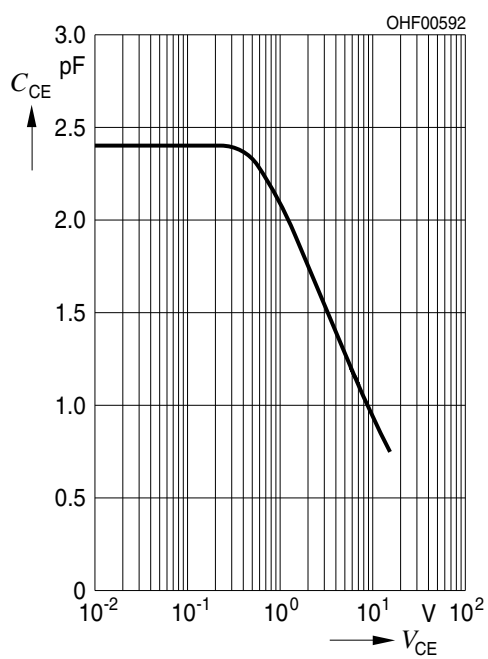


Dark Current 4), 5)

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

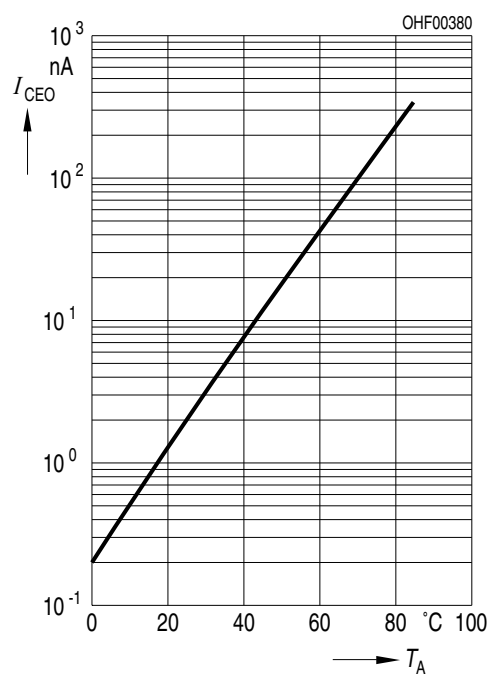
**Collector-Emitter Capacitance** 4), 5)

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

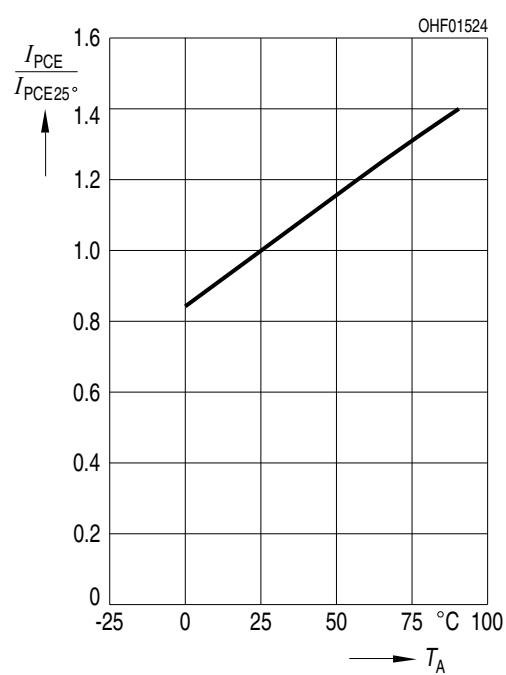


Dark Current ⁴⁾

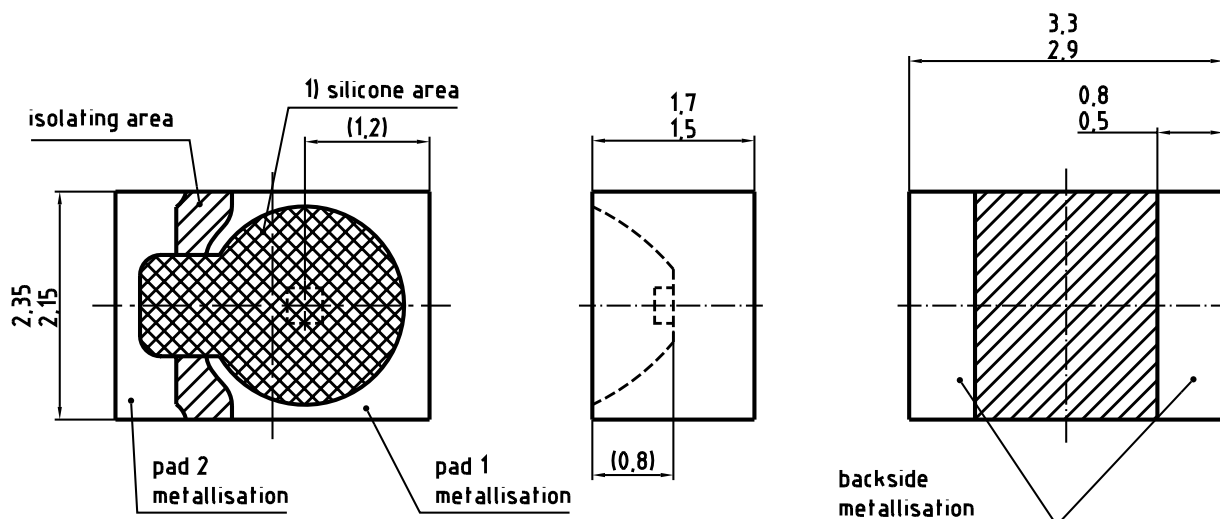
$$I_{\text{CEO}} = f(T_A); V_{\text{CE}} = 20 \text{ V}; E_e = 0 \text{ mW/cm}^2$$

**Photocurrent** ⁴⁾

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



Dimensional Drawing ⁶⁾



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

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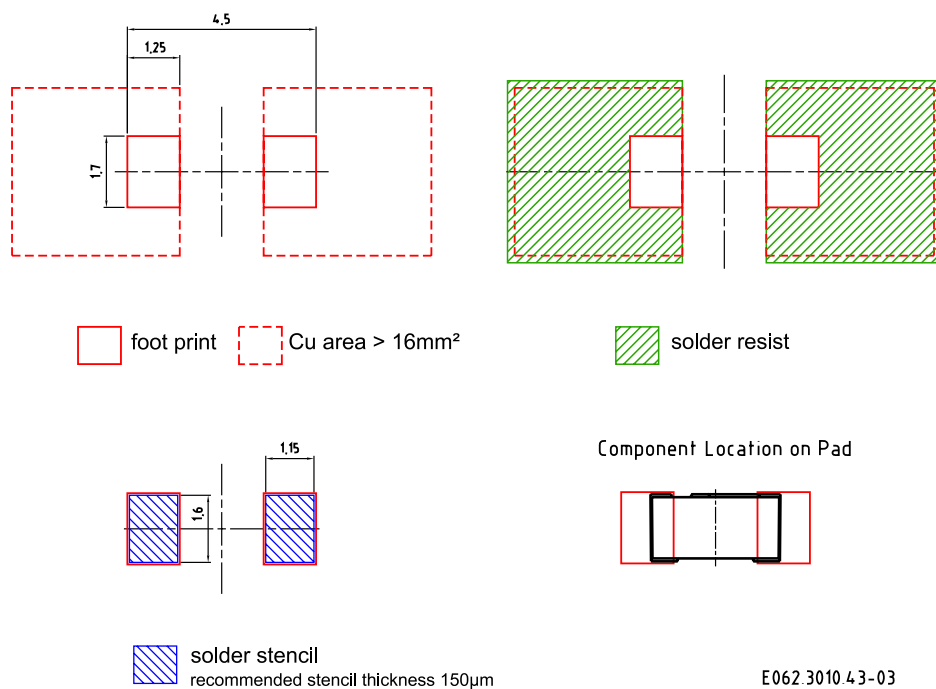
Further Information:

Approximate Weight: 23.0 mg

Package marking: Emitter

Pin	Description
1	collector
2	emitter

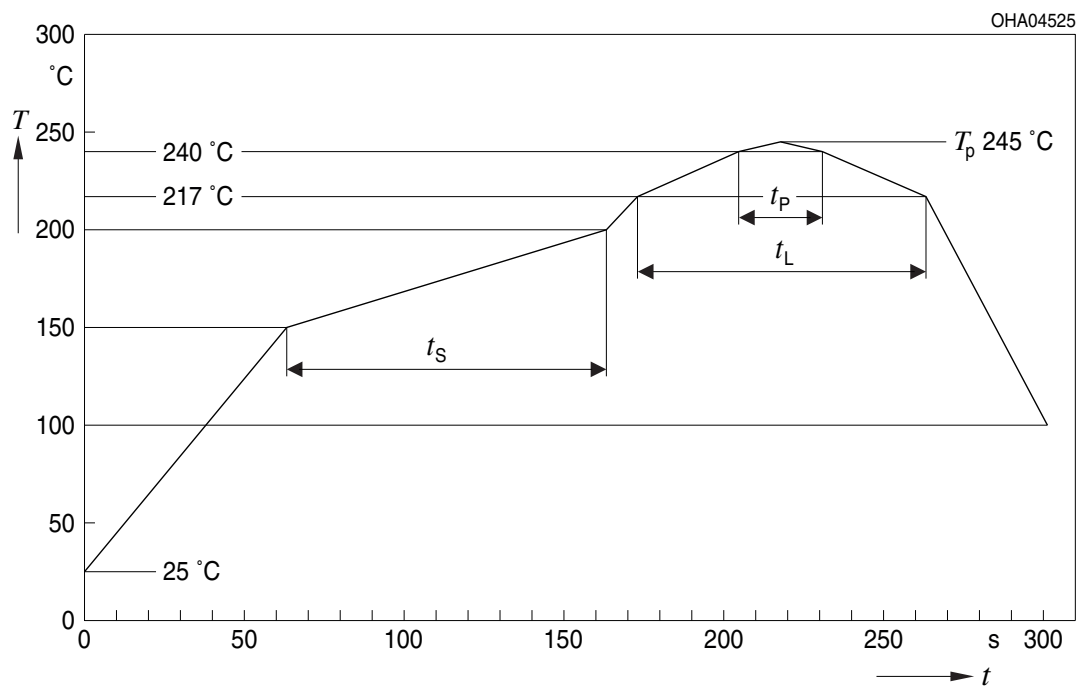
Recommended Solder Pad ⁶⁾



Pad 1: collector

Reflow Soldering Profile

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

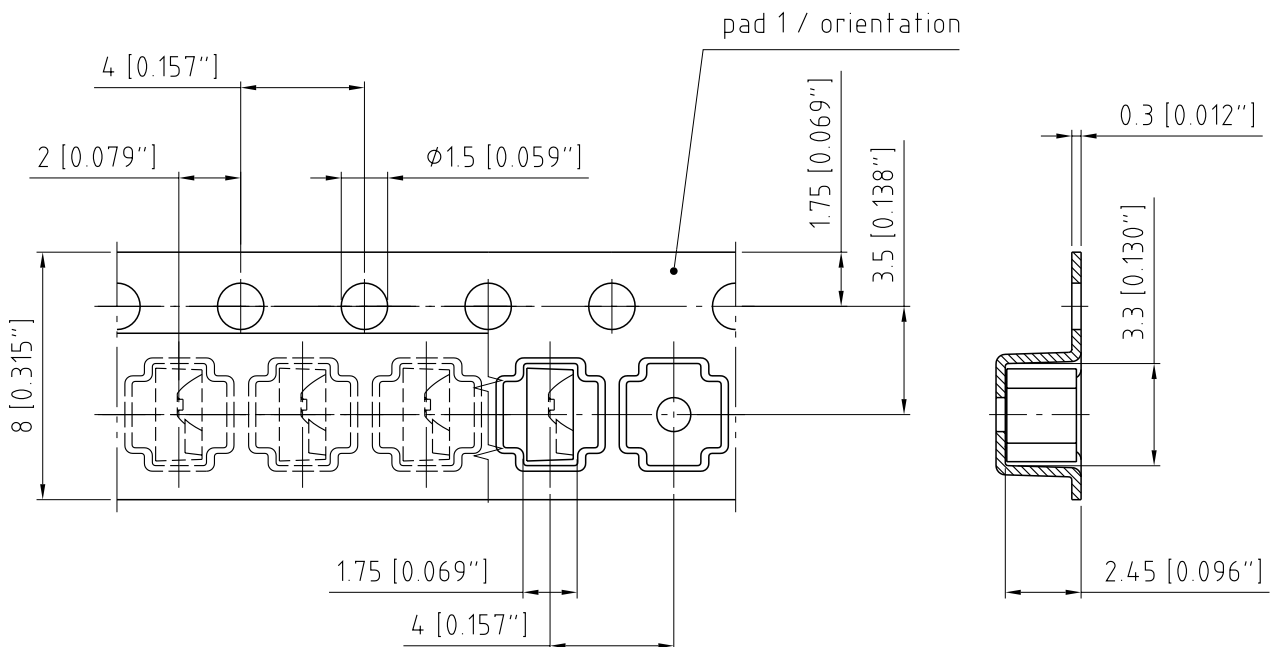


Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat ^{*)} 25 °C to 150 °C			2	3	K/s
Time t_s T_{Smin} to T_{Smax}	t_s	60	100	120	s
Ramp-up rate to peak ^{*)} T_{Smax} to T_p			2	3	K/s
Liquidus temperature	T_L		217		°C
Time above liquidus temperature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

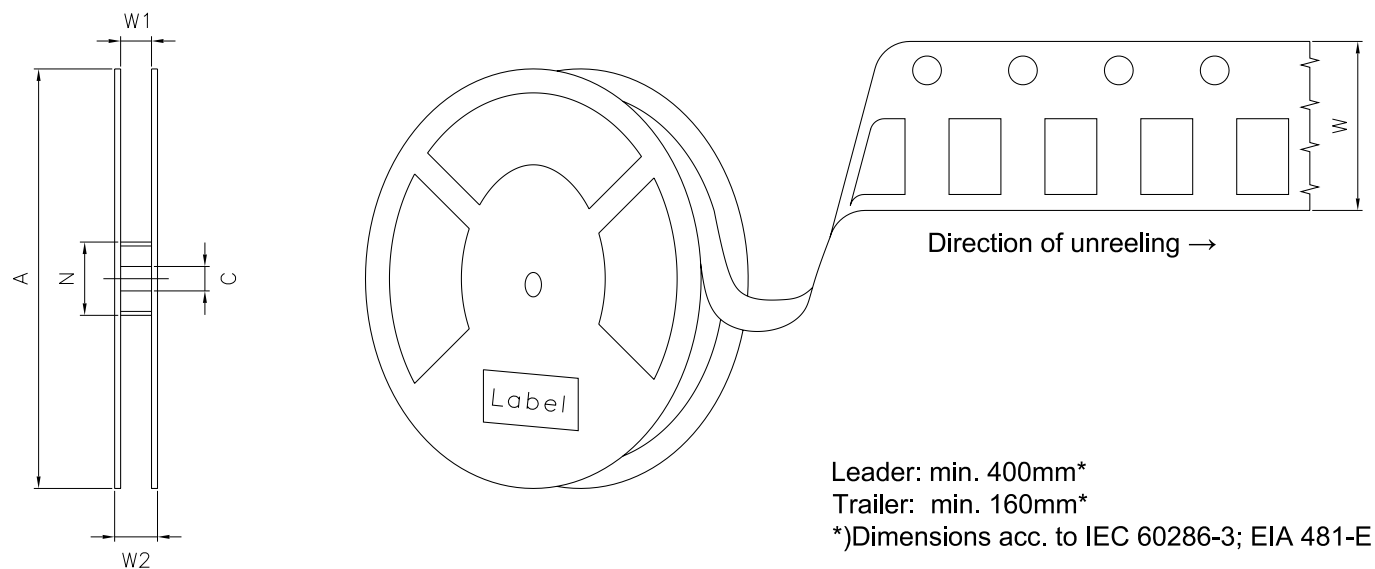
* slope calculation DT/Dt : Dt max. 5 s; fulfillment for the whole T-range

Taping ⁶⁾



C63062-A3811-B8-08

Tape and Reel ⁷⁾



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	1600

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 (9D) D/C: 1234

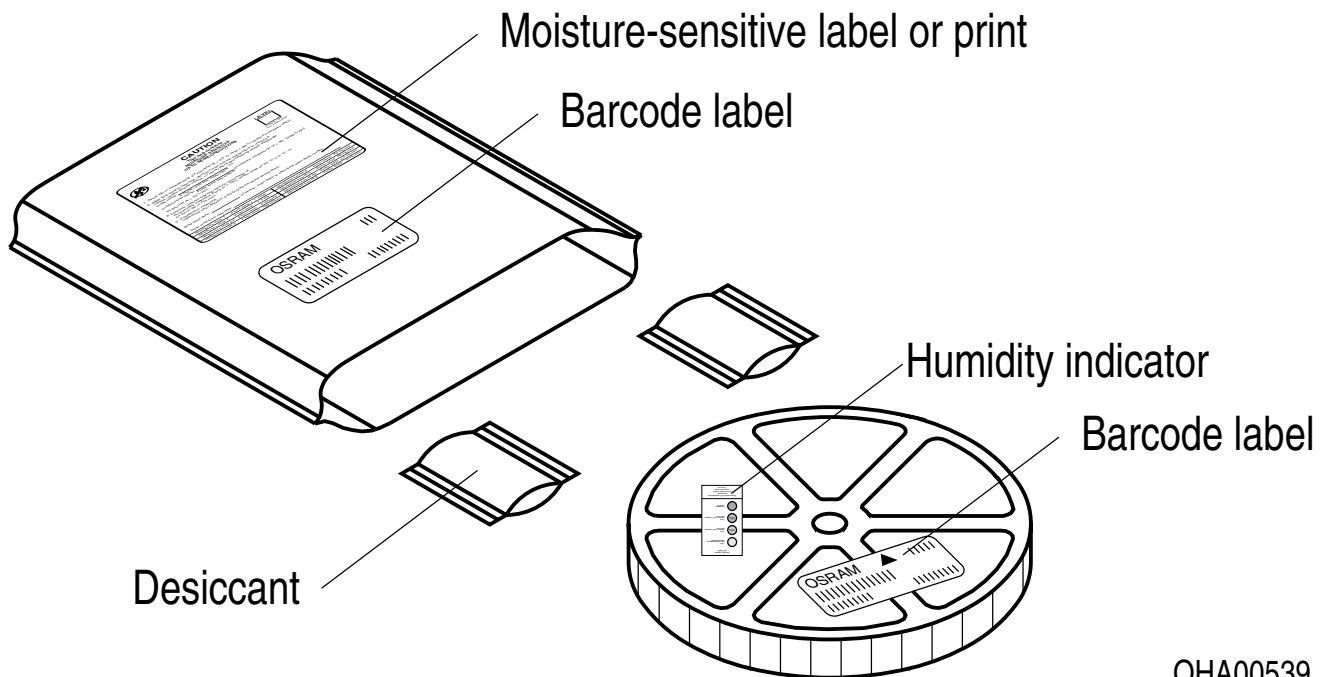
ML Temp ST
X XXX °C X

Pack: RXX
DEMY XXX
X_X123_1234.1234 X

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

OHA04563

Dry Packing Process and Materials ⁶⁾



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 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

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.

Glossary

- 1) **Photocurrent:** The photocurrent values are measured (by irradiating the devices with a homogenous light source and applying a voltage to the device) with a tolerance of $\pm 11\%$.
- 2) **IPCEmin:** IPCEmin is the min. photocurrent of the specified group.
- 3) **Thermal resistance:** junction - ambient, mounted on PC-board (FR4), padsize 16 mm² each
- 4) **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.
- 5) **Testing temperature:** TA = 25°C (unless otherwise specified)
- 6) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ± 0.1 and dimensions are specified in mm.
- 7) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

Revision History

Version	Date	Change
1.4	2020-11-19	Schematic Transportation Box Dimensions of Transportation Box Electro - Optical Characteristics (Diagrams)

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