

# BIOFY® Sensor Version 1.1

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## SFH 7070



### Features:

- Multi chip package featuring two green emitters and one detector
- Package size: (WxDxH) 7.5 mm x 3.9 mm x 0.9 mm
- Light Barriers to block optical crosstalk
- optimized for strong PPG signal

### Applications

- Heart rate monitoring

### for:

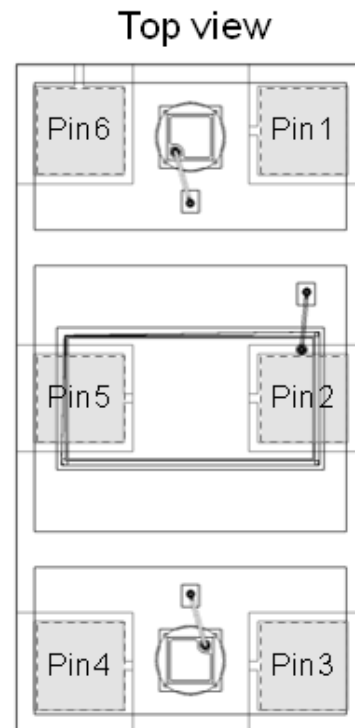
- Wearable devices (e.g. smart watches, fitness trackers, ...)
- Mobile devices

### Ordering Information

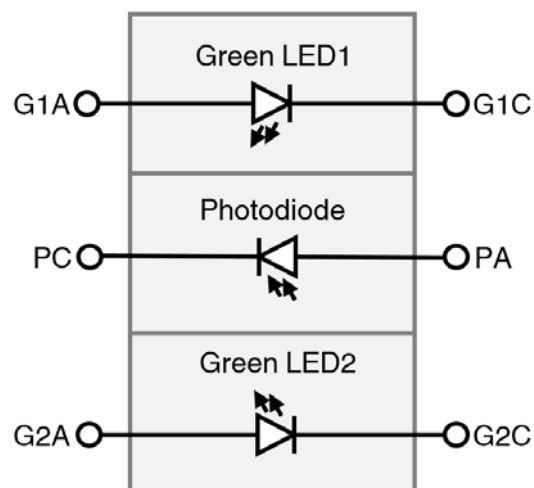
Type	Ordering Code
SFH 7070	Q65111A9887

## Pin configuration

Pin	Name	Function
1	G1C	Green LED 1 Cathode
2	PA	Photodiode Anode
3	G2C	Green LED 2 Cathode
4	G2A	Green LED 2 Anode
5	PC	Photodiode Cathode
6	G1A	Green LED 1 Anode



## Block diagram



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

Parameter	Symbol	Values	Unit
<b>General</b>			
Operating temperature range	$T_{op}$	-40 ... 85	°C
Storage temperature range	$T_{stg}$	-40 ... 85	°C
ESD withstand voltage (acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)	$V_{ESD}$	2	kV
<b>Green Emitters</b>			
Reverse voltage	$V_R$	5	V
Forward current	$I_{F(DC)}$	25	mA
Surge current ( $t_p = 10\ \mu s$ , $D = 0$ )	$I_{FSM}$	300	mA
<b>Detector</b>			
Reverse voltage	$V_R$	16	V

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

Parameter		Symbol	Value	Unit
<b>Green Emitter (single emitter)</b>				
Wavelength of peak emission ( $I_F = 20\text{ mA}$ )	(typ.)	$\lambda_{\text{peak}}$	526	nm
Centroid Wavelength ( $I_F = 20\text{ mA}$ )	(typ. (max.))	$\lambda_{\text{centroid}}$	530 ( $\pm 10$ )	nm
Spectral bandwidth at 50% of $I_{\text{max}}$ ( $I_F = 20\text{ mA}$ )	(typ.)	$\Delta\lambda$	32	nm
Half angle	(typ.)	$\varphi$	$\pm 60$	$^\circ$
Rise and fall time of $I_e$ (10% and 90% of $I_{e\text{max}}$ ) ( $I_F = 100\text{ mA}$ , $t_p = 16\text{ }\mu\text{s}$ , $R_L = 50\text{ }\Omega$ )	(typ.)	$t_r, t_f$	56	ns
Forward voltage ( $I_F = 20\text{ mA}$ )	(typ. (max.))	$V_F$	3.0 ( $\leq 3.4$ )	V
Reverse current ( $V_R = 5\text{ V}$ )		$I_R$	not designed for reverse operation	$\mu\text{A}$
Radiant intensity ( $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ.)	$I_e$	3.8	mW / sr
Total radiant flux ( $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ.)	$\Phi_e$	11.7	mW
Temperature coefficient of $I_e$ or $\Phi_e$ ( $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ.)	$TC_{I_e}$	-0.35	% / K
Temperature coefficient of $\lambda_{\text{centroid}}$ ( $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ.)	$TC_{\lambda_{\text{centroid}}}$	0.03	nm / K
Temperature coefficient of $V_F$ ( $I_F = 20\text{ mA}$ , $t_p = 20\text{ ms}$ )	(typ.)	$TC_{V_F}$	-3.6	mV / K

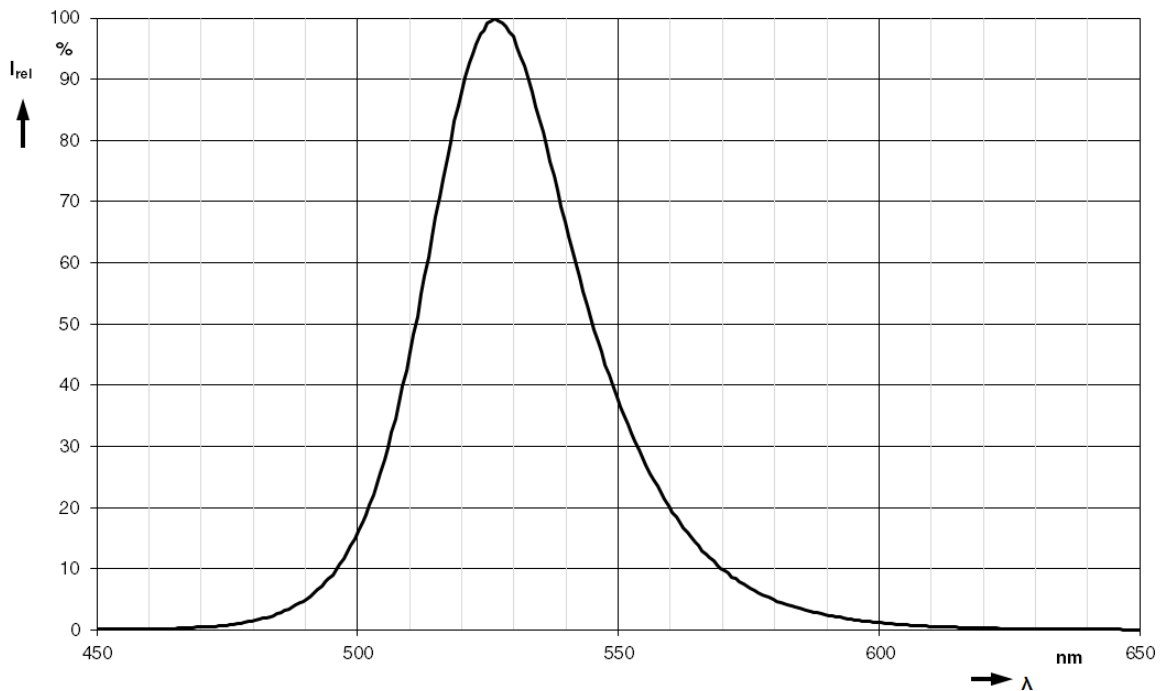
Characteristics ( $T_A = 25\text{ °C}$ )

Parameter		Symbol	Value	Unit
<b>Detector</b>				
Photocurrent ( $E_e = 0.1\text{ mW/cm}^2$ , $\lambda = 530\text{ nm}$ , $V_R = 5\text{ V}$ )	(typ.)	$I_{P,530}$	0.985	$\mu\text{A}$
Wavelength of max. sensitivity	(typ.)	$\lambda_{S\text{ max}}$	635	nm
Spectral range of sensitivity	(typ.)	$\lambda_{10\%}$	402 ... 694	nm
Radiation sensitive area	(typ.)	A	3.46	$\text{mm}^2$
Dimensions of radiant sensitive area	(typ.)	L x W	1.29 x 2.69	mm x mm
Half angle	(typ.)	$\varphi$	$\pm 57$	$^\circ$
Dark current ( $V_R = 5\text{ V}$ , $E_e = 0\text{ mW/cm}^2$ )	(typ. (max.))	$I_R$	0.4 ( $\leq 5$ )	nA
Spectral sensitivity of the chip ( $\lambda = 530\text{ nm}$ )	(typ.)	$S_{\lambda,530}$	0.31	A / W
Spectral sensitivity of the chip ( $\lambda > 690\text{ nm}$ )	(typ.)	$S_{IR}$	0.02	A / W
Open-circuit voltage ( $E_e = 0.1\text{ mW/cm}^2$ , $\lambda = 530\text{ nm}$ )	(typ.)	$V_{O,535}$	390	mV
Short-circuit current ( $E_e = 0.1\text{ mW/cm}^2$ , $\lambda = 530\text{ nm}$ )	(typ.)	$I_{SC,535}$	0.984	$\mu\text{A}$
Rise and fall time ( $V_R = 5\text{ V}$ , $R_L = 50\ \Omega$ , $\lambda = 530\text{ nm}$ )	(typ.)	$t_r, t_f$	40	ns
Forward voltage ( $I_F = 10\text{ mA}$ , $E = 0\text{ mW/cm}^2$ )	(typ.)	$V_F$	0.84	V
Capacitance ( $V_R = 5\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0\text{ mW/cm}^2$ )	(typ.)	$C_0$	55	pF

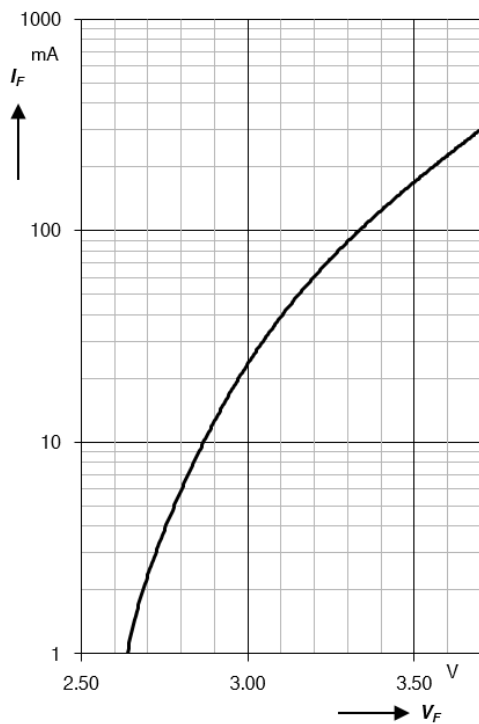
## Diagrams for green emitters

Relative spectral emission <sup>1)</sup>

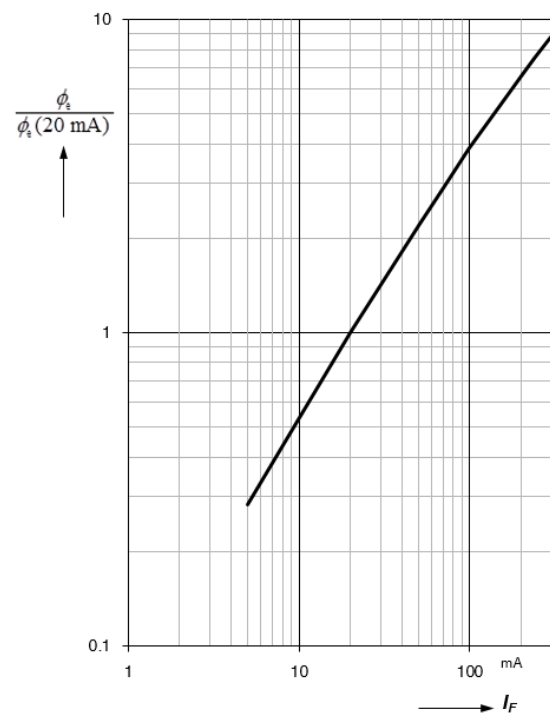
$$I_{\text{rel}} = f(\lambda), T_A = 25^\circ\text{C}, I_F = 20\text{ mA}$$

Forward current <sup>1)</sup>

$$I_F = f(V_F), T_A = 25^\circ\text{C}$$

Relative radiant flux <sup>1)</sup>

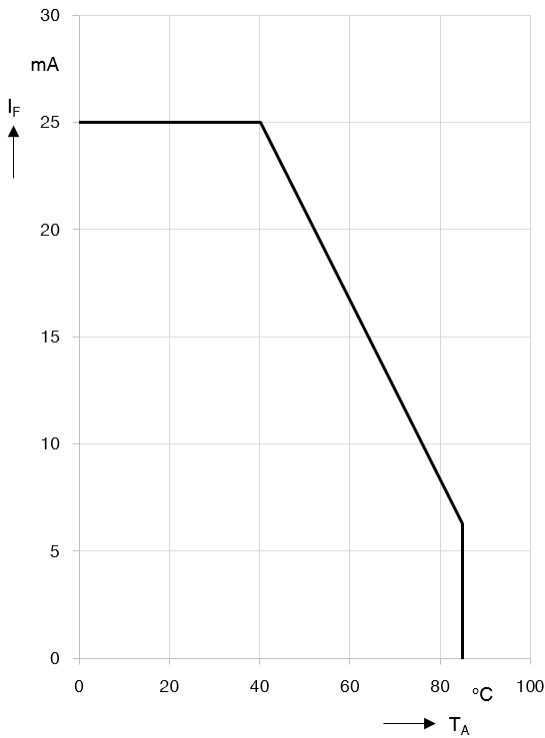
$$\Phi_e / \Phi_e(20\text{ mA}) = f(I_F), \text{ single pulse, } t_p = 25\mu\text{s}, T_A = 25^\circ\text{C}$$



Diagrams for green emitters

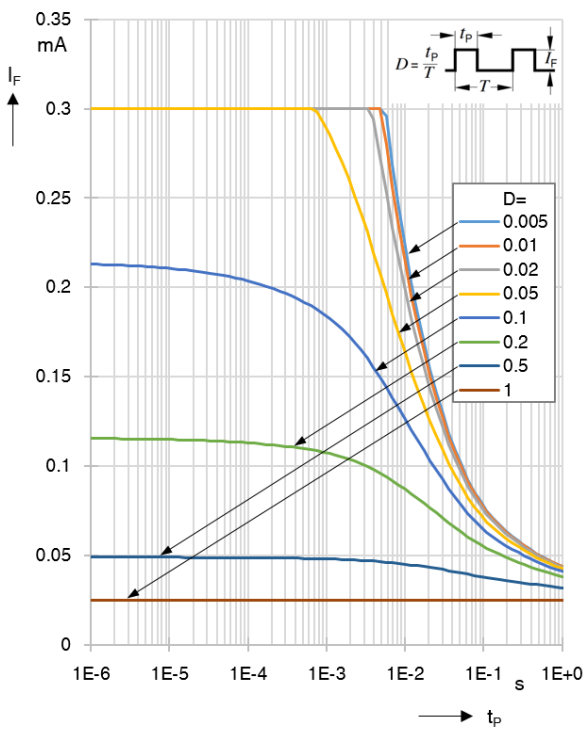
Max. permissible forward current <sup>1)</sup>

$I_{F,max} = f(T_A), R_{thJA} = 800 \text{ K/W}$



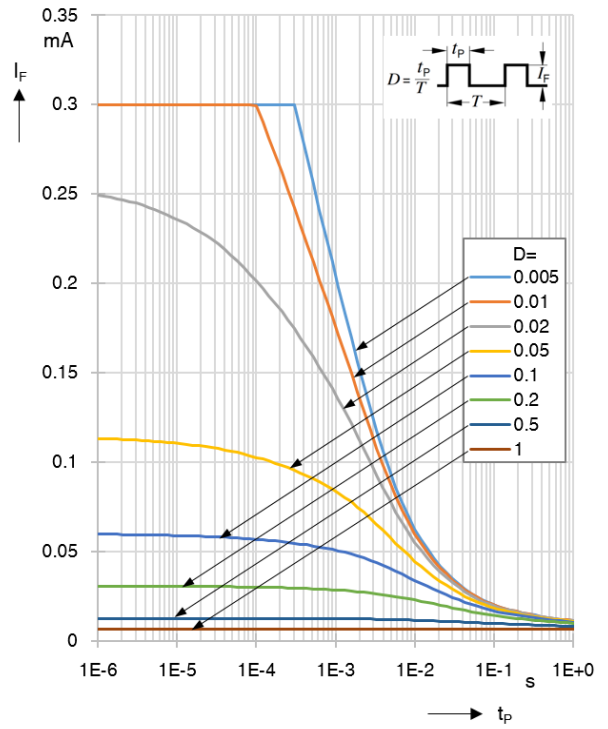
Permissible pulse handling capability <sup>1)</sup>

$I_F = f(t_p), T_A = 40^\circ\text{C}, \text{ duty cycle } D$



Permissible pulse handling capability <sup>1)</sup>

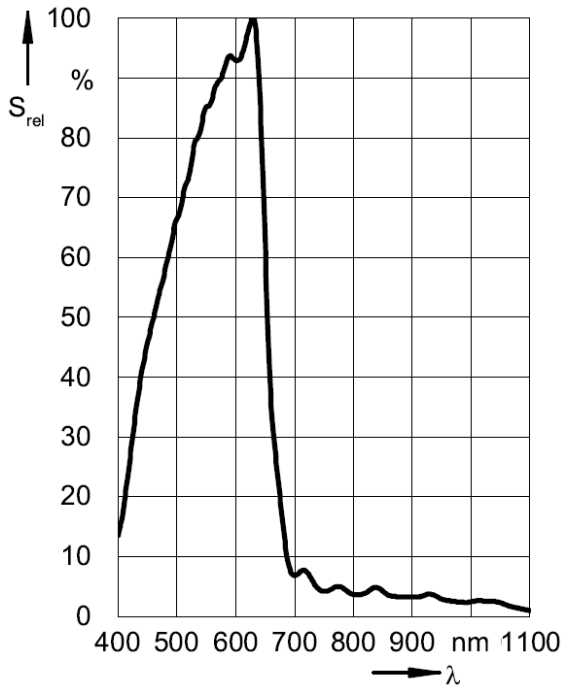
$I_F = f(t_p), T_A = 85^\circ\text{C}, \text{ duty cycle } D$



Diagrams for detector

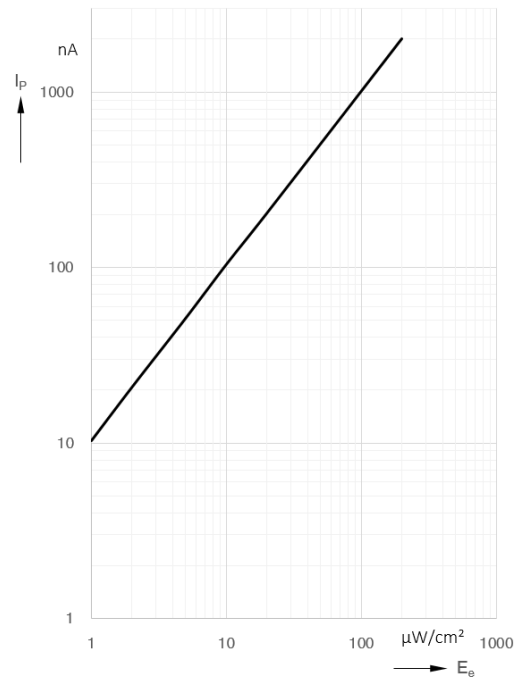
Relative spectral sensitivity <sup>1)</sup>

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



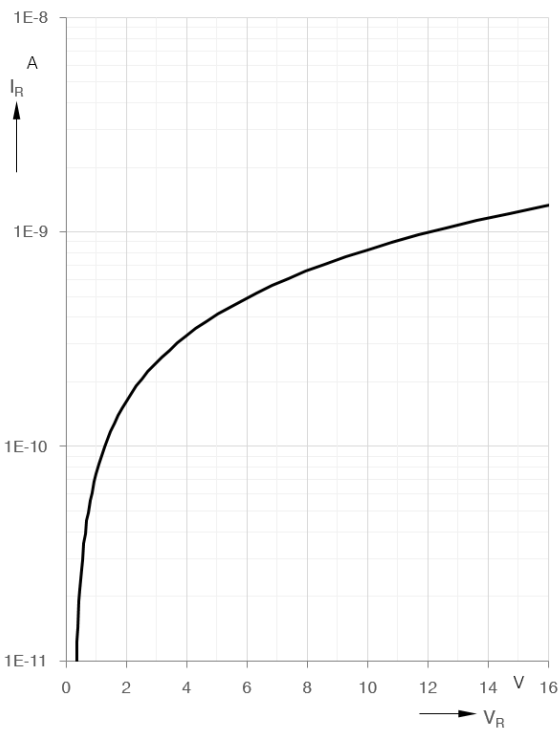
Photocurrent <sup>1)</sup>

$I_P(V_R = 5\text{ V}), \lambda = 530\text{ nm}, T_A = 25\text{ }^\circ\text{C}$



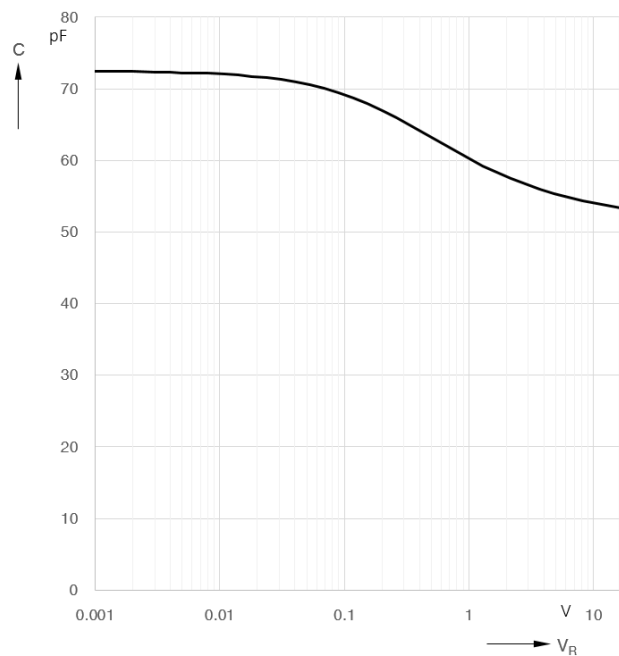
Dark current <sup>1)</sup>

$I_R = f(V_R), E = 0\text{ mW}/\text{cm}^2, T_A = 25\text{ }^\circ\text{C}$



Capacitance <sup>1)</sup>

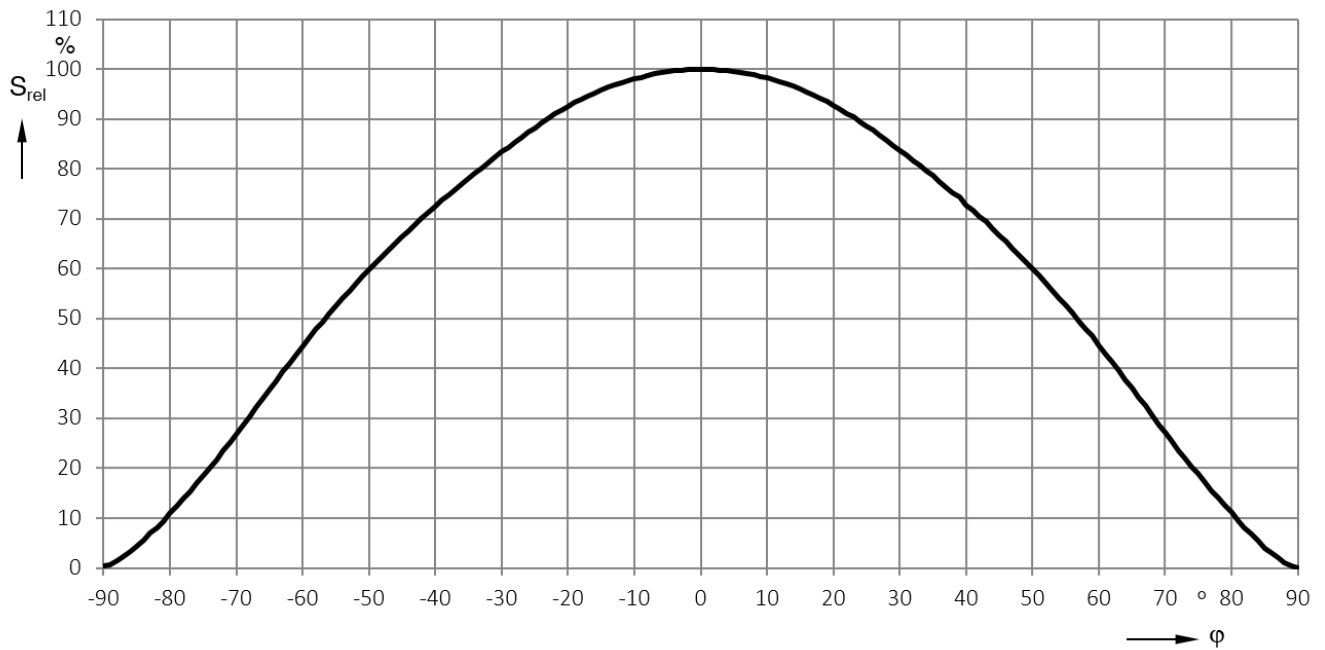
$C = f(V_R), f = 1\text{ MHz}, E = 0\text{ mW}/\text{cm}^2, T_A = 25\text{ }^\circ\text{C}$



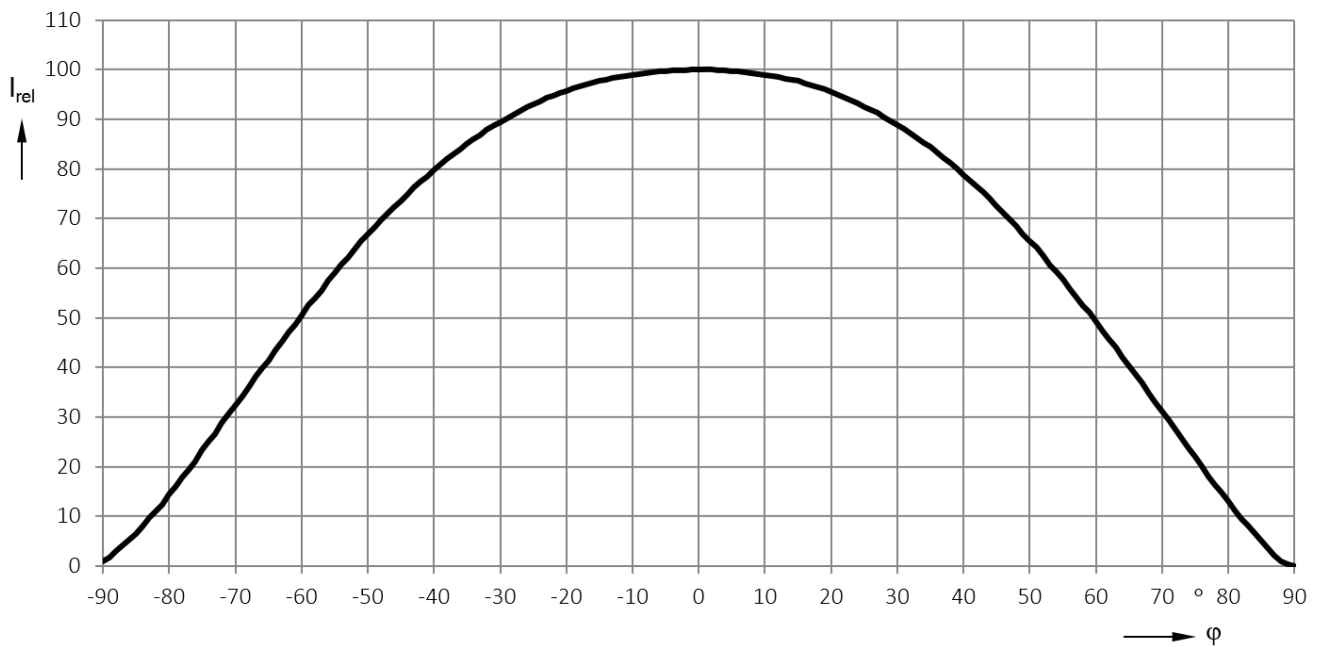


**Directional characteristics of detector** <sup>1)</sup>

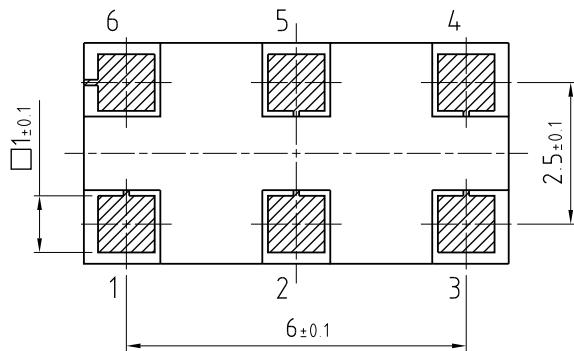
$$S_{\text{rel}} = f(\varphi), \lambda = 530\text{nm}$$

**Radiation characteristics of emitter** <sup>1)</sup>

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

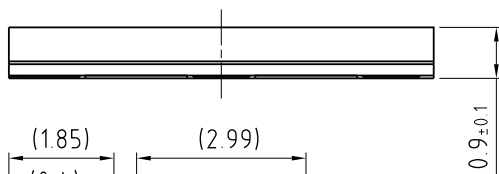


## Package Outline

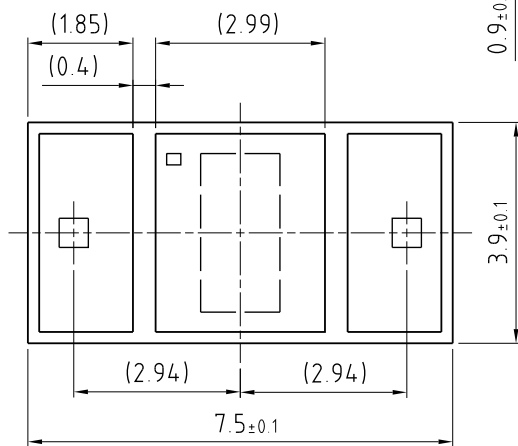


BOTTOM VIEW

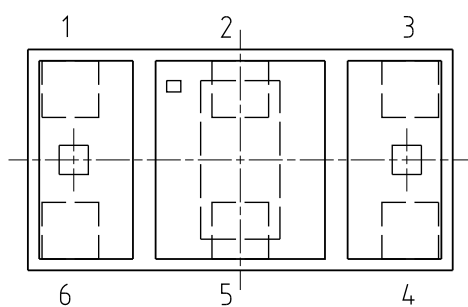
Pin	Name	Function
1	G1C	Green LED1 cathode
2	PA	Photodiode anode
3	G2C	Green LED2 cathode
4	G2A	Green LED2 anode
5	PC	Photodiode cathode
6	G1A	Green LED1 anode



SIDE VIEW



TOP VIEW

TOP VIEW /  
Pad Info

C63062-A4310-A1-02

Dimensions in mm

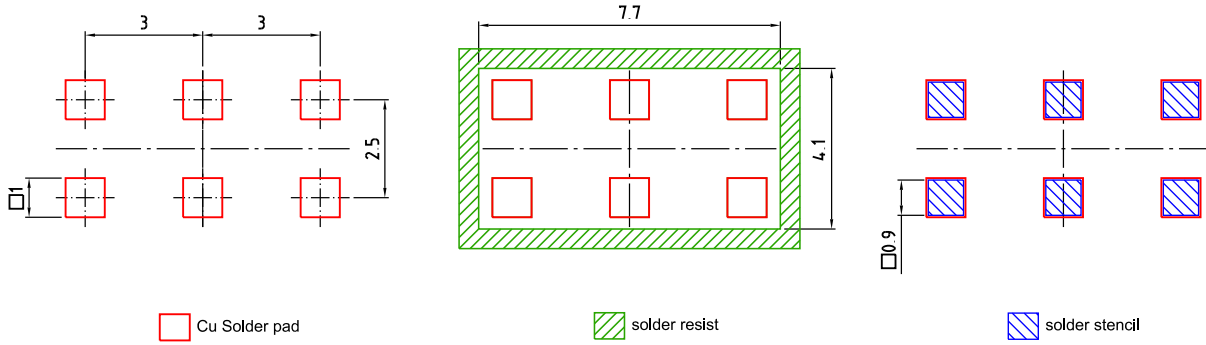
**Package:**

chip on board

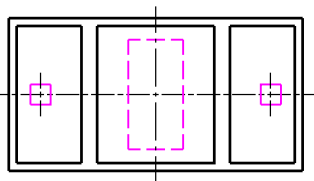
**Approximate Weight:**

43 mg

**Recommended solder pad design**



Component Location on Pad

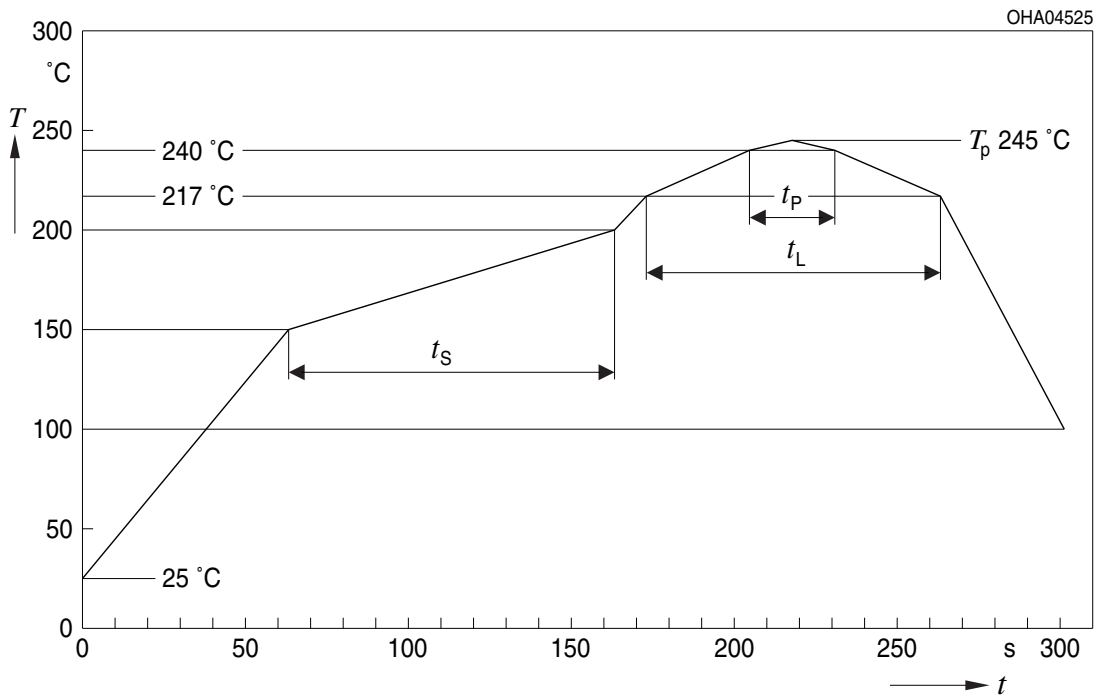


Dimensions in mm (inch).

E062.3010.204-02

**Reflow Soldering Profile**

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



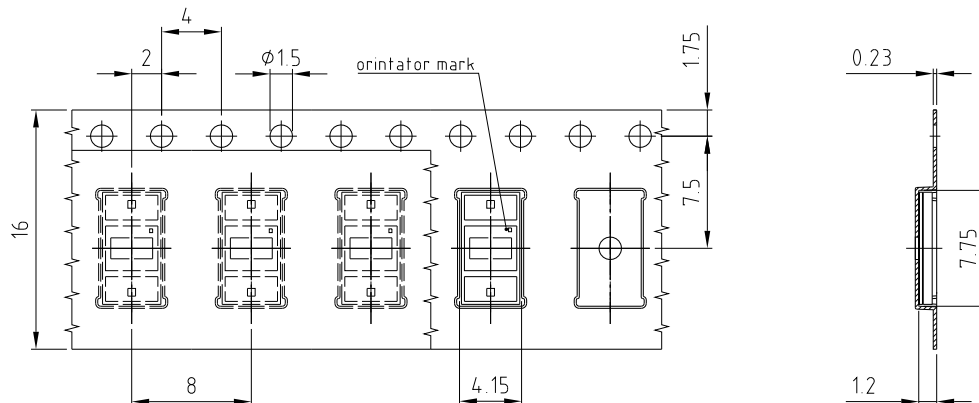
OHA04612

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

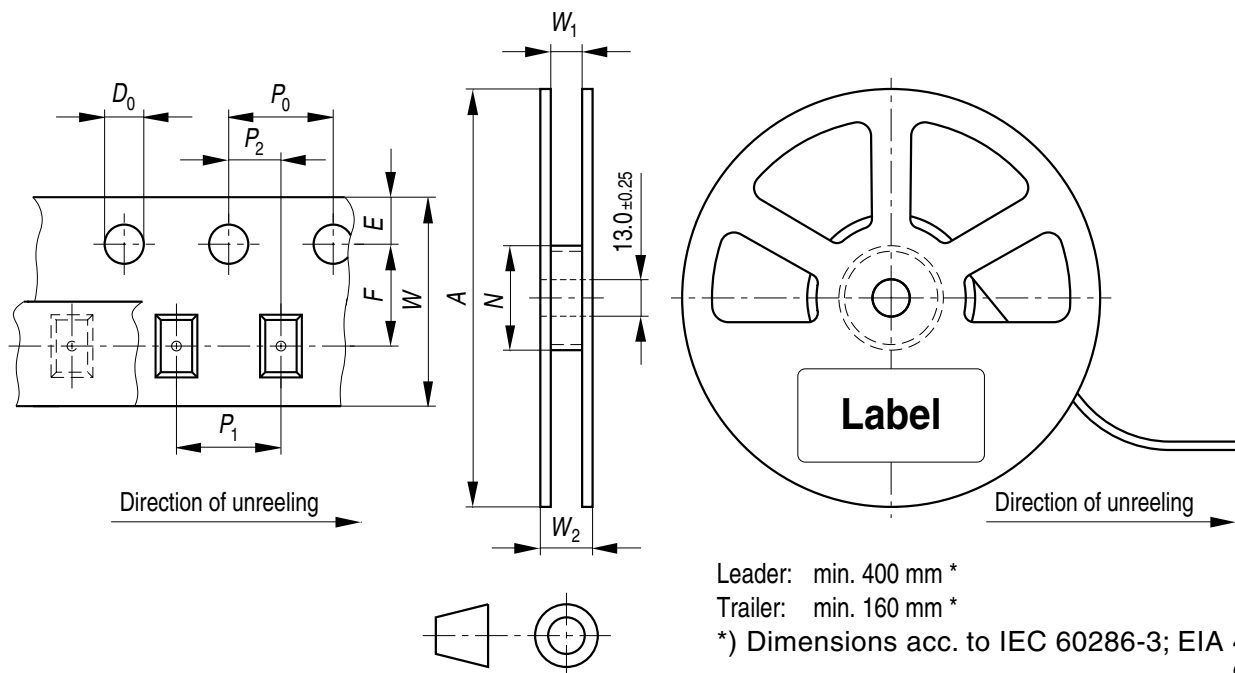
\* slope calculation  $DT/Dt$ :  $Dt$  max. 5 s; fulfillment for the whole T-range

## Method of Taping



C63062-A4310-B2 -02

Dimensions in mm [inch].

**Tape and Reel**16 mm tape with 1500 pcs. on  $\varnothing$  180 mm reel

Dimensions in mm

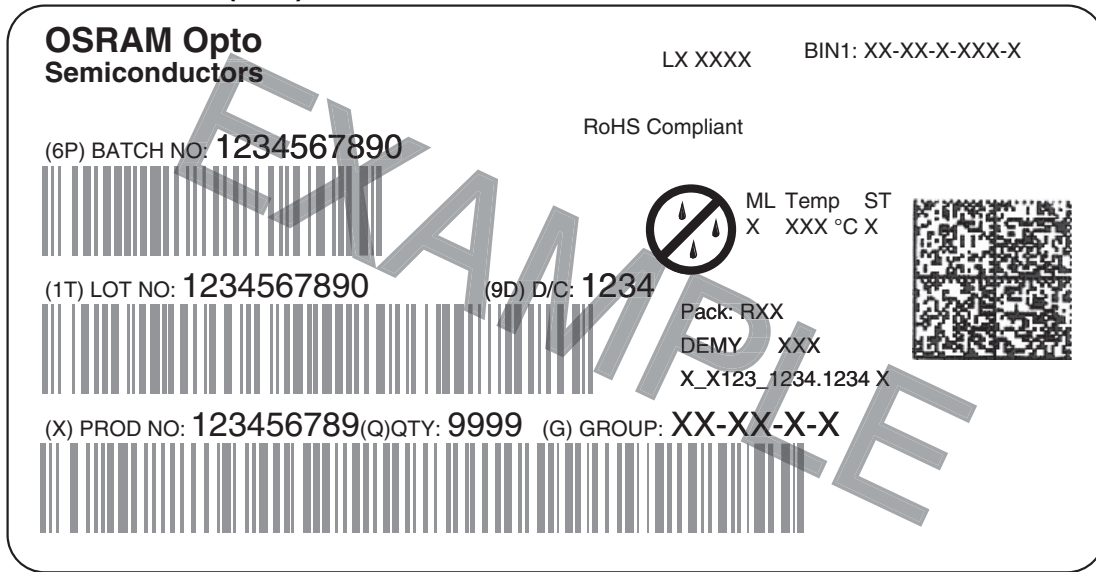
**Tape Dimensions [mm]**

W	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	D <sub>0</sub>	E	F
16 +0.3 / -0.1	4 ±0.1	8 ±0.1	2 ±0.05	1.5 ±0.1	1.75 ±0.1	7.5 ±0.05

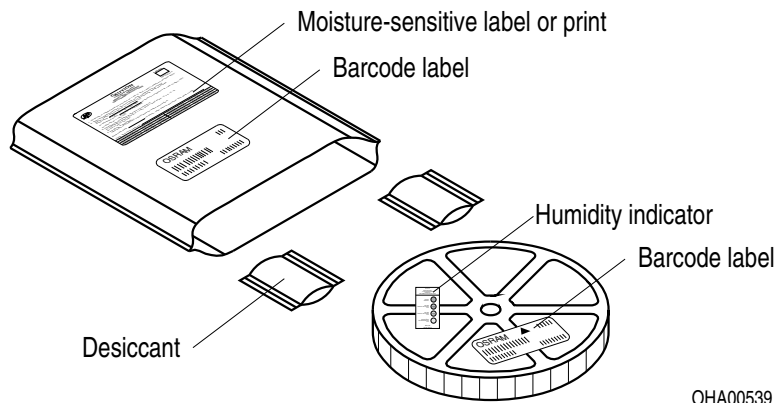
**Reel Dimensions [mm]**

A	W	N <sub>min</sub>	W <sub>1</sub>	W <sub>2max</sub>
180	16	60	16.4 +2	22.4

Barcode-Product-Label (BPL)



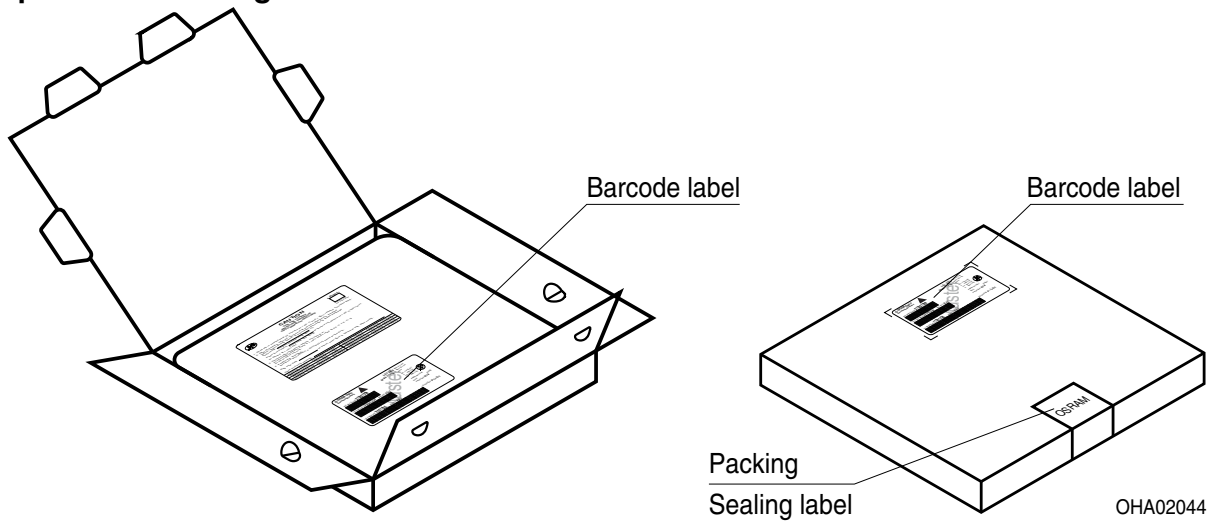
Dry Packing Process and Materials



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
195 ± 5	195 ± 5	42 ± 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) **Typical Values:** Due to the special conditions of the manufacturing processes of LED and photodiodes, 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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按照中国的相关法规和标准，不含有毒有害物质或元素。



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