BioMon Sensor
Datasheet
Version 1.1

SFH7060

Features:

- Multi chip package featuring three green, one red, one infrared emitter and one detector
- Small package: (WxDxH) 7.2 mm x 2.5 mm x 0.9 mm
- Light Barrier to block optical crosstalk
- Improved geometry for optimized signal quality

Applications

- Heart rate monitoring
- Pulse oximetry

for:

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

Ordering Information SFH7060

Type	Ordering Code
SFH7060	Q65111A7791

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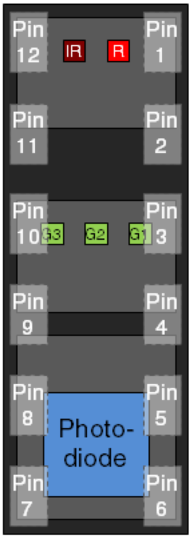
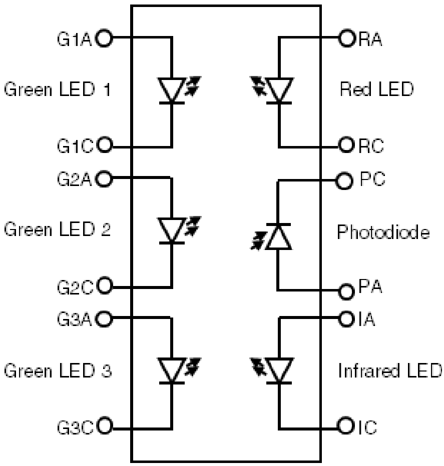
Pin configuration

Pin	Name	Function
1	RA	Red LED Anode
2	RC	Red LED Cathode
3	G1C	Green LED 1 Cathode
4	G1A	Green LED 1 Anode
5	G2A	Green LED 2 Anode
6	PA	Photodiode Anode
7	PC	Photodiode Cathode
8	G2C	Green LED 2 Cathode
9	G3A	Green LED 3 Anode
10	G3C	Green LED 3 Cathode
11	IC	Infrared LED Cathode
12	IA	Infrared LED Anode

Top view



Block diagram



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Maximum Ratings (T_A = 25 °C)

Parameter	Symbol	Values	Unit
General			
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
Infrared Emitter			
Reverse Voltage	V_R	5	V
Forward current	$I_{F (DC)}$	60	mA
Surge current (t_p = 100 µs, D = 0)	I_{FSM}	1	A
Red Emitter			
Reverse voltage	V_R	12	V
Forward current	$I_{F (DC)}$	40	mA
Surge current (t_p = 100 µs, D = 0)	I_{FSM}	600	mA
Green Emitters			
Reverse voltage	V_R	5	V
Forward current (single operation)	$I_{F (DC)}$	25	mA
Forward current (all three green emitters operation)	$I_{F (DC)}$	15	mA
Surge current (single and all three emitters operation) (t_p = 100 µs, D = 0)	I_{FSM}	300	mA
Detector			
Reverse voltage	V_R	16	V

Note: The stated maximum ratings refer to single emitter chip operation, unless otherwise specified.

Characteristics (T_A = 25 °C)

Parameter		**Symbol**	**Value**	**Unit**
Infrared Emitter				
Wavelength of peak emission (I_F = 20 mA, t_p = 20 ms)	(typ.)	λ_{peak}	950	nm
Centroid Wavelength (I_F = 20 mA, t_p = 20 ms)	(typ. (max.))	$\lambda_{centroid}$	940 (±10)	nm
Spectral bandwidth at 50% of I_{max} (I_F = 20 mA, t_p = 20 ms)	(typ.)	$\Delta\lambda$	42	nm
Half angle	(typ.)	φ	± 60	°
Rise and fall time of I_e (10% and 90% of $I_{e\ max}$) (I_F = 100 mA, t_p = 16 µs, R_L = 50 Ω)	(typ.)	t_r, t_f	16	ns
Forward voltage (I_F = 20 mA, t_p = 20 ms)	(typ. (max.))	V_F	1.3 (≤ 1.8)	V
Reverse current (V_R = 5 V)		I_R	not designed for reverse operation	µA
Radiant intensity (I_F = 20 mA, t_p = 20 ms)	(typ.)	I_e	2	mW / sr
Total radiant flux (I_F = 20 mA, t_p = 20 ms)	(typ.)	Φ_e	5.3	mW
Temperature coefficient of I_e or Φ_e (I_F = 20 mA, t_p = 20 ms)	(typ.)	TC_I	-0.3	% / K
Temperature coefficient of V_F (I_F = 20 mA, t_p = 20 ms)	(typ.)	TC_V	-0.8	mV / K
Temperature coefficient of $\lambda_{centroid}$ (I_F = 20 mA, t_p = 20 ms)	(typ.)	$TC_{\lambda centroid}$	0.25	nm / K

Characteristics (T_A = 25 °C)

Parameter		**Symbol**	**Value**	**Unit**
Red Emitter				
Wavelength of peak emission (I_F = 20 mA)	(typ.)	λ_{peak}	660	nm
Centroid Wavelength (I_F = 20 mA)	(typ. (max.))	$\lambda_{centroid}$	655 (±3)	nm
Spectral bandwidth at 50% of I_{max} (I_F = 20 mA)	(typ.)	$\Delta\lambda$	17	nm
Half angle	(typ.)	φ	± 60	°
Rise and fall time of I_e (10% and 90% of $I_{e\ max}$) (I_F = 100 mA, t_p = 16 µs, R_L = 50 Ω)	(typ.)	t_r, t_f	17	ns
Forward voltage (I_F = 20 mA)	(typ. (max.))	V_F	2.1 (≤ 2.8)	V
Reverse current (V_R = 12V)		I_R	not designed for reverse operation	µA
Radiant intensity (I_F = 20 mA, t_p = 20 ms)	(typ.)	I_e	2.6	mW / sr
Total radiant flux (I_F = 20 mA, t_p = 20 ms)	(typ.)	Φ_e	6.4	mW
Temperature coefficient of $\lambda_{centroid}$ (I_F = 20 mA, -10°C ≤ T ≤ 100°C)	(typ.)	$TC_{\lambda centroid}$	0.13	nm / K

Characteristics (T_A = 25 °C)

Parameter		Symbol	Value	Unit
Green Emitter (single emitter)				
Wavelength of peak emission (I_F = 20 mA)	(typ.)	λ_{peak}	530	nm
Centroid Wavelength (I_F = 20 mA)	(typ. (max.))	$\lambda_{centroid}$	535 (±10)	nm
Spectral bandwidth at 50% of I_{max} (I_F = 20 mA)	(typ.)	$\Delta\lambda$	34	nm
Half angle	(typ.)	φ	± 60	°
Rise and fall time of I_e (10% and 90% of $I_{e\ max}$) (I_F = 100 mA, t_p = 16 µs, R_L = 50 Ω)	(typ.)	t_r, t_f	32	ns
Forward voltage (I_F = 20 mA)	(typ. (max.))	V_F	3.2 (≤ 3.70)	V
Reverse current (V_R = 5 V)		I_R	not designed for reverse operation	µA
Radiant intensity (I_F = 20 mA, t_p = 20 ms)	(typ.)	I_e	1.4	mW / sr
Total radiant flux (I_F = 20 mA, t_p = 20 ms)	(typ.)	Φ_e	3.4	mW
Temperature coefficient of $\lambda_{centroid}$ (I_F = 20 mA, -10°C ≤ T ≤ 100°C)	(typ.)	$TC_{\lambda centroid}$	0.02	nm / K
Temperature coefficient of V_F (I_F = 20 mA, -10°C ≤ T ≤ 100°C)	(typ.)	TC_V	-4.0	mV / K

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Characteristics (T_A = 25 °C)

Parameter		**Symbol**	**Value**	**Unit**
Detector				
Photocurrent (E_e = 0.1 mW/cm², λ = 535nm, V_R = 5 V)	(typ.)	$I_{P,535}$	0.42	µA
Photocurrent (E_e = 0.1 mW/cm², λ = 655 nm, V_R = 5 V)	(typ.)	$I_{P,655}$	0.76	µA
Photocurrent (E_e = 0.1 mW/cm², λ = 940 nm, V_R = 5 V)	(typ.)	$I_{P,940}$	1.3	µA
Wavelength of max. sensitivity	(typ.)	$\lambda_{S\ max}$	920	nm
Spectral range of sensitivity	(typ.)	$\lambda_{10\%}$	400 … 1100	nm
Radiation sensitive area	(typ.)	A	1.7	mm²
Dimensions of radiant sensitive area	(typ.)	L x W	1.3 x 1.3	mm x mm
Dark current (V_R = 5 V, Ee = 0 mW/cm²)	(typ. (max.))	I_R	1 (≤ 5)	nA
Spectral sensitivity of the chip (λ = 535 nm)	(typ.)	$S_{\lambda 535}$	0.27	A / W
Spectral sensitivity of the chip (λ = 655nm)	(typ.)	$S_{\lambda 655}$	0.47	A / W
Spectral sensitivity of the chip (λ = 940 nm)	(typ.)	$S_{\lambda 940}$	0.77	A / W
Open-circuit voltage (E_e = 0.1 mW/cm², λ = 535 nm)	(typ.)	$V_{O,535}$	240	mV
Short-circuit current (E_e = 0.1 mW/cm², λ = 535 nm)	(typ.)	$I_{SC,535}$	0.40	µA
Open-circuit voltage (E_e = 0.1 mW/cm², λ = 655nm)	(typ.)	$V_{O,655}$	250	mV
Short-circuit current (E_e = 0.1 mW/cm², λ = 655 nm)	(typ.)	$I_{SC,655}$	0.71	µA
Open-circuit voltage (E_e = 0.1 mW/cm², λ =940 nm)	(typ.)	$V_{O,940}$	270	mV
Short-circuit current (E_e = 0.1 mW/cm², λ = 940 nm)	(typ.)	$I_{SC,940}$	1.2	µA

Characteristics (T_A = 25 °C)

Parameter		Symbol	Value	Unit
Rise and fall time (V_R = 3.3 V, R_L = 50 Ω, λ = 940 nm)	(typ.)	t_r, t_f	2.3	µs
Forward voltage (I_F = 10 mA, E = 0 mW/cm^2)	(typ.)	V_F	0.9	V
Capacitance (V_R = 5 V, f = 1 MHz, E = 0 mW/cm^2)	(typ.)	C_0	5	pF

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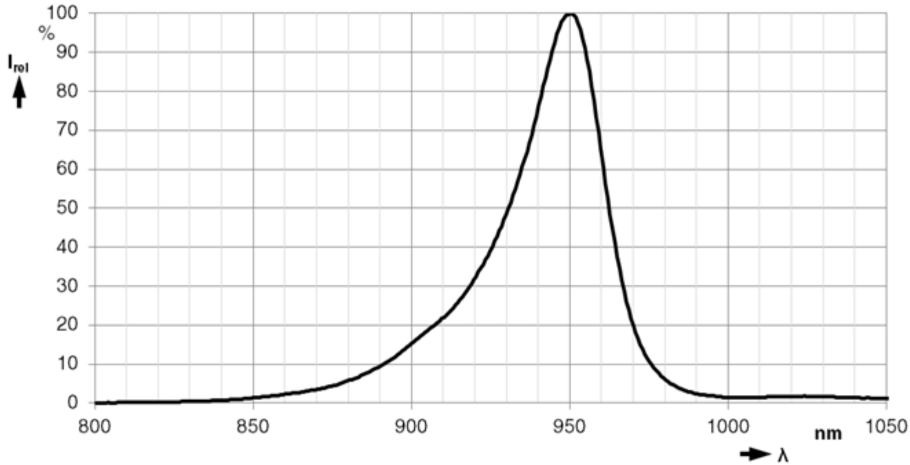
Diagrams for infrared emitter

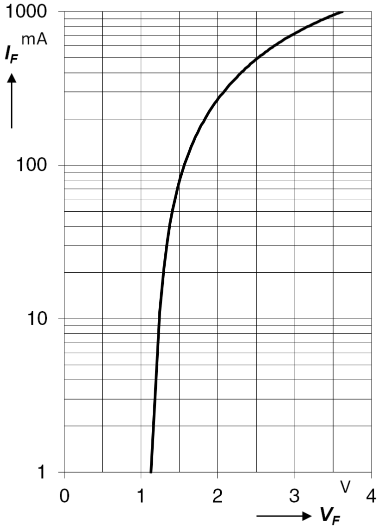
Relative spectral emission [1)]

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



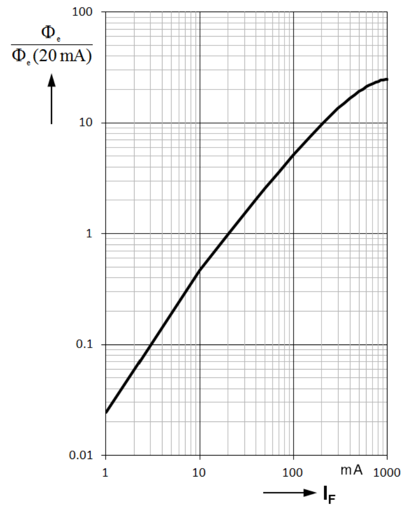
Forward current [1)]

$I_F = f(V_F)$, single pulse, t_p = 100 µs, T_A= 25°C



Relative radiant flux [1)]

$\Phi_e / \Phi_e(20\ mA) = f(I_F)$, single pulse, t_p = 25µs, T_A= 25°C



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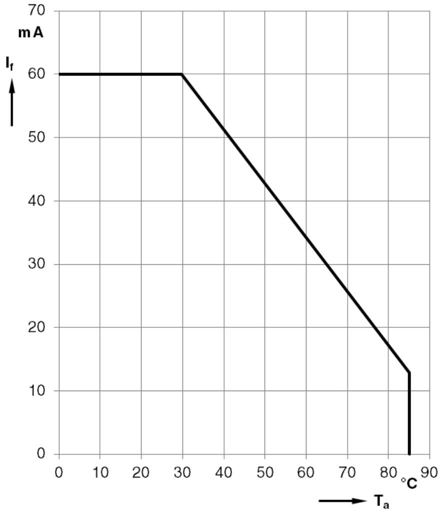
Diagrams for infrared emitter

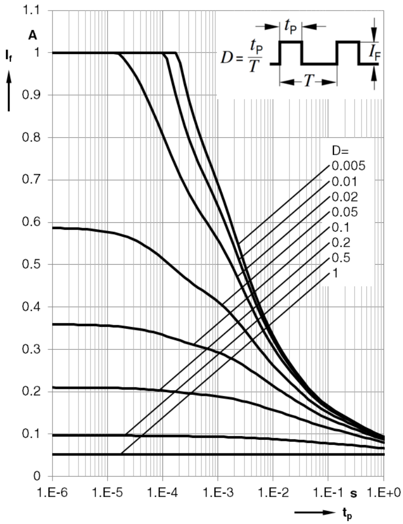
Max. permissible forward current [1)]

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



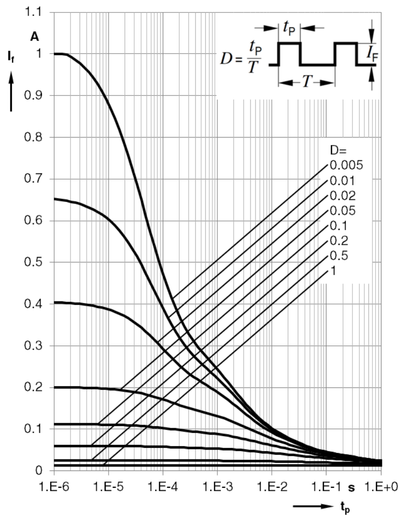
Permissible pulse handling capability [1)]

$I_F = f(t_p)$, T_A= 40°C, duty cycle D = parameter



Permissible pulse handling capability [1)]

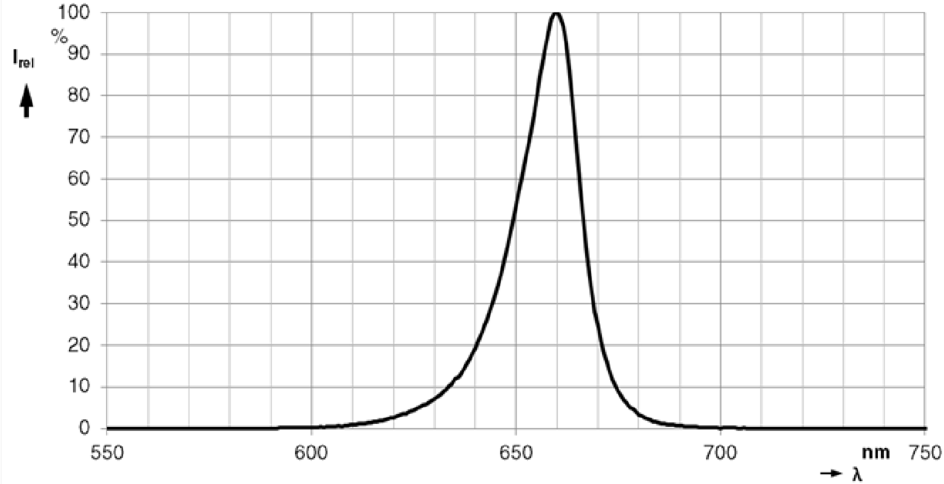
$I_F = f(t_p)$, T_A= 85°C, duty cycle D = parameter



Diagrams for red emitter

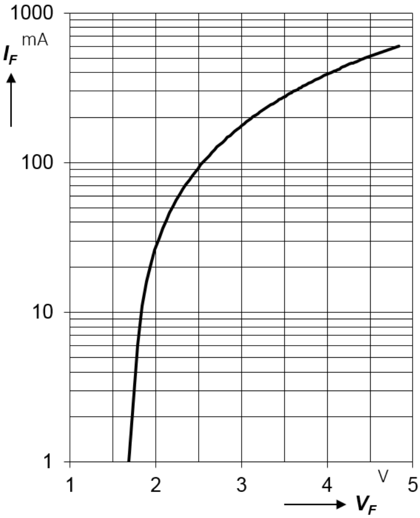
Relative spectral emission [1)]

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



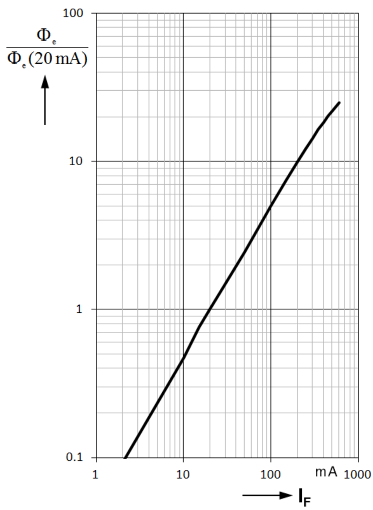
Forward current [1)]

$I_F = f(V_F)$, $T_A = 25°C$



Relative radiant flux [1)]

$\Phi_e / \Phi_e(20\ mA) = f(I_F)$, single pulse, $t_p = 25µs$, $T_A = 25°C$



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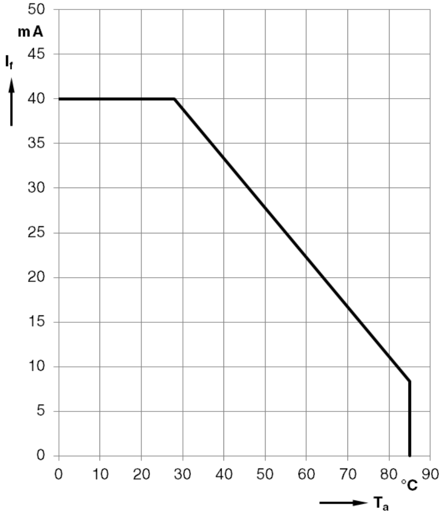
Diagrams for red emitter

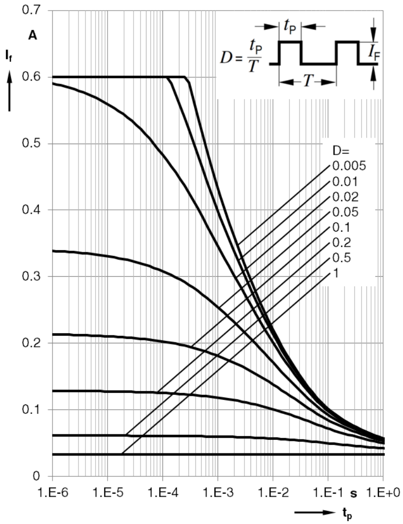
Max. permissible forward current [1)]

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



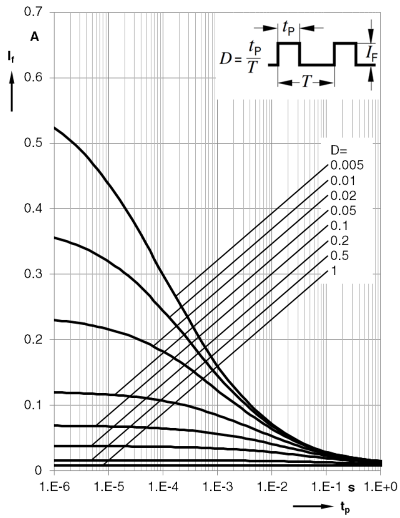
Permissible pulse handling capability [1)]

$I_F = f(t_p)$, T_A= 40°C, duty cycle D = parameter



Permissible pulse handling capability [1)]

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



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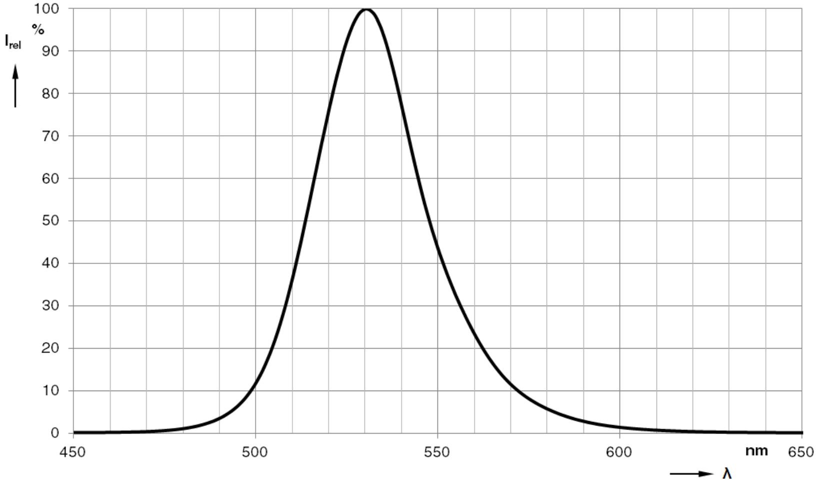
Diagrams for green emitters

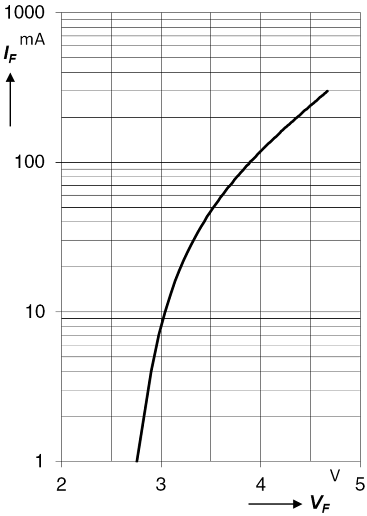
Relative spectral emission [1)]

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



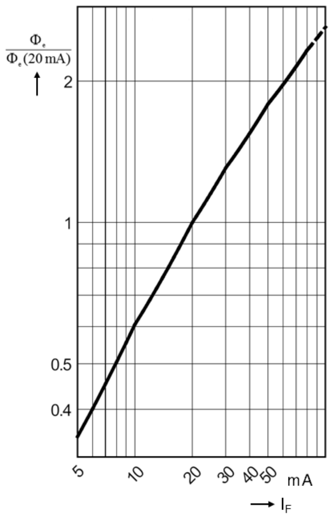
Forward current [1)]

$I_F = f(V_F)$, T_A= 25°C



Relative radiant flux [1)]

Φ_e / Φ_e(20 mA) = f(I_F), single pulse, t_p = 25µs, T_A= 25°C



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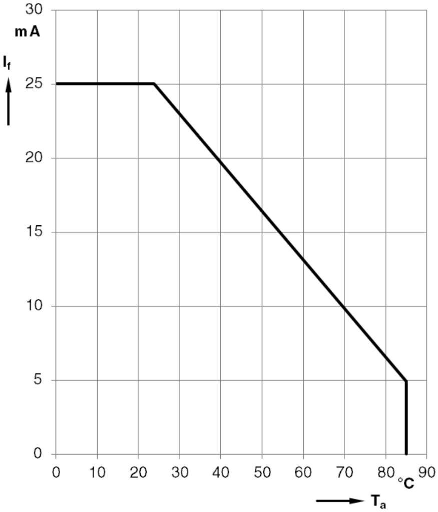
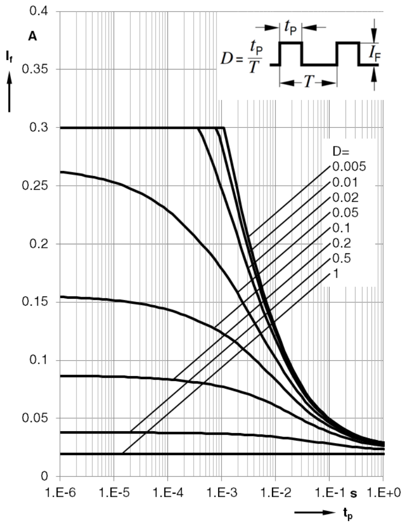
Diagrams for green emitters

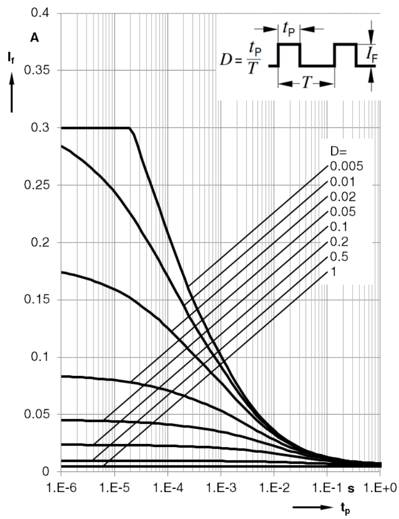
Max. permissible forward current [1]
(single emitter) $I_{F,max} = f(T_A)$, R_{thJA} = 800 K/W



Permissible pulse handling capability [1]
(single emitter) $I_F = f(t_p)$, T_A= 40°C, duty cycle D



Permissible pulse handling capability [1]
(single emitter) $I_F = f(t_p)$, T_A= 85°C, duty cycle D



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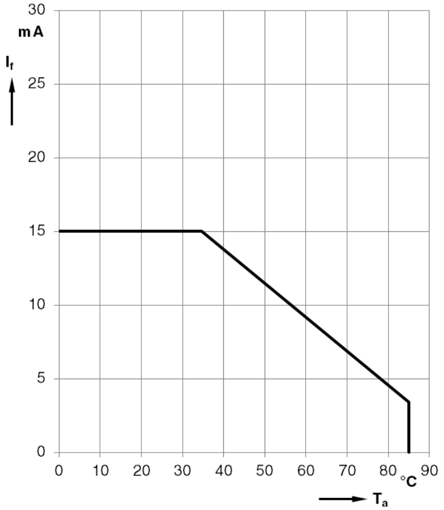
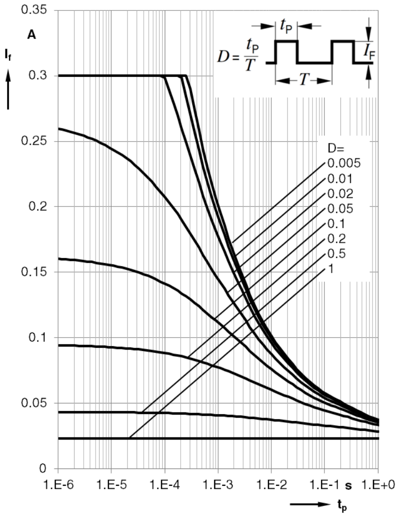
Diagrams for green emitters

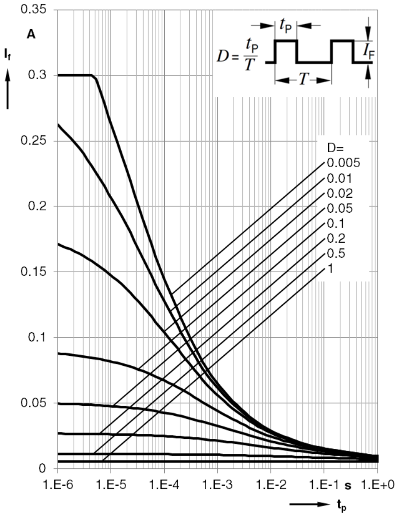
Max. permissible forward current [1)]
(three emitters) $I_{F,max} = f(T_A)$, R_{thJA} = 800 K/W



Permissible pulse handling capability [1)]
(three emitters) $I_F = f(t_p)$, T_A= 40°C, duty cycle D



Permissible pulse handling capability [1)]
(three emitters) $I_F = f(t_p)$, T_A= 85°C, duty cycle D



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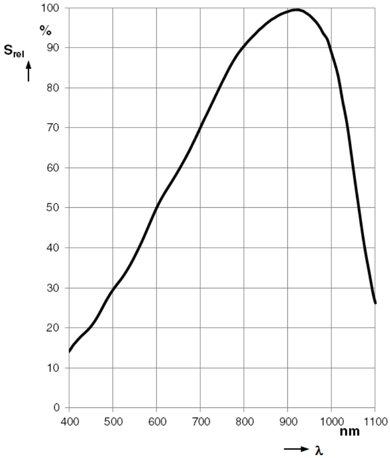
Diagrams for detector

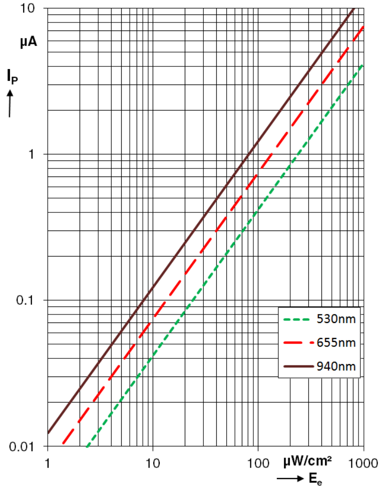
Relative spectral sensitivity [1)]

$S_{rel} = f(\lambda)$, T_A = 25 °C



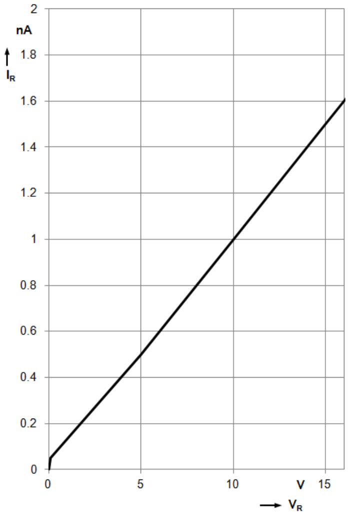
Photocurrent [1)]

$I_P(V_R$ = 5 V), T_A = 25 °C



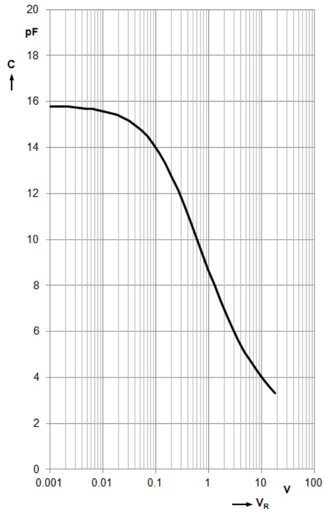
Dark current [1)]

$I_R = f(V_R)$, E = 0 mW/cm^2, T_A = 25 °C



Capacitance [1)]

$C = f(V_R)$, f = 1 MHz, E = 0 mW/cm^2, T_A = 25 °C



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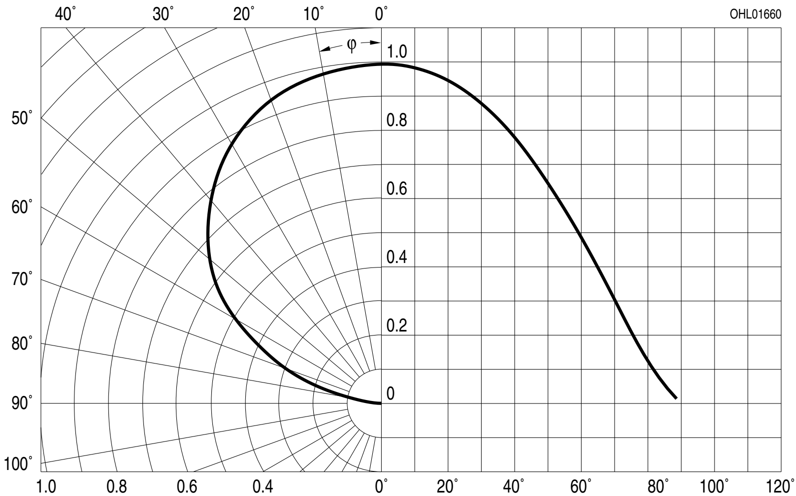
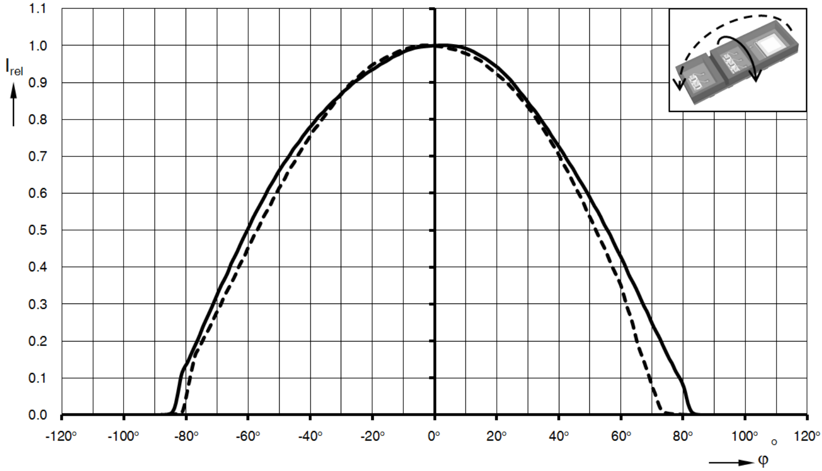
Directional characteristics of detector [1)]

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



Radiation characteristics of emitters [1)]

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



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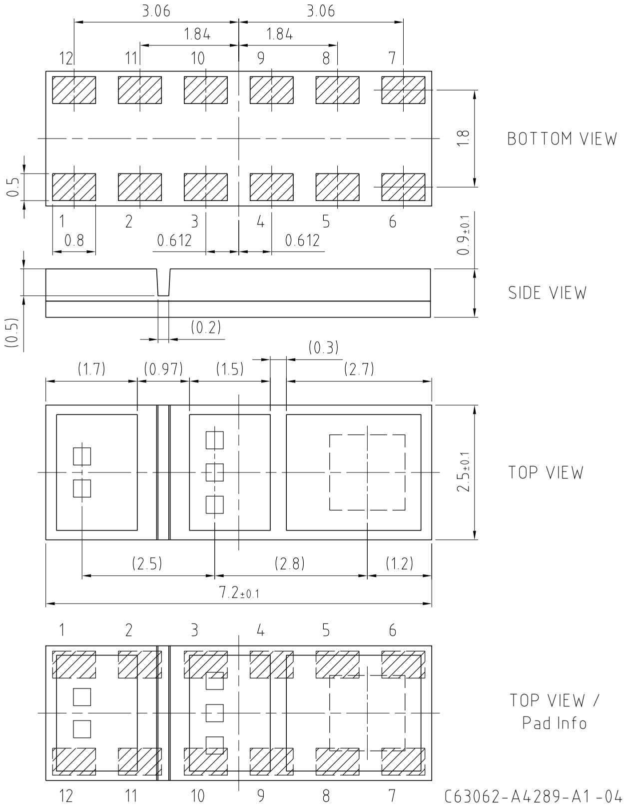
Package Outline



Pin	Name	Function
1	RA	Red LED Anode
2	RC	RED LED Cathode
3	G1C	Green LED 1 Cathode
4	G1A	Green LED 1 Anode
5	G2A	Green LED 2 Anode
6	PA	Photodiode Anode
7	PC	Photodiode Cathode
8	G2C	Green LED 2 Cathode
9	G3A	Green LED 3 Anode
10	G3C	Green LED 3 Cathode
11	IC	Infrared LED Cathode
12	IA	Infrared LED Anode

Dimensions in mm.

Package:
chip on board

Approximate weight:
28 mg

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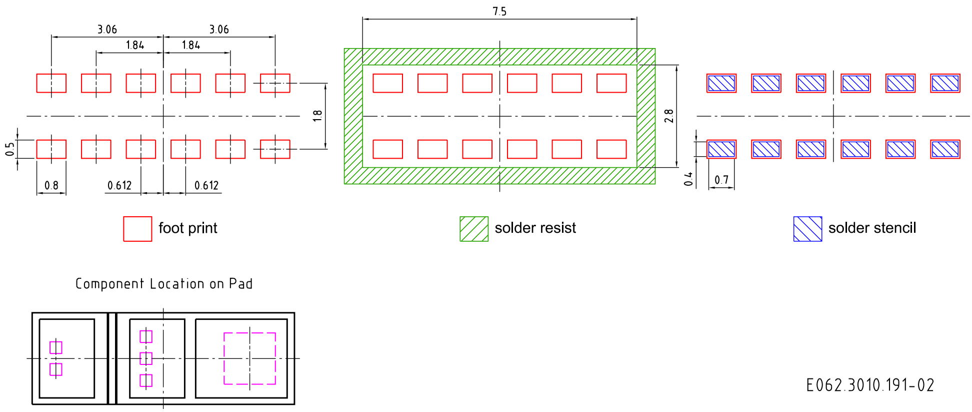
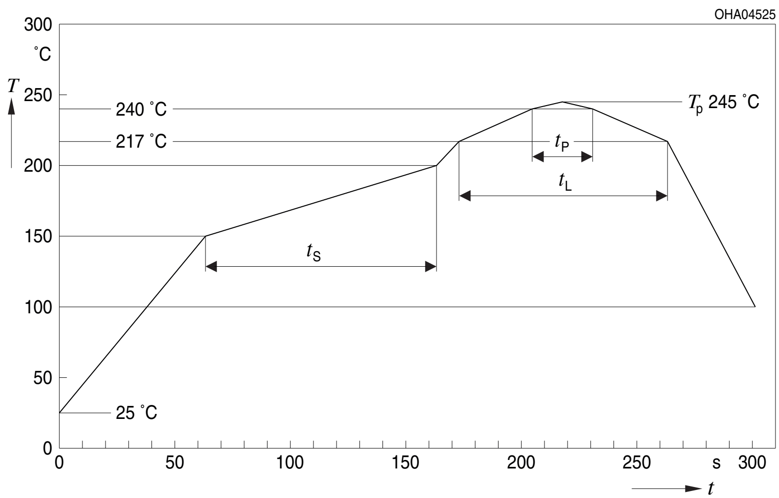
Recommended solder pad design



Dimensions in mm (inch).

Reflow Soldering Profile

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



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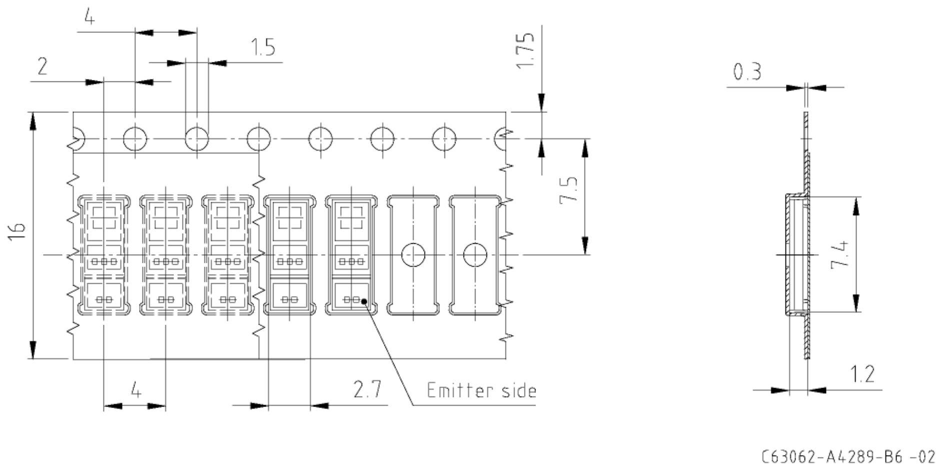
OHA04612

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

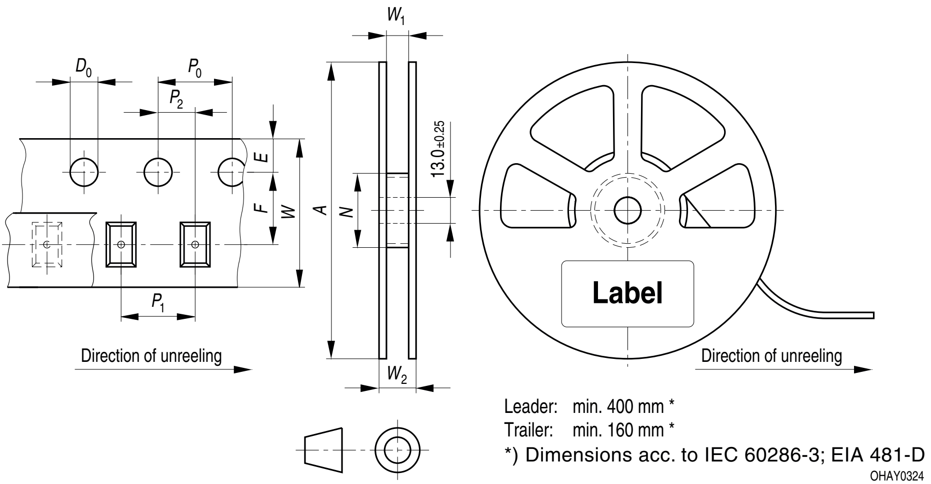
All temperatures refer to the center of the package, measured on the top of the component
* slope calculation DT/Dt: Dt max. 5 s; fulfillment for the whole T-range

Method of Taping



Dimensions in mm [inch].

Tape and Reel
16 mm tape with 3000 pcs. on Ø 180 mm reel



Dimensions in mm

Tape Dimensions [mm]

W	P_0	P_1	P_2	D_0	E	F
16 +0.3 / -0.1	4 ±0.1	4 ±0.1	2 ±0.05	1.5 ±0.1	1.75 ±0.1	7.5 ±0.05

Reel Dimensions [mm]

A	W	N_{min}	W_1	W_{2max}
180	16	60	16.4 +2	22.4

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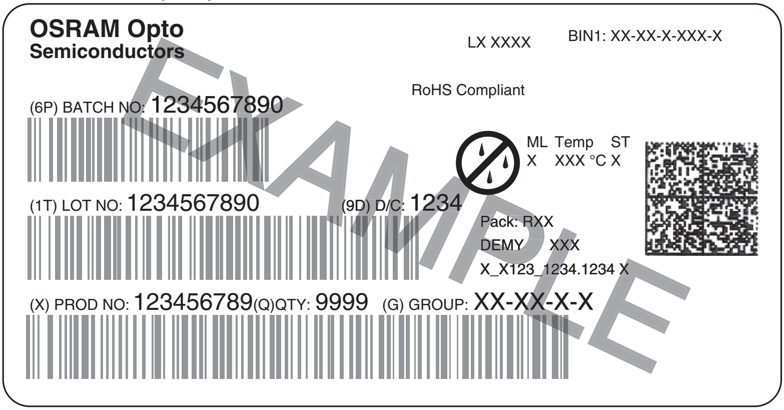
Barcode-Product-Label (BPL)



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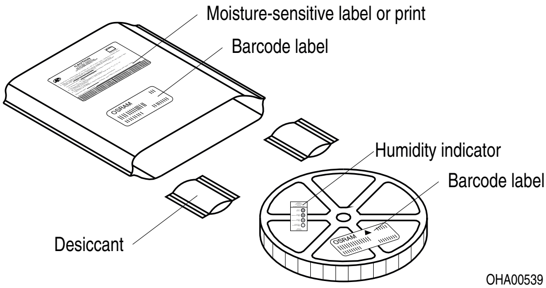
Dry Packing Process and Materials



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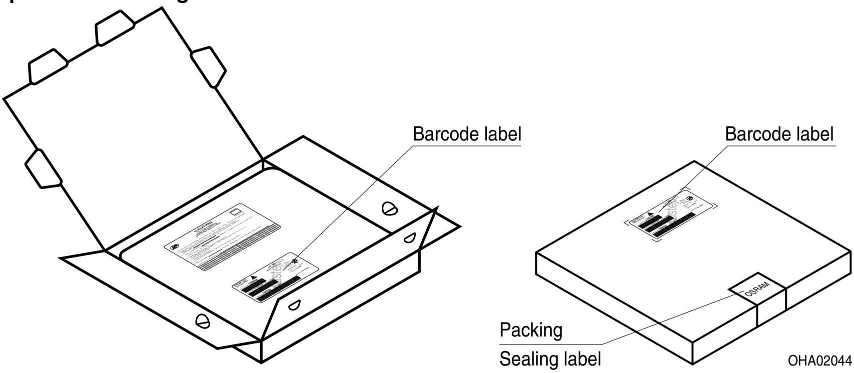
Note:
Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card.
Regarding dry pack you will find further information in the internet. Here you will also find the normative references like JEDEC.

Transportation Packing and Materials



Dimensions of transportation box in mm

Width	Length	Height
195 ± 5	195 ± 5	42 ± 5

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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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