

# Narrow beam LED in MIDLED package (940 nm)

## Version 1.6

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### SFH 4646



#### Features:

- High Power Infrared LED (35 mW)
- Short switching times
- Narrow halfangle ( $\pm 10^\circ$ )
- The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.
- Taping as Sidelooker
- Also available as Toplooker (SFH4641)

#### Applications

- Infrared Illumination for cameras
- IR data transmission
- Automotive sensors
- Remote control

#### Notes

Depending on the mode of operation, these devices emit highly concentrated non visible infrared light which can be hazardous to the human eye. Products which incorporate these devices have to follow the safety precautions given in IEC 60825-1 and IEC 62471.

#### Ordering Information

Type:	Radiant Intensity $I_e$ [mW/sr] $I_F = 70 \text{ mA}, t_p = 20 \text{ ms}$	Ordering Code
SFH 4646	55 ( $\geq 16$ )	Q65110A8099
SFH 4646-TV	25 ... 125	Q65111A6148

Note: Measured at a solid angle of  $\Omega = 0.01 \text{ sr}$

**Maximum Ratings** ( $T_A = 25\text{ °C}$ )

Parameter	Symbol	Values	Unit
Operation and storage temperature range	$T_{op}; T_{stg}$	-40 ... 100	°C
Reverse voltage	$V_R$	5	V
Forward current	$I_F$	70	mA
Surge current ( $t_p = 25\text{ }\mu\text{s}$ , $D = 0$ )	$I_{FSM}$	0.7	A
Power consumption	$P_{tot}$	140	mW
ESD withstand voltage (acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)	$V_{ESD}$	2	kV
Thermal resistance junction - ambient <sup>1) page 12</sup>	$R_{thJA}$	380	K / W
Thermal resistance junction - soldering point <sup>2) page 12</sup>	$R_{thJS}$	220	K / W

**Characteristics** ( $T_A = 25\text{ °C}$ )

Parameter		Symbol	Values	Unit
Peak wavelength ( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ)	$\lambda_{peak}$	950	nm
Centroid wavelength ( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ)	$\lambda_{centroid}$	940	nm
Spectral bandwidth at 50% of $I_{max}$ ( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ)	$\Delta\lambda$	42	nm
Half angle	(typ)	$\varphi$	$\pm 10$	°
Dimensions of active chip area	(typ)	L x W	0.2 x 0.2	mm x mm
Rise and fall time of $I_e$ ( 10% and 90% of $I_{e\ max}$ ) ( $I_F = 70\text{ mA}$ , $R_L = 50\text{ }\Omega$ )	(typ)	$t_r, t_f$	12	ns
Forward voltage ( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ (max))	$V_F$	1.6 ( $\leq 2$ )	V
Forward voltage ( $I_F = 500\text{ mA}$ , $t_p = 100\text{ }\mu\text{s}$ )	(typ (max))	$V_F$	2.4 ( $\leq 3$ )	V
Reverse current ( $V_R = 5\text{ V}$ )		$I_R$	not designed for reverse operation	$\mu\text{A}$
Total radiant flux ( $I_F = 70\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ)	$\Phi_e$	35	mW

Parameter		Symbol	Values	Unit
Temperature coefficient of $I_e$ or $\Phi_e$ ( $I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ )	(typ)	$TC_I$	-0.5	% / K
Temperature coefficient of $V_F$ ( $I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ )	(typ)	$TC_V$	-1.3	mV / K
Temperature coefficient of wavelength ( $I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ )	(typ)	$TC_\lambda$	0.3	nm / K

**Grouping** ( $T_A = 25 \text{ }^\circ\text{C}$ )

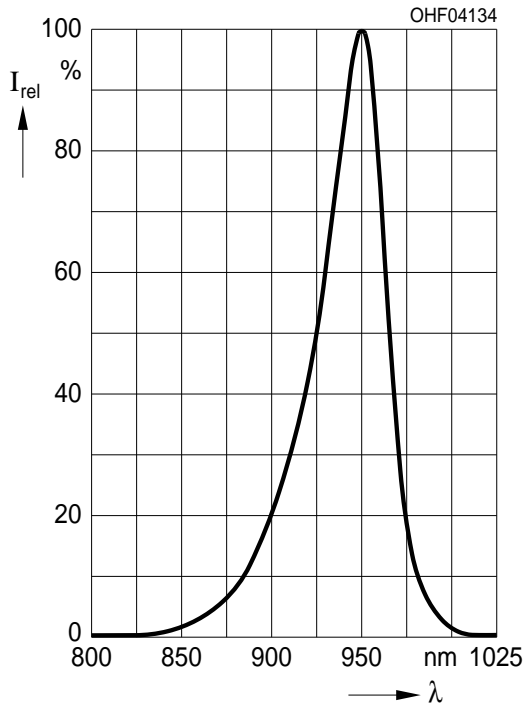
Group	Min Radiant Intensity	Max Radiant Intensity	Typ Radiant Intensity
	$I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ $I_{e, \text{min}}$ [mW / sr]	$I_F = 70 \text{ mA}$ , $t_p = 20 \text{ ms}$ $I_{e, \text{max}}$ [mW / sr]	$I_F = 500 \text{ mA}$ , $t_p = 25 \text{ } \mu\text{s}$ $I_{e, \text{typ}}$ [mW / sr]
SFH 4646-T	25	50	185
SFH 4646-U	40	80	300
SFH 4646-V	63	125	470
SFH 4646-AW	100	200	750

Note: measured at a solid angle of  $\Omega = 0.01 \text{ sr}$

Only one group in one packing unit (variation lower 2:1).

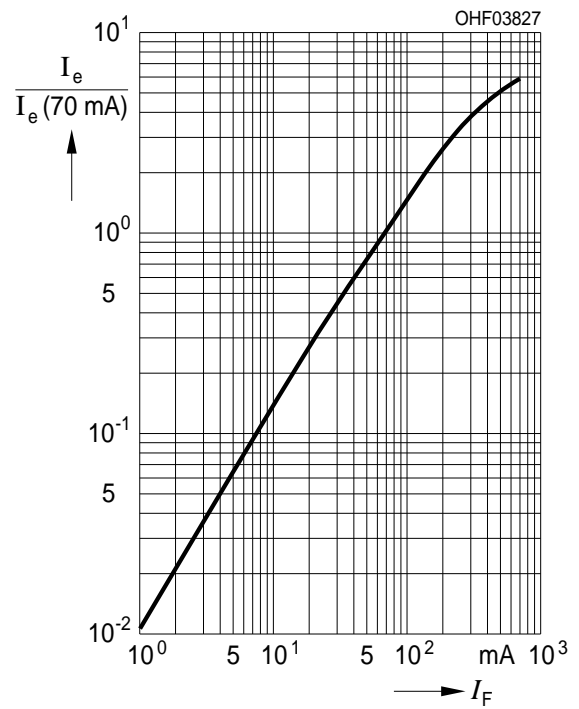
**Relative Spectral Emission** <sup>3) page 12</sup>

$I_{rel} = f(\lambda), T_A = 25^\circ\text{C}$



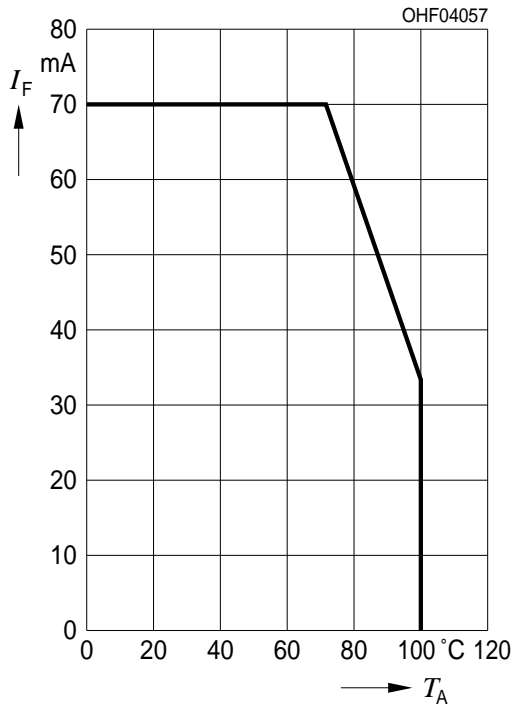
**Radiant Intensity** <sup>3) page 12</sup>

$I_e / I_e(70 \text{ mA}) = f(I_F), \text{ single pulse, } t_p = 25 \mu\text{s}, T_A = 25^\circ\text{C}$



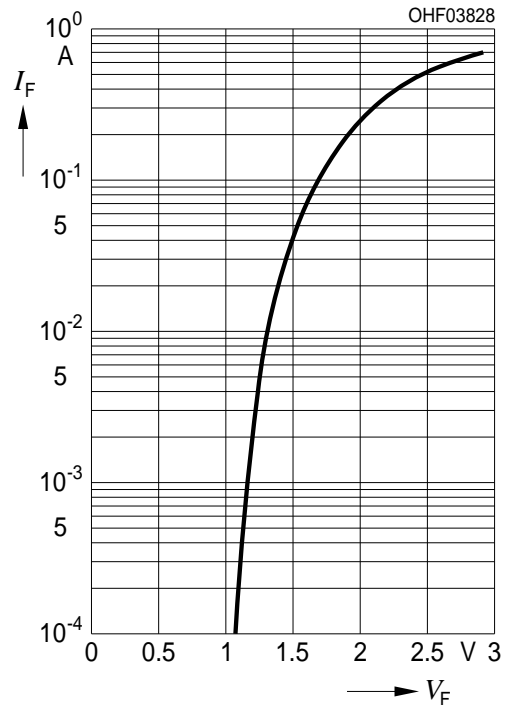
**Max. Permissible Forward Current**

$I_{F, max} = f(T_A), R_{thJA} = 380 \text{ K/W}$



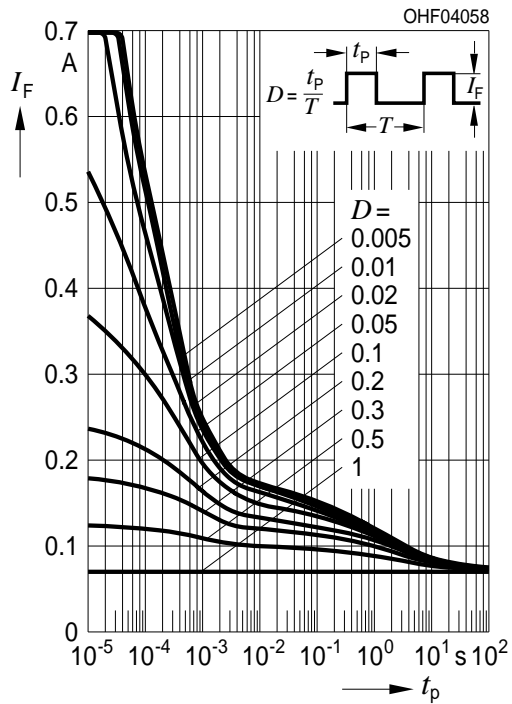
**Forward Current** <sup>3) page 12</sup>

$I_F = f(V_F), \text{ single pulse, } t_p = 100 \mu\text{s}, T_A = 25^\circ\text{C}$



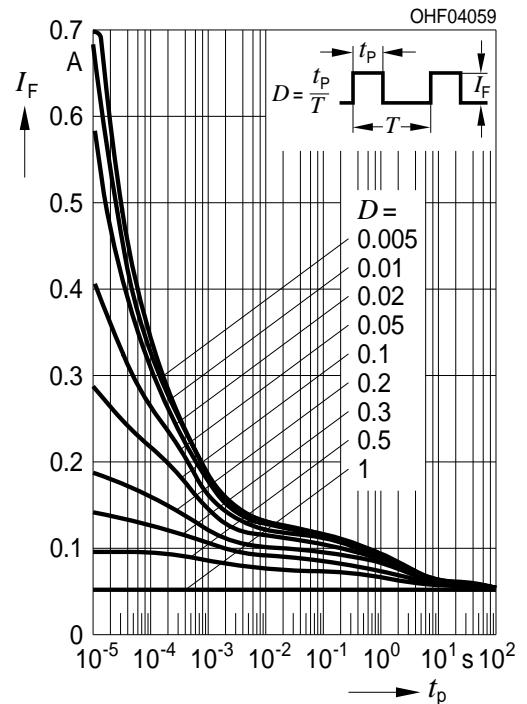
**Permissible Pulse Handling Capability**

$I_F = f(t_p)$ ,  $T_A = 25\text{ °C}$ , duty cycle  $D = \text{parameter}$



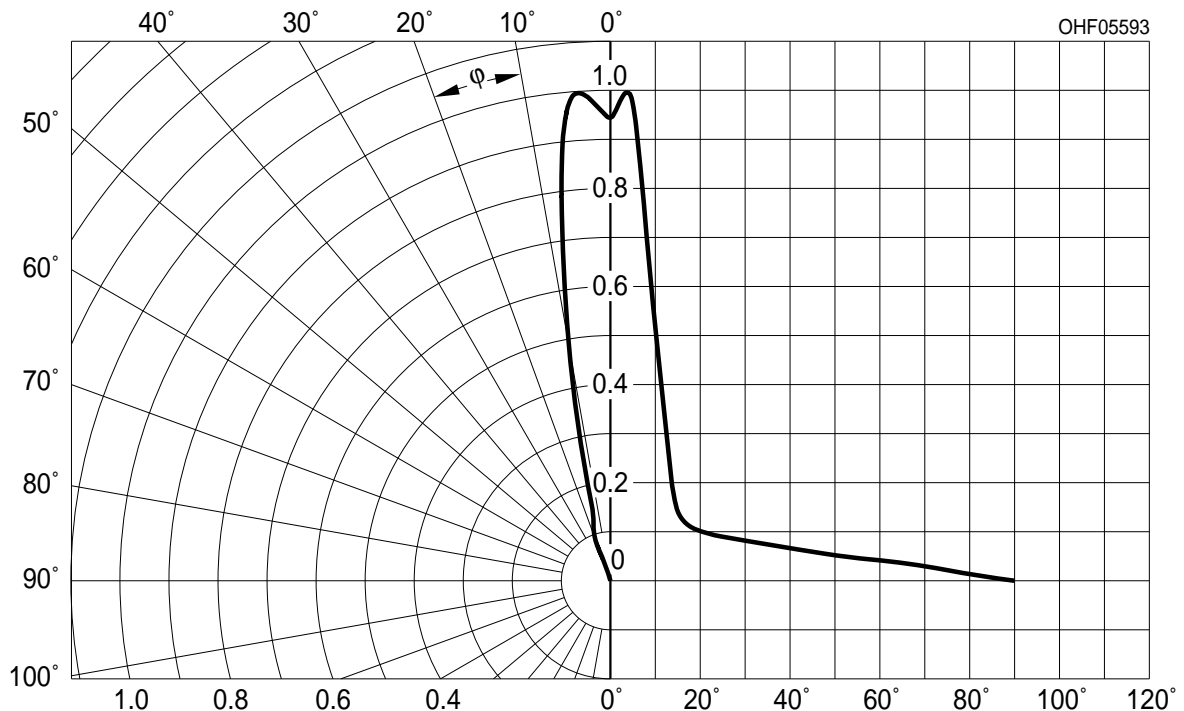
**Permissible Pulse Handling Capability**

$I_F = f(t_p)$ ,  $T_A = 85\text{ °C}$ , duty cycle  $D = \text{parameter}$

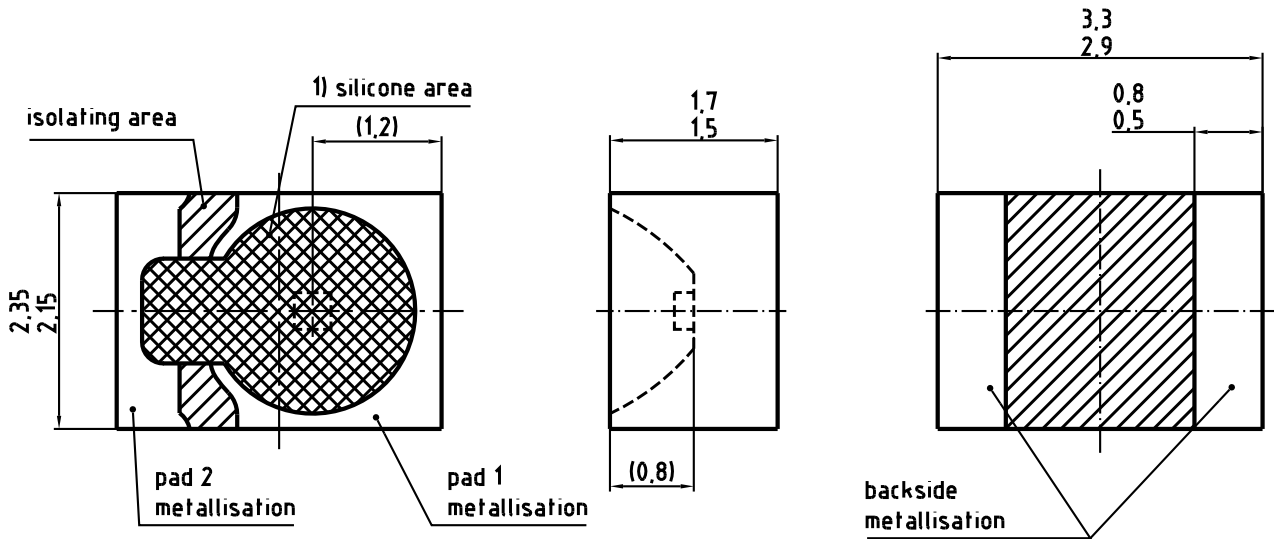


**Radiation Characteristics** <sup>3) page 12</sup>

$I_{rel} = f(\phi)$ ,  $T_A = 25\text{ °C}$



Package Outline



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

C63062-A3811-A1...-15

Dimensions in mm.

Pad	Description
1	Anode
2	Cathode

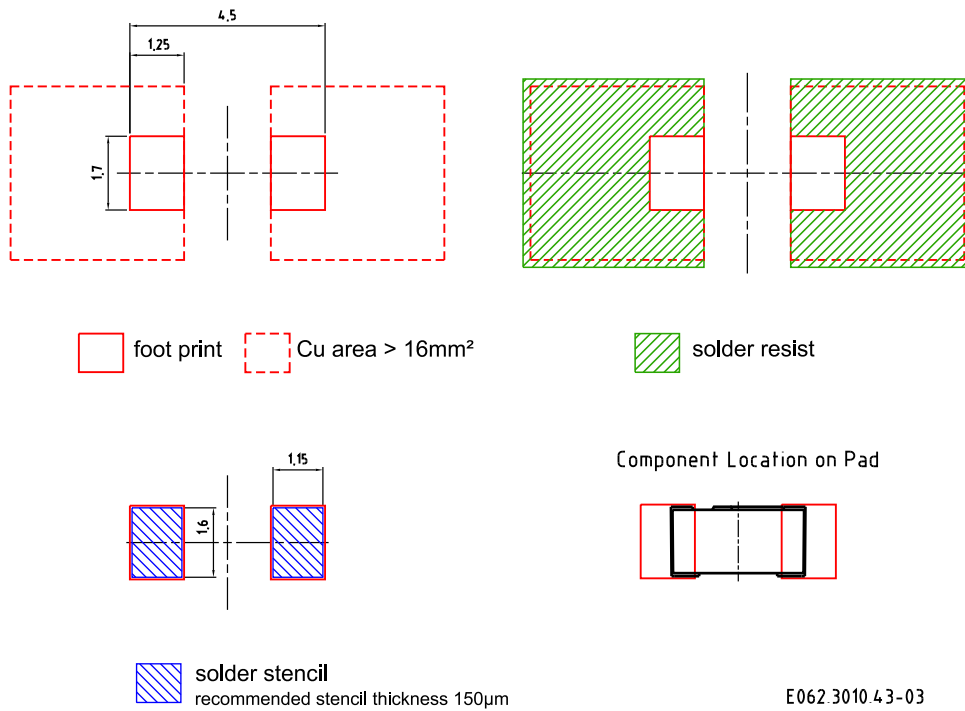
Package

MIDLED, Silicone, colourless, clear

Approximate Weight:

23 mg

**Recommended Solder Pad**

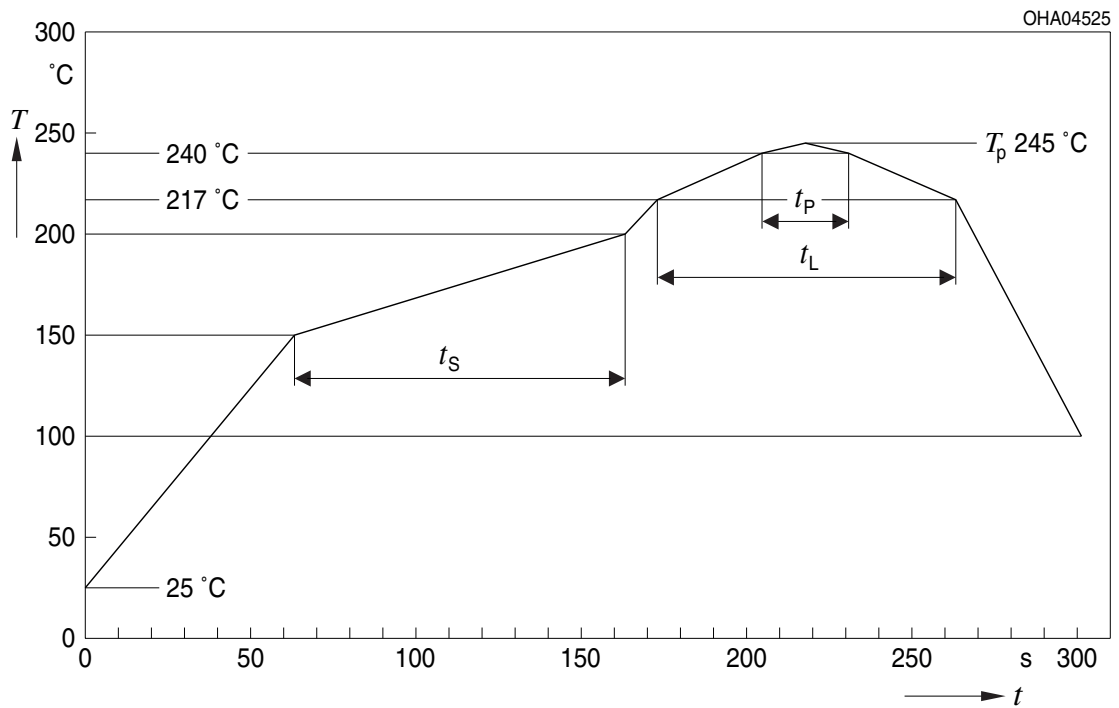


E062.3010.43-03

Dimensions in mm.

**Reflow Soldering Profile**

Product complies to MSL Level 2 acc. to JEDEC J-STD-020D.01



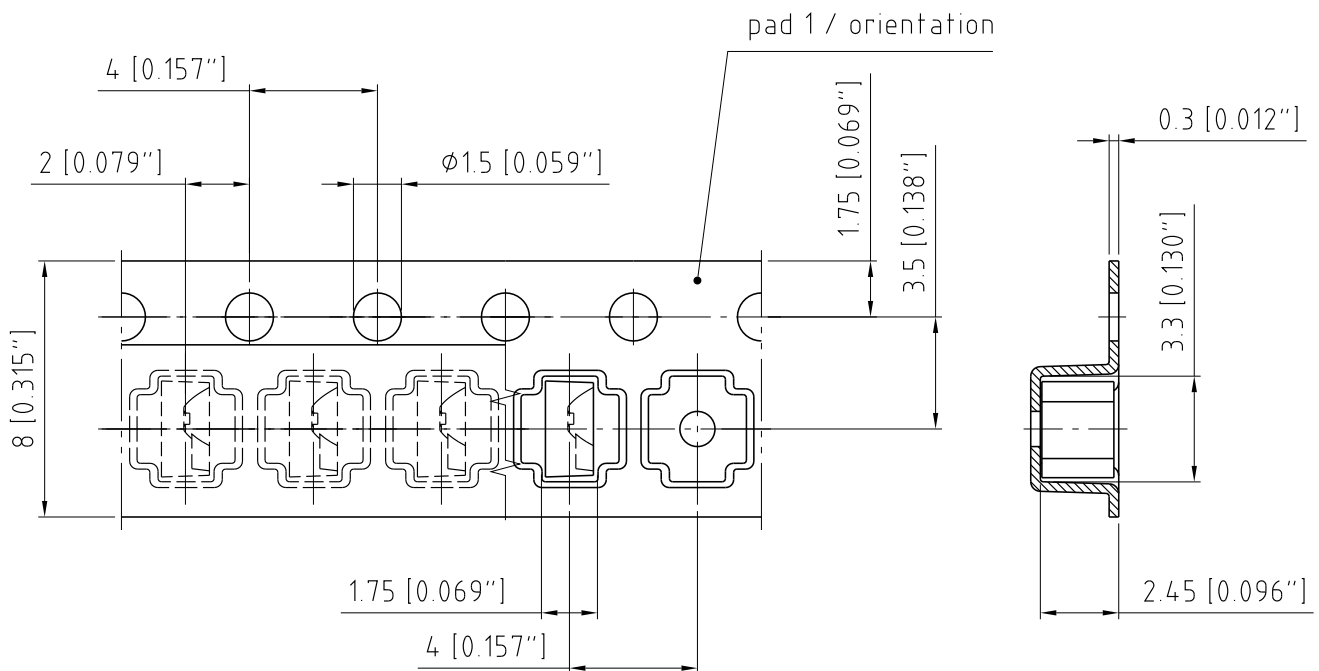
OHA04612

Profile Feature Profil-Charakteristik	Symbol Symbol	Pb-Free (SnAgCu) Assembly			Unit Einheit
		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



C63062-A3811-B8-08

Dimensions in mm (inch).

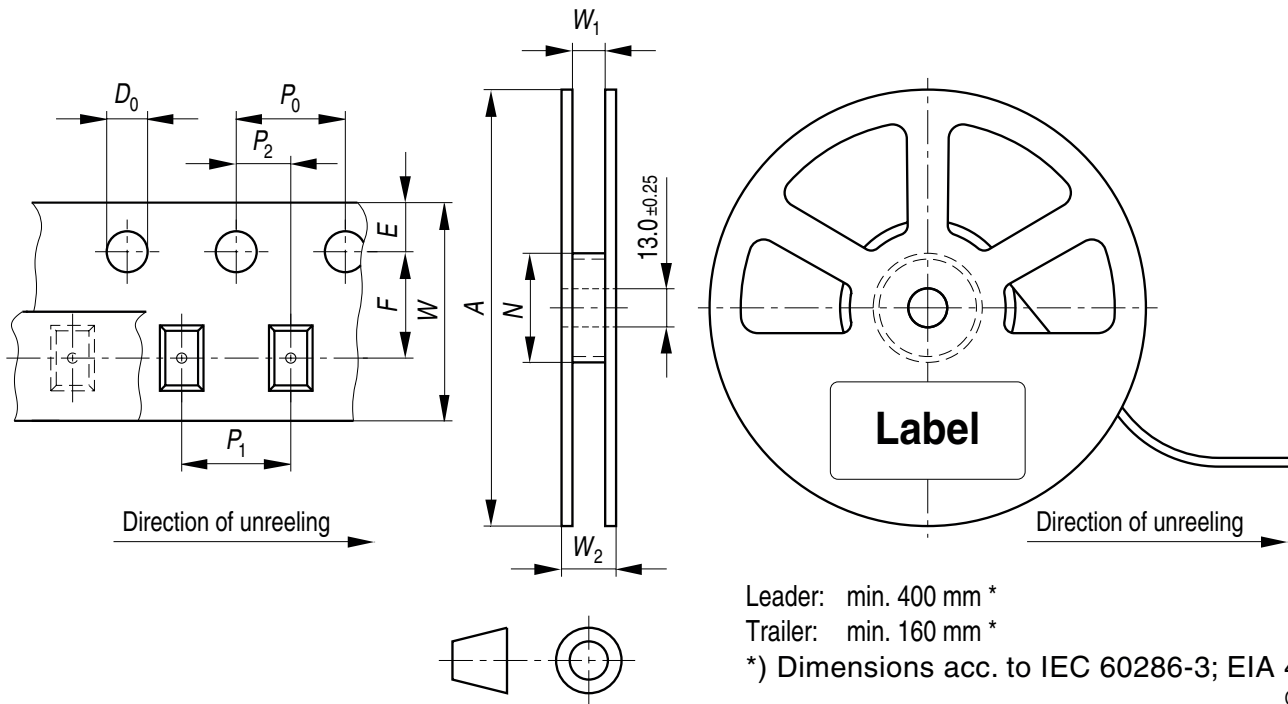
### Note:

Pad 1 = Anode



**Tape and Reel**

8 mm tape with 2000 pcs. on  $\varnothing$  180 mm reel



Leader: min. 400 mm \*  
 Trailer: min. 160 mm \*  
 \*) Dimensions acc. to IEC 60286-3; EIA 481-D  
 OHAY0324

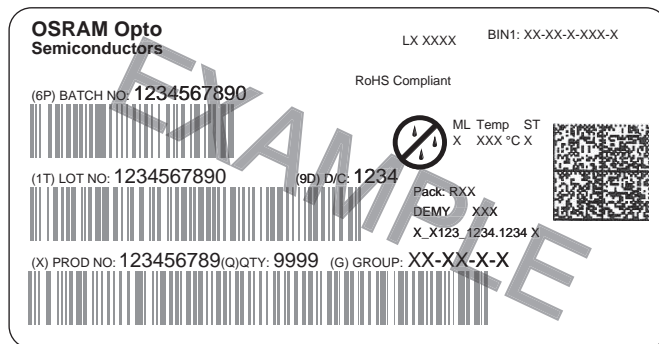
**Tape dimensions [mm]**

W	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	E	F
8 + 0.3 / -0.1	4 ± 0.1	2 ± 0.05 or 4 ± 0.1	2 ± 0.05	1.5 ± 0.1	1.75 ± 0.1	3.5 ± 0.05

**Reel dimensions [mm]**

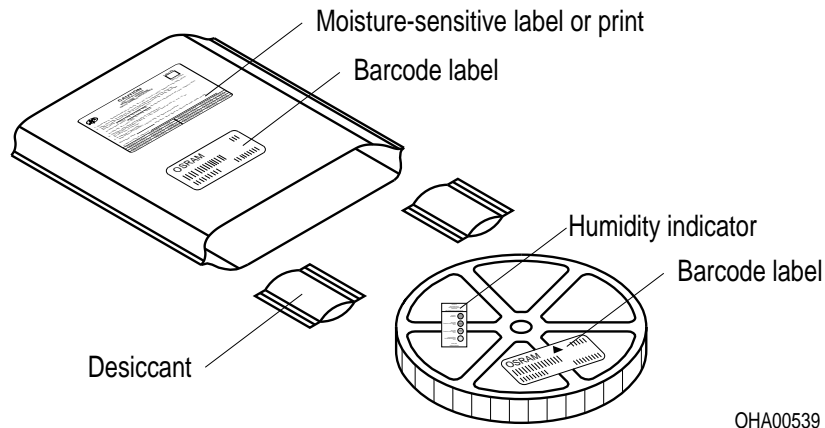
A	W	N <sub>min</sub>	W <sub>1</sub>	W <sub>2max</sub>
180	8	60	8.4 + 2	14.4

**Barcode-Product-Label (BPL)**



OHA04563

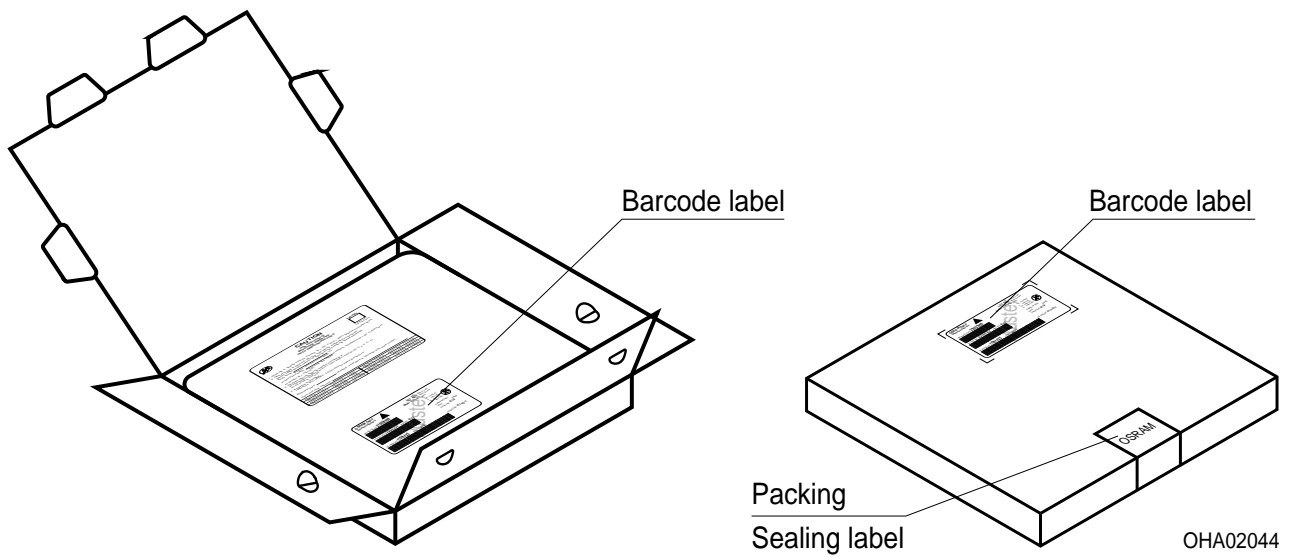
**Dry Packing Process and Materials**



**Note:**

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card. Regarding dry pack you will find further information in the internet. Here you will also find the normative references like JEDEC.

**Transportation Packing and Materials**



**Dimensions of transportation box in mm**

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

**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.

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\*\*) Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health and the life of the user may be endangered.

**Glossary**

- 1) **Thermal resistance:** junction -ambient, mounted on PC-board (FR4), pads size 16 mm<sup>2</sup> each
- 2) **Thermal resistance:** junction - soldering point, of the device only, mounted on an ideal heatsink (e.g. metal block)
- 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.

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