

# High Accuracy Ambient Light Sensor Version 1.8

## SFH 5711



### Features:

- Opto hybrid with logarithmic current output
- Perfect match to Human Eye Sensitivity ( $V_\lambda$ )
- Low temperature coefficient of spectral sensitivity
- High accuracy over wide illumination range
- The product qualification test plan is based on the guidelines of AEC-Q101-REV-C, Stress Test Qualification for Automotive Grade Discrete Semiconductors.

### Applications

- Automotive applications
- Sunlight sensor / head lamp control
- Control of display backlighting
- Mobile devices

### Ordering Information

Type:	Output current $I_{OUT}$ [ $\mu A$ ] $E_V = 1000$ lx (white LED LW 541C)	Ordering Code
SFH 5711-1/2	25 - 30	on request
SFH 5711-2/3	27 - 32	Q65110A4513
SFH 5711-3/4	29 - 34	on request

*Note:* Only one bin within one packing unit, see characteristics.

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

Parameter	Symbol	Values	Unit
Operation temperature range	$T_{op}$	-40 ... 100	°C
Storage temperature range	$T_{stg}$	-40 ... 100	°C
Supply voltage	$V_{CC}$	6	V
Output voltage	$V_{OUT}$	$< V_{CC}$	V
ESD withstand voltage (acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)	$V_{ESD}$	2000	V

**Operating Conditions**

Parameter	Symbol	Values			Unit
		min	typ	max	
Supply voltage	$V_{CC}$	2.3		5.5	V
Illuminance ( $T_A = -30\text{ °C} \dots 70\text{ °C}$ )	$E_V$		3 ... 80 k		lx
Illuminance ( $T_A = -40\text{ °C} \dots 100\text{ °C}$ )	$E_V$		10 ... 80 k		lx

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

Parameter		Symbol	Values	Unit
Current consumption ( $E_V = 0, V_{CC} = 2.5\text{ V}$ )	(typ)	$I_{CC}$	0.41	mA
	(max)	$I_{CC}$	0.5	mA
Current consumption ( $E_V = 0, V_{CC} = 5\text{ V}$ )	(typ)	$I_{CC}$	0.42	mA
Current consumption ( $E_V = 1000\text{ lx}, V_{CC} = 2.5\text{ V}$ )	(typ)	$I_{CC}$	0.46	mA
	(max)	$I_{CC}$	0.55	mA
Current consumption ( $E_V = 1000\text{ lx}, V_{CC} = 5\text{ V}$ )	(typ)	$I_{CC}$	0.47	mA
Wavelength of max. sensitivity	(min)	$\lambda_{s\ max}$	540	nm
	(typ)	$\lambda_{s\ max}$	555	nm
	(max)	$\lambda_{s\ max}$	570	nm
Spectral range of sensitivity	(min)	$\lambda_{10\%}$	475	nm
	(max)	$\lambda_{10\%}$	650	nm
Dimensions of radiant sensitive area	(typ)	L x W	0.4 x 0.4	mm x mm
Half angle	(typ)	$\varphi$	$\pm 60$	°
Output capacitance	(typ)	$C_{OUT}$	3	pF

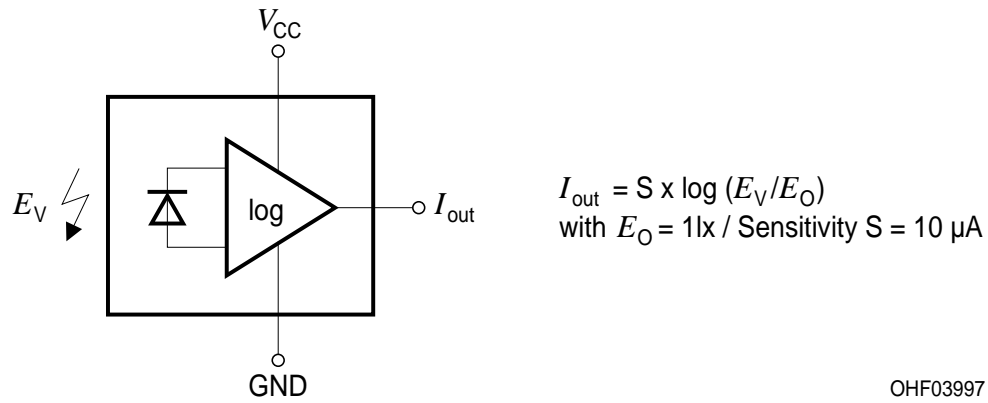
Parameter		Symbol	Values	Unit
Transfer function (Fig.: Circuitry)	(min)	G	9.5	$\mu\text{A} / \text{dec}$
	(typ)	G	10	$\mu\text{A} / \text{dec}$
	(max)	G	10.5	$\mu\text{A} / \text{dec}$
Deviation of output characteristics from logarithmic function (Fig.: Circuitry)	(min)	L	-3	%
	(max)	L	3	%
Output voltage	(typ)	$V_{\text{OUT high}}$	$V_{\text{CC}} - 0.5$	V
Rise time ( $R_L = 25 \text{ k}\Omega$ , $C = 1 \text{ nF}$ , Fig.: Definition of Response Time, $E_V = 100 \rightarrow 1000 \text{ lx}$ )	(typ)	$t_r$	30	$\mu\text{s}$
Fall time ( $R_L = 25 \text{ k}\Omega$ , $C = 1 \text{ nF}$ , Fig.: Definition of Response Time, $E_V = 1000 \rightarrow 100 \text{ lx}$ )	(typ)	$t_f$	100	$\mu\text{s}$
Power on time ( $E_V = 1000 \text{ lx}$ , $V_{\text{CC}} = 0 \text{ V} \rightarrow V_{\text{CC}}$ )	(typ)	$t_{\text{ON}}$	0.1	ms
	(max)	$t_{\text{ON}}$	1.2	ms
Output accuracy over temperature range ( $E_V = 1000 \text{ lx}$ , $T_A = -40 \text{ }^\circ\text{C} \dots 100 \text{ }^\circ\text{C}$ )	(min)		-2	$\mu\text{A}$
	(typ)		$\pm 1$	
	(max)		2	
Output accuracy over temperature range ( $E_V = 1000 \text{ lx}$ , $T_A = -30 \text{ }^\circ\text{C} \dots 70 \text{ }^\circ\text{C}$ )	(min)		-1.5	$\mu\text{A}$
	(typ)		$\pm 0.6$	
	(max)		1.5	
Output accuracy over temperature range ( $E_V = 1000 \text{ lx}$ , $T_A = 0 \text{ }^\circ\text{C} \dots 50 \text{ }^\circ\text{C}$ )	(min)		-0.7	$\mu\text{A}$
	(typ)		$\pm 0.2$	
	(max)		0.7	
Output dark current ( $E_V = 0 \text{ lx}$ )	(typ)	$I_{\text{OUT\_dark}}$	0.1	nA
	(max)	$I_{\text{OUT\_dark}}$	100	nA

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

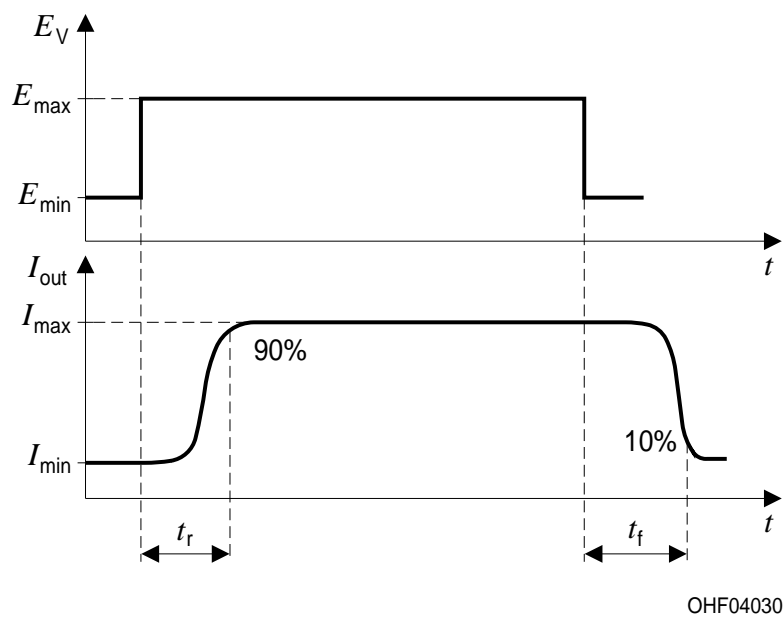
Group	Output current $E_V = 1000 \text{ lx}$ (white LED LW 541C) $I_{\text{OUT}}$
SFH 5711-1	25 ... 28
SFH 5711-2	27 ... 30
SFH 5711-3	29 ... 32
SFH 5711-4	31 ... 34

Note: 3  $\mu\text{A}$  bin width is equivalent to a spread of 1:2 of the irradiance.

## Circuitry

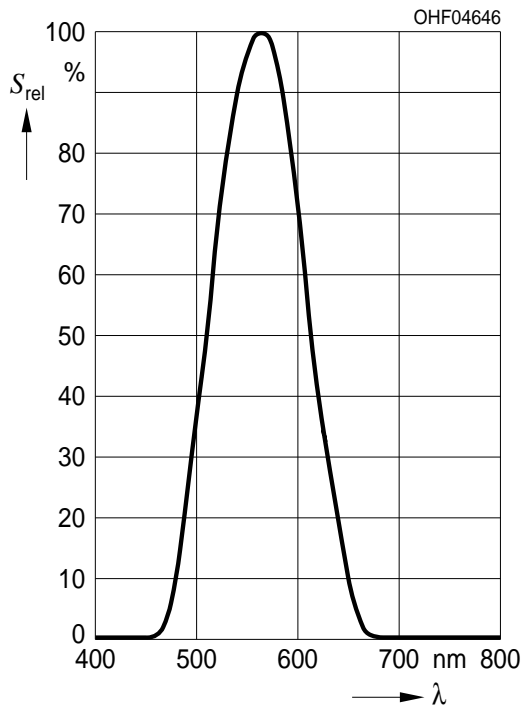


## Switching Time Definitions



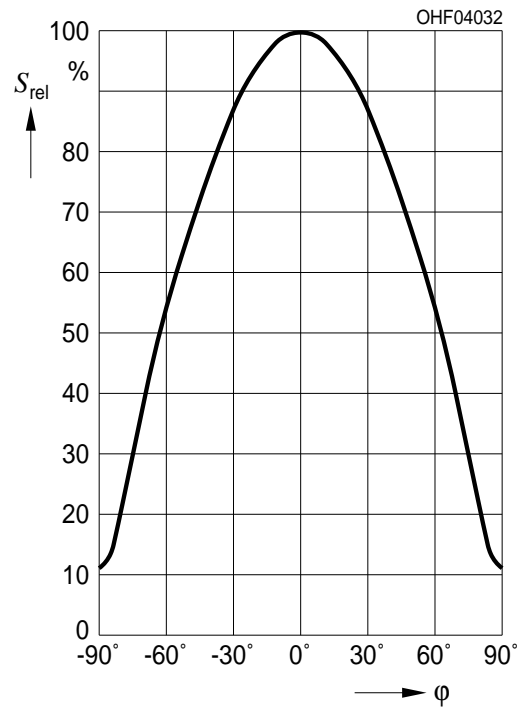
**Relative Spectral Sensitivity** <sup>2) page 13</sup>

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



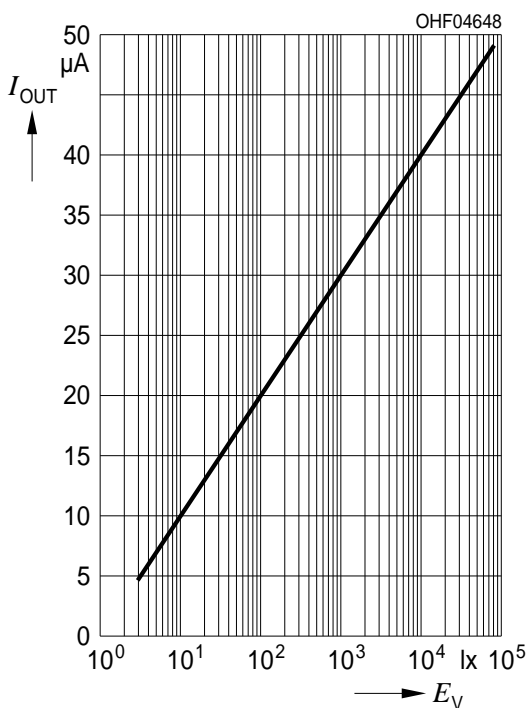
**Directional Characteristics** <sup>2) page 13</sup>

Photodiode  $S_{rel} = f(\phi)$



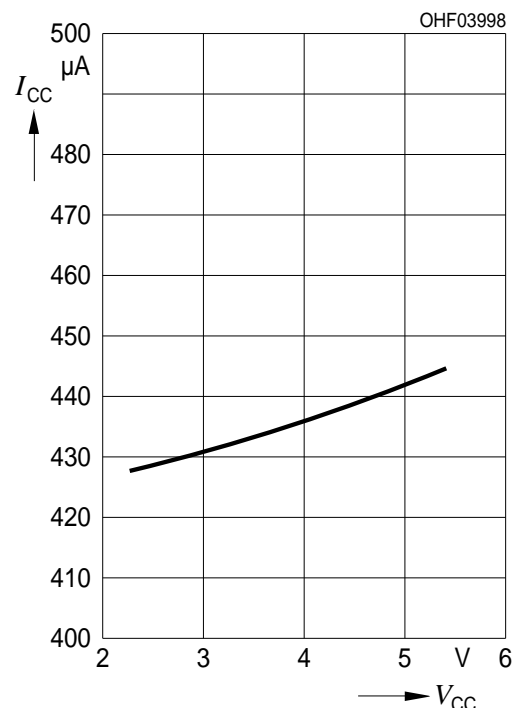
**Output Current** <sup>2) page 13</sup>

$I_{OUT} = f(E_V)$



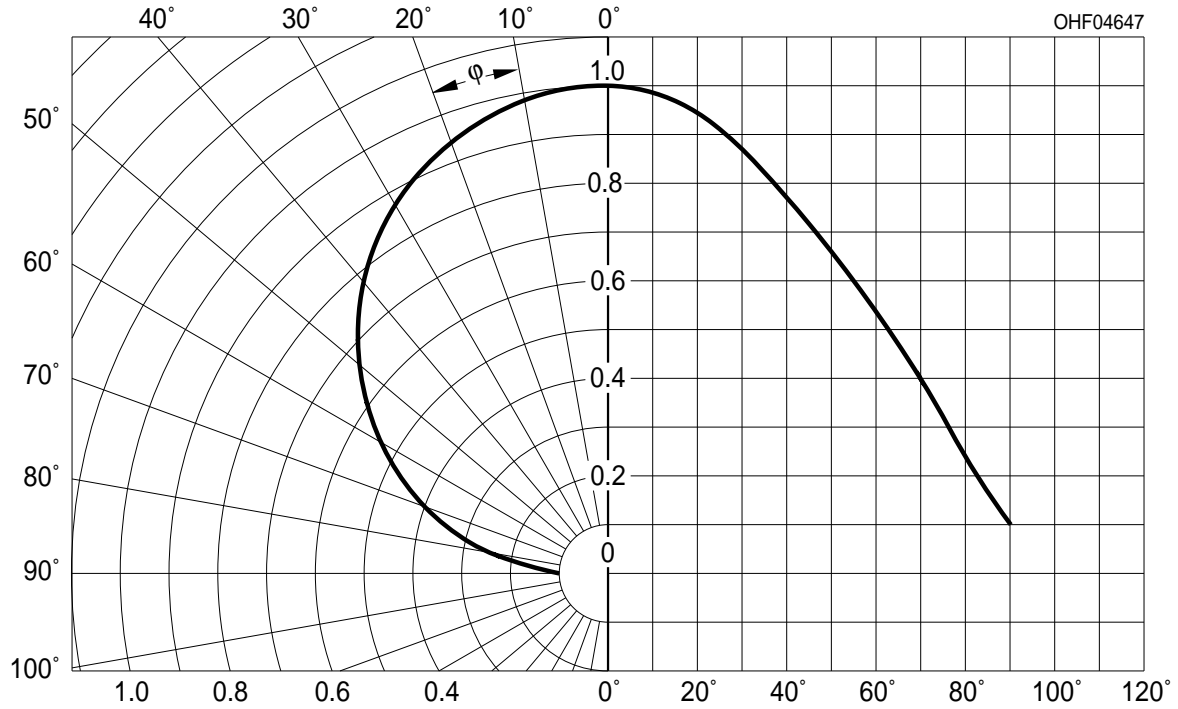
**Current Consumption** <sup>2) page 13</sup>

$I_{CC} = f(V_{CC})$

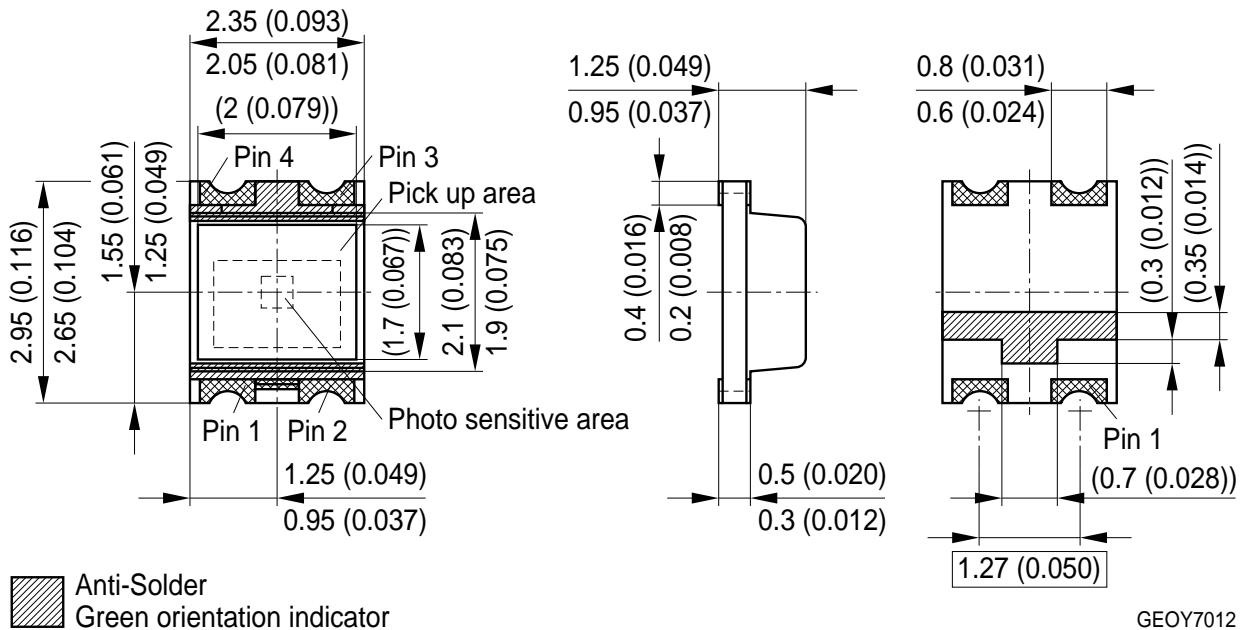


Directional Characteristics (Horizontal) <sup>2) page 13</sup>

Photodiode  $S_{rel} = f(\phi)$



Package Outline



GEOY7012

Dimensions in mm (inch).

**Pinning**

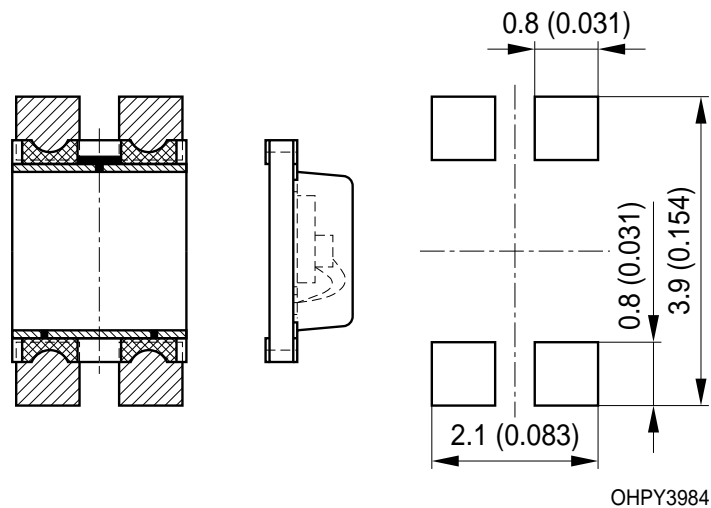
Pin	Description
1	GND
2	GND
3	V <sub>CC</sub>
4	I <sub>OUT</sub>

**Package**

Chiplid

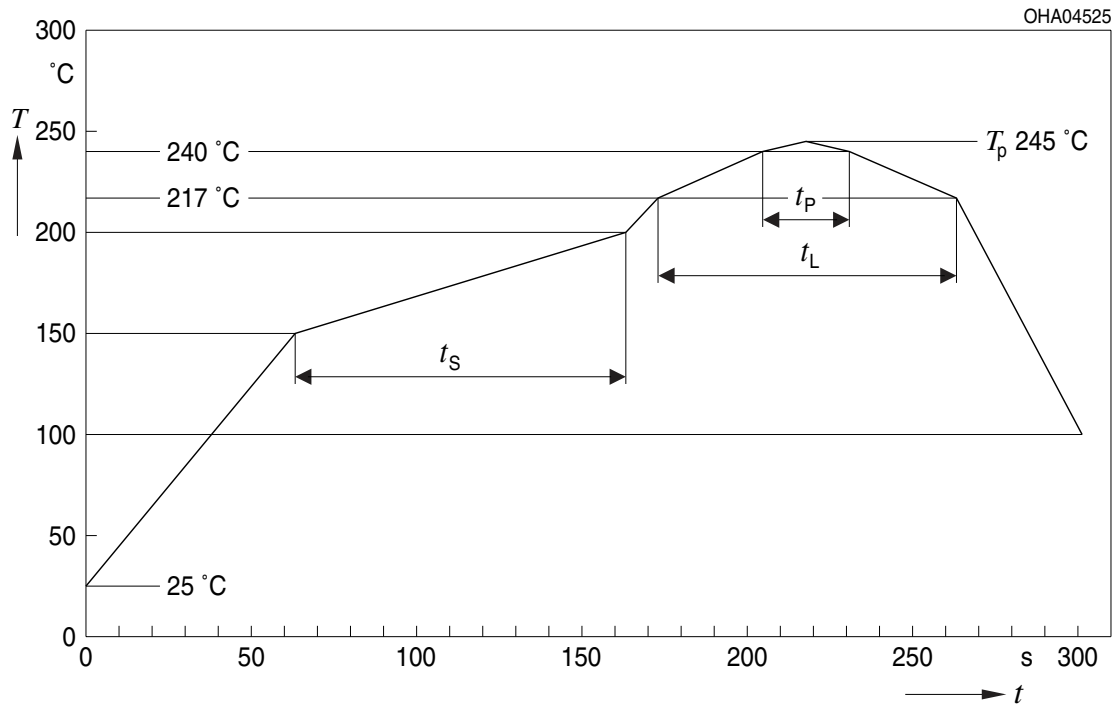
**Approximate Weight:**

10.0 mg

**Recommended Solder Pad***Dimensions in mm (inch).*

## Reflow Soldering Profile

Product complies to MSL Level 3 or 4 acc. to JEDEC J-STD-020D.01



OHA04612

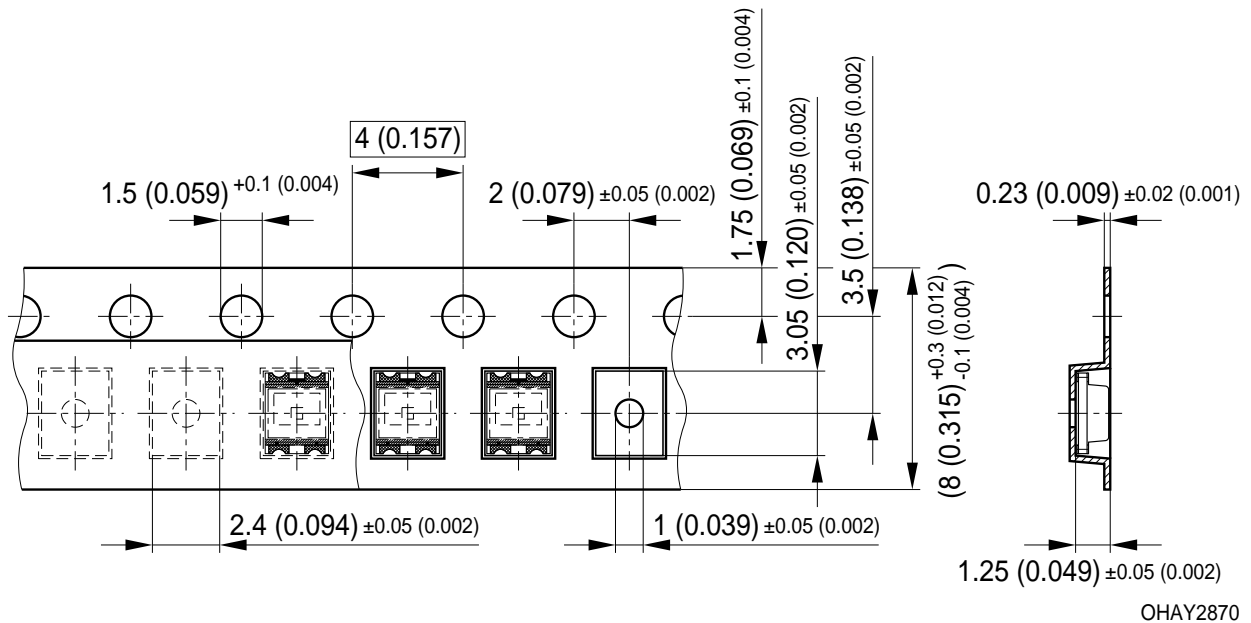
Profile Feature Profil-Charakteristik	Symbol Symbol	Pb-Free (SnAgCu) Assembly			Unit Einheit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat*) 25 °C to 150 °C			2	3	K/s
Time $t_S$ $T_{Smin}$ to $T_{Smax}$	$t_S$	60	100	120	s
Ramp-up rate to peak*) $T_{Smax}$ to $T_P$			2	3	K/s
Liquidus temperature	$T_L$	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

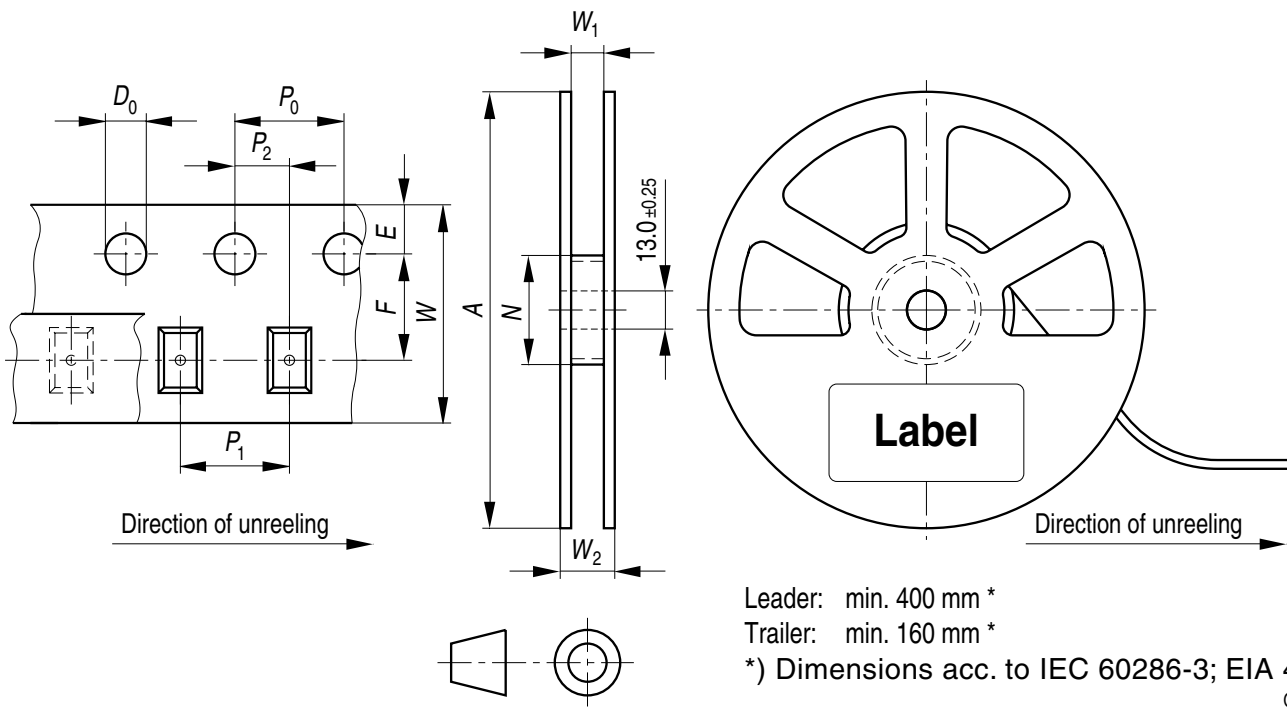


OHAY2870

Dimensions in mm (inch).

Tape and Reel

8 mm tape with 2000 pcs. on Ø 180 mm reel



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

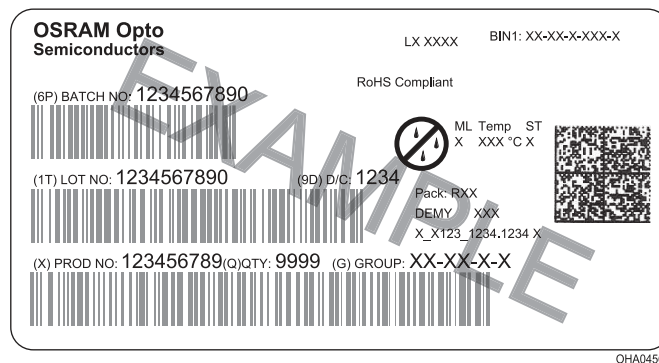
## Tape dimensions [mm]

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

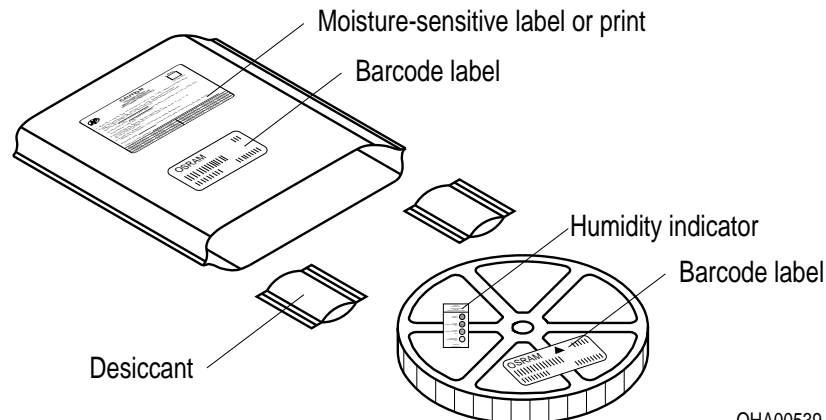
## Reel dimensions [mm]

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)



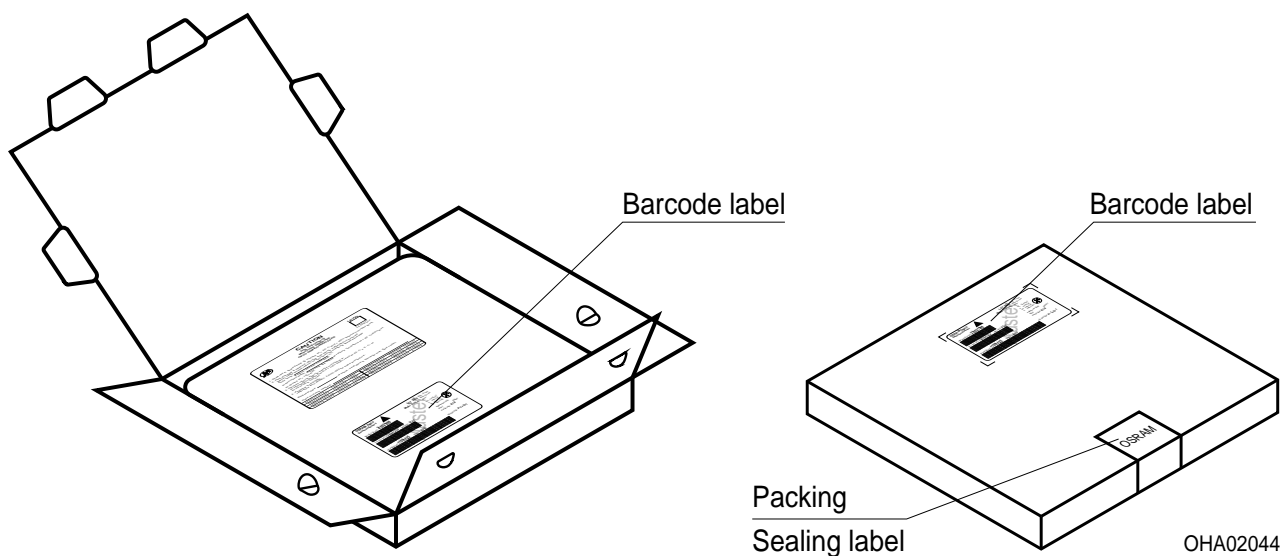
## Dry Packing Process and Materials



## 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. If printed or downloaded, please find the latest version in the Internet.

**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.

**Components used in life-support devices or systems must be expressly authorized for such purpose!**

Critical components\* may only be used in life-support devices\*\* or systems with the express written approval of OSRAM OS.

\*) A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or the effectiveness of that device or system.

\*\*) 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) **Operating and storage temperature range:** Maximum operating and storage temperature of 100 °C is only valid with storage conditions according to JEDEC Moisture Sensitivity Level (MSL) 4. With storage conditions according to JEDEC MSL 3, the max. operating and storage temperature is 85 °C.
- 2) **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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