SFH 7072

BIOFY®

Biomonitoring Sensor

Applications

- Health Monitoring (Heart Rate Monitoring, Pulse Oximetry)

Features:

- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Multi chip package featuring two green, one red, one infrared emitter and two photodetectors
- Light Barrier to block optical crosstalk
- optimized for strong PPG signal
- Package size: (WxDxH) 7.5 mm x 3.9 mm x 0.9 mm

Ordering Information

Type	Ordering Code
SFH 7072	Q65112A1516

Maximum Ratings

T_A = 25 °C

Parameter	Symbol		Values
Operating temperature range	T_{op}	min.	-40 °C
		max.	85 °C
Storage temperature range	T_{stg}	min.	-40 °C
		max.	85 °C
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 - HBM	V_{ESD}	max.	2 kV
Green Emitters			
Reverse voltage	V_R	max.	5 V
Forward current	$I_{F\ (DC)}$	max.	25 mA
Surge current t_p = 10 µs, D = 0	I_{FSM}	max.	300 mA
Red Emitter			
Reverse voltage	V_R	max.	12 V
Forward current	$I_{F\ (DC)}$	max.	40 mA
Surge current t_p = 100 µs, D = 0	I_{FSM}	max.	600 mA
Infrared Emitters			
Reverse voltage	V_R	max.	5 V
Forward current	$I_{F\ (DC)}$	max.	60 mA
Surge current t_p = 100 µs, D = 0	I_{FSM}	max.	1 A
Photodiode			
Reverse voltage	V_R	max.	16 V

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Characteristics

T_A = 25 °C

Parameter	Symbol		Values
Green Emitter (single emitter)			
Peak wavelength I_F = 20 mA	λ_{peak}	typ.	526 nm
Centroid Wavelength [6)] I_F = 20 mA	$\lambda_{centroid}$	min. typ. max.	520 nm 530 nm 540 nm
Spectral bandwidth at 50% of I_{max} I_F = 20 mA	$\Delta\lambda$	typ.	32 nm
Half angle	φ	typ.	± 60 °
Rise time I_F = 100 mA, t_p = 16µs, R_L = 50 Ω	t_r	typ.	56 ns
Fall time I_F = 100 mA, t_p = 16µs, R_L = 50 Ω	t_f	typ.	56 ns
Forward voltage [7)] I_F = 20 mA	V_F	typ. max.	3.0 V 3.4 V
Reverse current V_R = 5 V	I_R		not designed for reverse operation
Radiant intensity I_F = 20 mA, t_p = 20 ms	I_e	typ.	3.8 mW / sr
Total radiant flux I_F = 20 mA, t_p = 20 ms	Φ_e	typ.	11 mW
Temperature coefficient of brightness I_F = 20 mA, t_p = 20 ms	TC_I	typ.	-0.35 % / K
Temperature coefficient of wavelength I_F = 20 mA, -10°C ≤ T ≤ 100°C	TC_λ	typ.	0.03 nm / K
Temperature coefficient of voltage I_F = 20 mA -10°C ≤ T ≤ 100°C	TC_V	typ.	-3.6 mV / K

Characteristics

T_A = 25 °C

Parameter	Symbol		Values
Red Emitter			
Peak wavelength I_F = 20 mA	λ_{peak}	typ.	660 nm
Centroid Wavelength [6)] I_F = 20 mA	$\lambda_{centroid}$	min. typ. max.	652 nm 655 nm 658 nm
Spectral bandwidth at 50% of I_{max} I_F = 20 mA	$\Delta\lambda$	typ.	17 nm
Half angle	φ	typ.	± 60 °
Rise time I_F = 100 mA, t_p = 16µs, R_L = 50 Ω	t_r	typ.	17 ns
Fall time I_F = 100 mA, t_p = 16µs, R_L = 50 Ω	t_f	typ.	17 ns
Forward voltage [7)] I_F = 20 mA	V_F	typ. max.	2.1 V 2.8 V
Reverse current V_R = 12V	I_R		not designed for reverse operation
Radiant intensity I_F = 20 mA, t_p = 20 ms	I_e	typ.	4.8 mW / sr
Total radiant flux I_F = 20 mA, t_p = 20 ms	Φ_e	typ.	14 mW
Temperature coefficient of wavelength I_F = 20 mA, -10°C ≤ T ≤ 100°C	TC_λ	typ.	0.13 nm / K

Characteristics

T_A = 25 °C

Parameter	Symbol		Values
Infrared Emitter			
Peak wavelength I_F = 20 mA, t_p = 20 ms	λ_{peak}	typ.	950 nm
Centroid Wavelength [6] I_F = 20 mA, t_p = 20 ms	$\lambda_{centroid}$	min. typ. max.	930 nm 940 nm 950 nm
Spectral bandwidth at 50% of I_{max} I_F = 20 mA, t_p = 20 ms	$\Delta\lambda$	typ.	42 nm
Half angle	φ	typ.	± 60 °
Rise time (10% and 90%) I_F = 100 mA, t_p = 16 µs, R_L = 50 Ω	t_r	typ.	16 ns
Fall time (10% and 90%) I_F = 100 mA, t_p = 16 µs, R_L = 50 Ω	t_f	typ.	16 ns
Forward voltage [7] I_F = 20 mA, t_p = 20 ms	V_F	typ. max.	1.3 V 1.8 V
Reverse current V_R = 5 V	I_R	.	Not designed for reverse operation
Radiant intensity I_F = 20 mA, t_p = 20 ms	I_e	typ..	3.9 mW / sr
Total radiant flux I_F = 20 mA, t_p = 20 ms	Φ_e	typ.	11 mW
Temperature coefficient brightness I_F = 20 mA, t_p = 20 ms	TC_I	typ.	--0.3 % / K
Temperature coefficient of wavelength I_F = 20 mA, t_p = 20 ms	TC_λ	typ.	0.25 nm / K
Temperature coefficient of voltage I_F = 20 mA, t_p = 20 ms	TC_V	typ.	-0.8 mV / K

Characteristics

T_A = 25 °C

Parameter	Symbol		Values
Broadband Detector			
Wavelength of max. sensitivity	$\lambda_{S\ max}$	typ.	960 nm
Spectral range of sensitivity	$\lambda_{10\%}$	typ.	410 ... 1100 nm
Photocurrent E_e = 0.1 mW/cm², λ = 530 nm, V_R = 5 V	I_P	typ.	0.4 µA
Photocurrent E_e = 0.1 mW/cm², λ = 655 nm, V_R = 5 V	I_P	typ.	0.6 µA
Photocurrent E_e = 0.1 mW/cm², λ = 940 nm, V_R = 5 V	I_P	typ.	1.1 µA
Radiation sensitive area	A	typ.	0.88 mm²
Dimensions of radiant sensitive area	L x W	typ.	0.89 x 0.89 mm x mm
Half angle	φ	typ.	± 60 °
Dark current V_R = 5 V, E = 0	I_R	typ. max.	0.05 nA 10 nA
Open-circuit voltage E_e = 0.1 mW/cm², λ = 530nm	V_O	typ.	211 mV
Open-circuit voltage E_e = 0.1 mW/cm², λ = 655nm	V_O	typ.	249 mV
Open-circuit voltage E_e = 0.1 mW/cm², λ = 940nm	V_O	typ.	266 mV
Short-circuit current E_e = 0.1 mW/cm², λ = 530nm	I_{SC}	typ.	0.4 µA
Short-circuit current E_e = 0.1 mW/cm², λ = 655nm	I_{SC}	typ.	0.6 µA
Short-circuit current E_e = 0.1 mW/cm², λ = 940nm	I_{SC}	typ.	1.1 µA
Rise time V_R = 5 V, R_L = 50 Ω, λ = 940 nm	t_r	typ.	0.75 µs
Fall time V_R = 5 V, R_L = 50 Ω, λ = 940 nm	t_f	typ.	0.75 µs
Forward voltage I_F = 100 mA, E = 0	V_F	typ..	1.16 V
Capacitance V_R = 5 V, f = 1 MHz, E = 0	C_0	typ.	4.2 pF

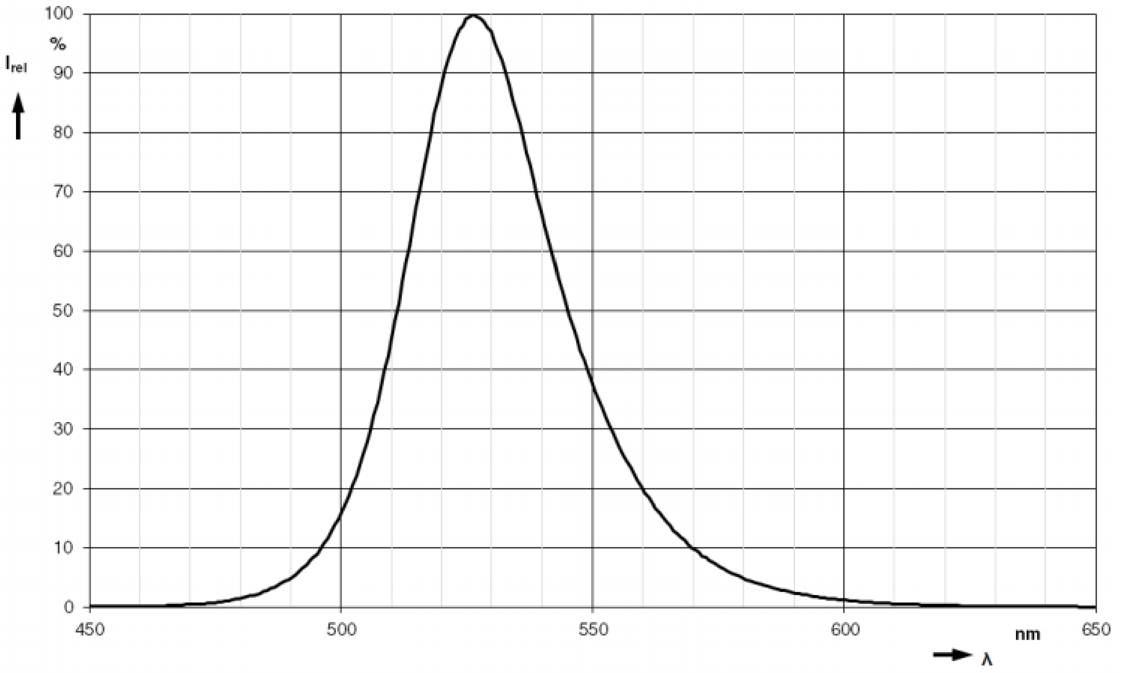
Characteristics

T_A = 25 °C

Parameter	Symbol		Values
IR-Cut Detector			
Wavelength of max. sensitivity	$\lambda_{S\ max}$	typ.	635 nm
Spectral range of sensitivity	$\lambda_{10\%}$	typ.	402 … 694 nm
Photocurrent E_e = 0.1 mW/cm², λ = 530 nm, V_R = 5 V	I_P	typ.	1.1 µA
Radiation sensitive area	A	typ.	3.46 mm²
Dimensions of radiant sensitive area	L x W	typ.	1.29 x 2.69 mm x mm
Half angle	φ	typ.	± 57 °
Dark current V_R = 5 V, E_e = 0	I_R	typ. max.	0.4 nA 2 nA
Open-circuit voltage E_e = 0.1 mW/cm², λ = 530nm	V_O	typ.	390 mV
Short-circuit current E_e = 0.1 mW/cm², λ = 530nm	I_{SC}	typ.	1.1 µA
Rise time V_R = 5 V, R_L = 50 Ω, λ = 530 nm	t_r	typ.	40 ns
Fall time V_R = 5 V, R_L = 50 Ω, λ = 530 nm	t_f	typ.	40 ns
Forward voltage I_F = 10 mA, E = 0	V_F	typ..	0.84 V
Capacitance V_R = 5 V, f = 1 MHz, E = 0	C_0	typ.	55 pF

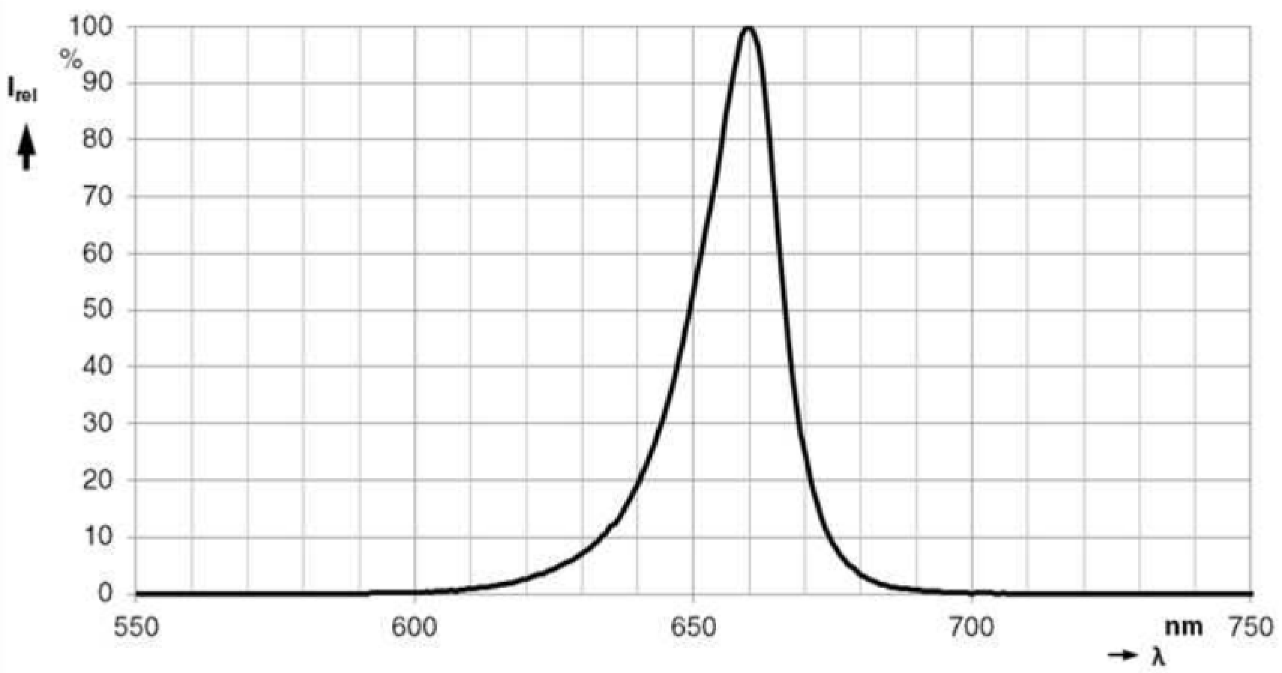
Relative Spectral Emission [1), 2)]

● true green: $I_{e,rel} = f(\lambda)$; I_F = 20 mA; t_p = 20 ms



Relative Spectral Emission [1), 2)]

● hyper red: $I_{e,rel} = f(\lambda)$; I_F = 20 mA; t_p = 20 ms



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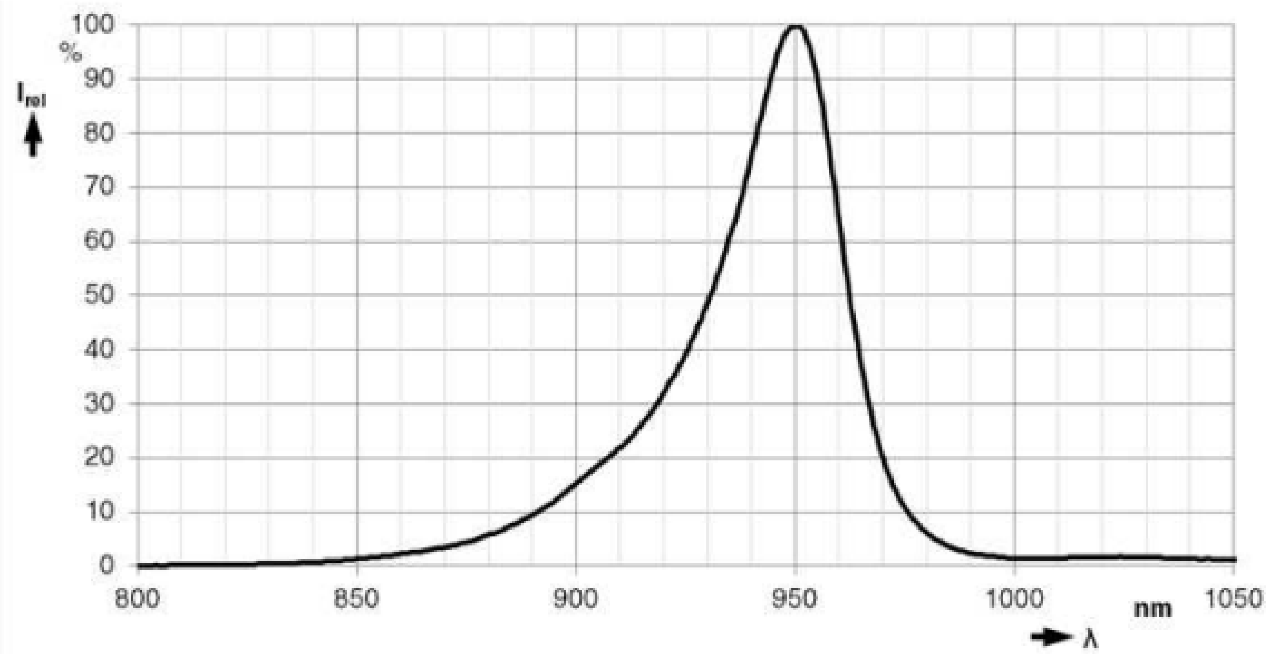
Relative Spectral Emission [1), 2)]

- infrared (940 nm): $I_{e,rel} = f(\lambda)$; I_F = 20 mA; t_p = 20 ms

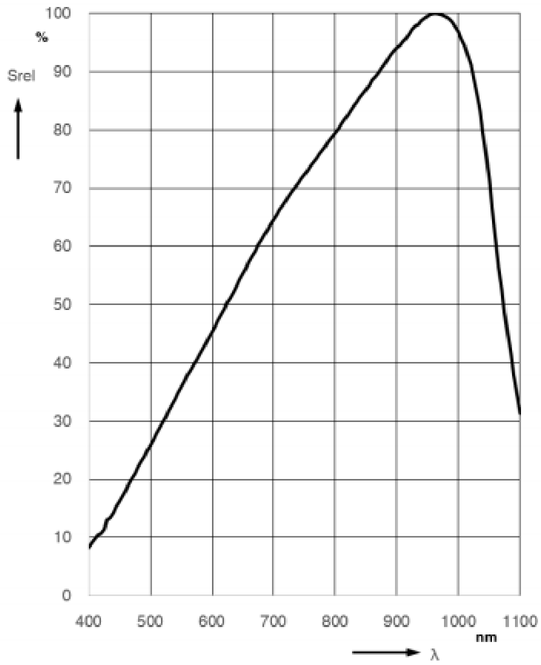


Radiation Characteristics [1), 2)]

true green/ hyper red/ infrared: $I_{e,rel} = f(\varphi)$

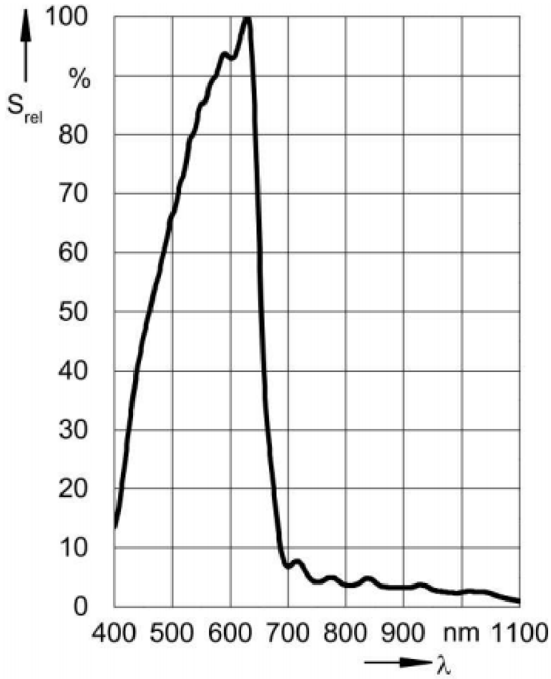
Relative Spectral Sensitivity [1), 2)]

■ photodiode BB: $S_{rel} = f(\lambda)$



Relative Spectral Sensitivity [1), 2)]

■ photodiode IR-Cut: $S_{rel} = f(\lambda)$



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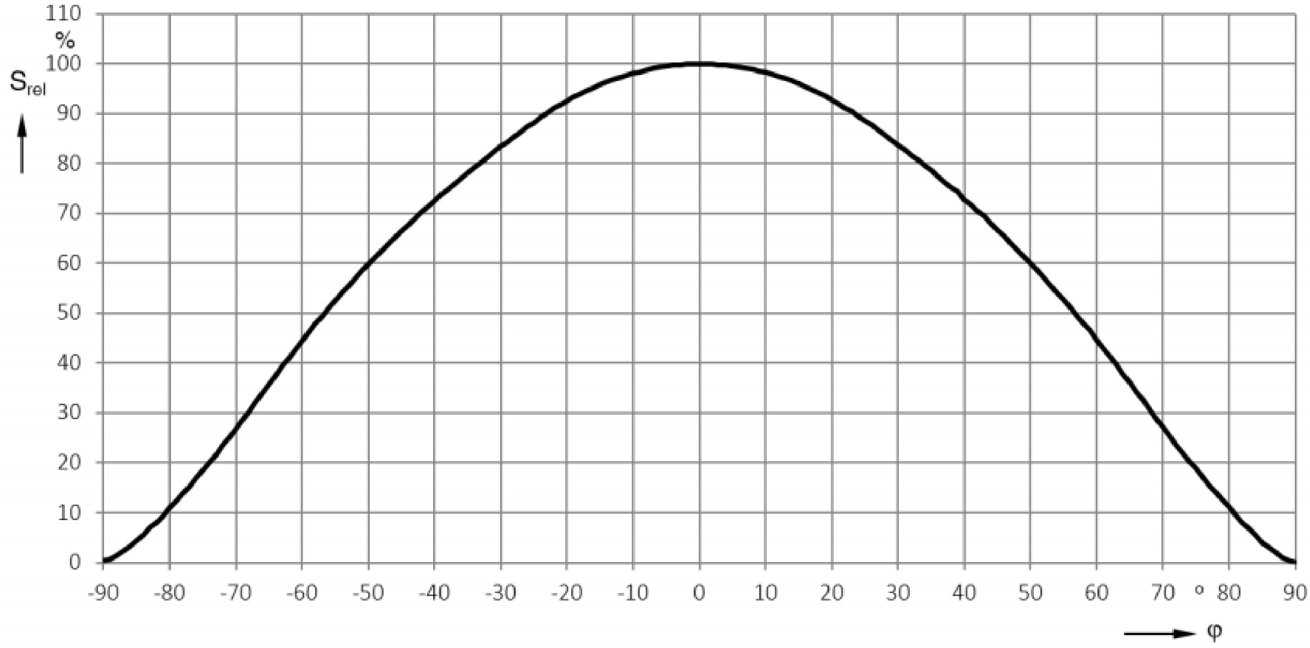
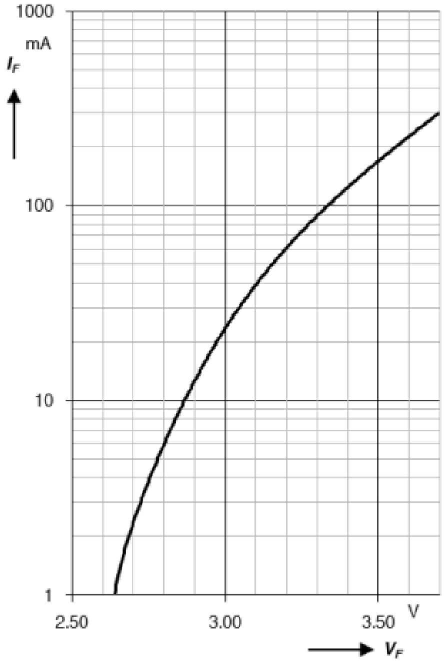
Directional Characteristics [1), 2)]

photodiode broadband/ IR-cut: $S_{rel} = f(\varphi)$; λ = 530 nm



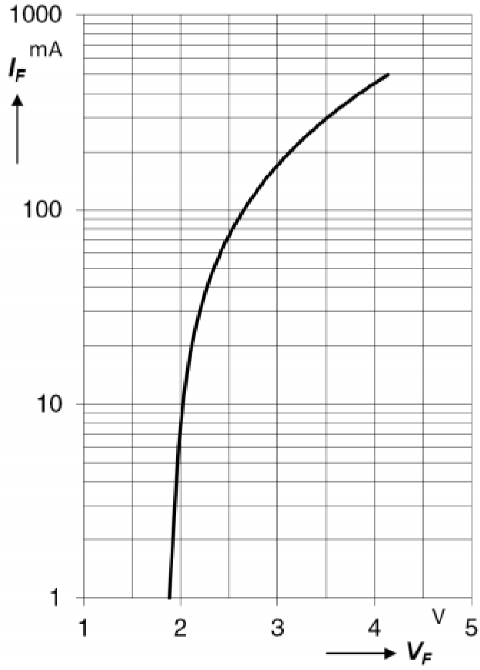
Forward current [1), 2)]

● true green: $I_F = f(V_F)$; single pulse; t_p = 100 µs



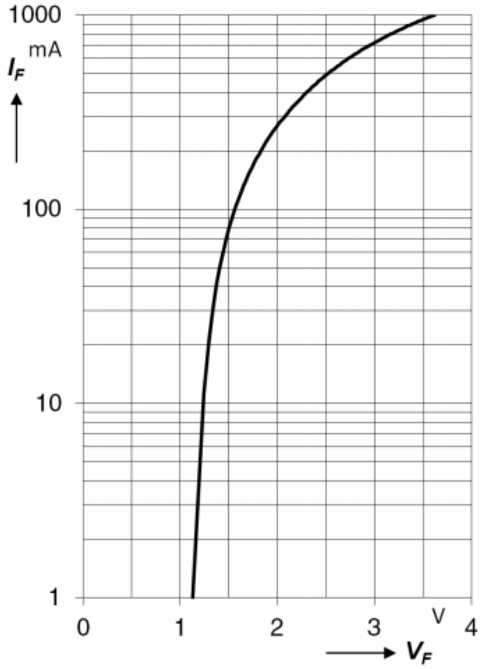
Forward current [1), 2)]

● hyper red: $I_F = f(V_F)$; single pulse; t_p = 100 µs



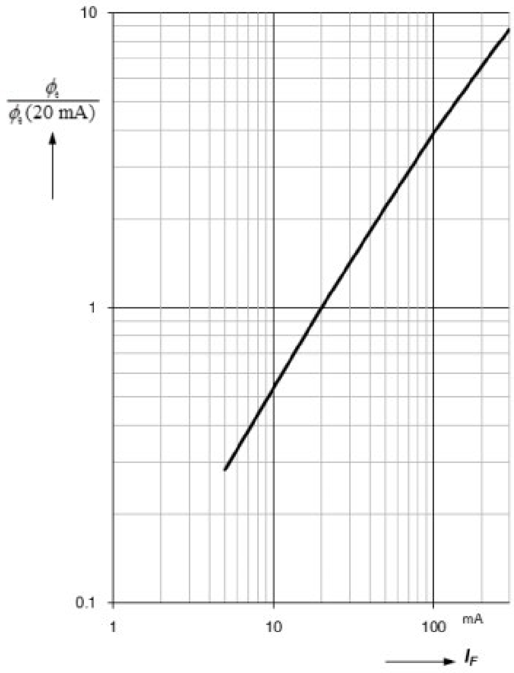
Forward current 1), 2)

● infrared (940 nm): I_F = f (V_F); s.p.; t_p = 100 µs



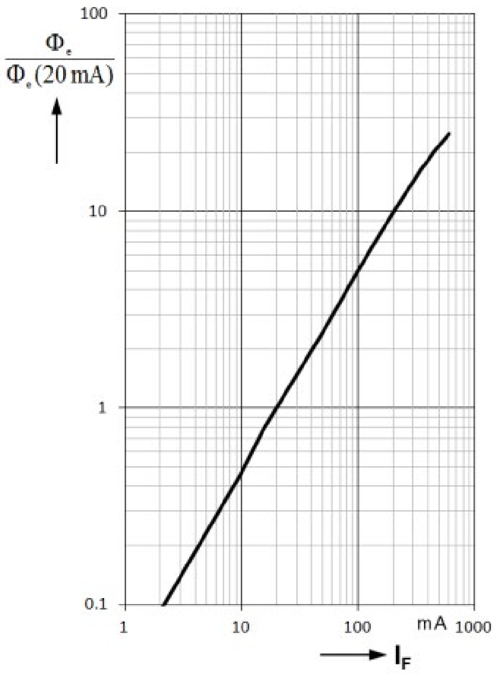
Relative Total Radiant Flux 1), 2)

● true green: Φ_e/Φ_e(20mA) = f (I_F); single pulse; t_p = 25 µs



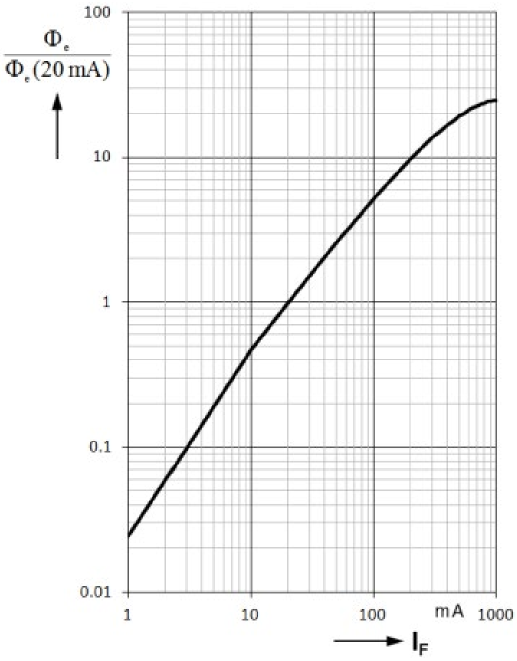
Relative Total Radiant Flux 1), 2)

● hyper red: Φ_e/Φ_e(20mA) = f (I_F); single pulse; t_p = 25 µs



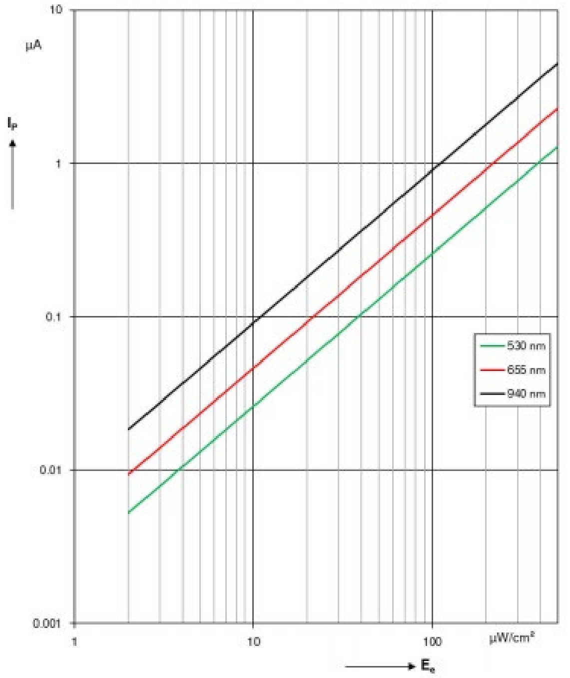
Relative Total Radiant Flux 1), 2)

● infrared (940 nm): Φ_e/Φ_e(20mA) = f (I_F); s. p.; t_p = 25 µs



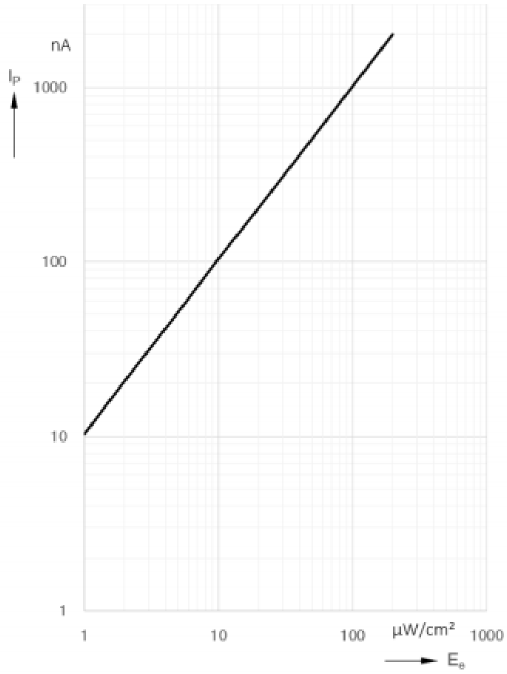
Photocurrent [1), 2)]

■ photodiode BB: $I_P = f(E_e)$; λ = parameter; V_R = 5 V



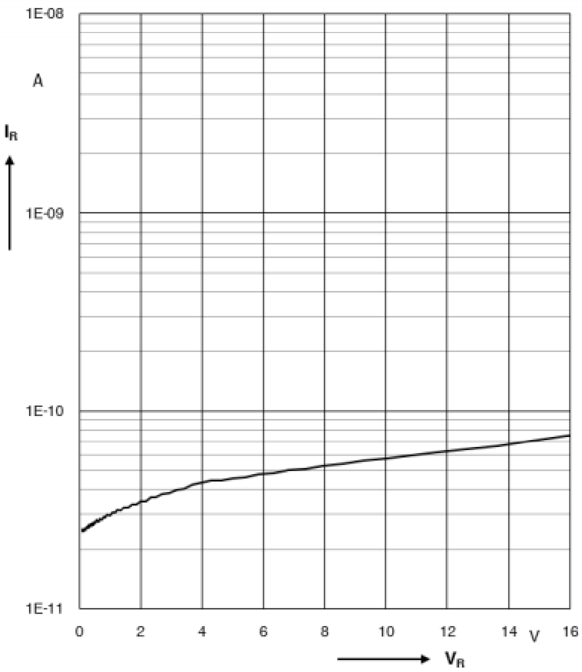
Photocurrent [1), 2)]

■ photodiode IR-Cut: $I_P = f(E_e)$; λ = 530 nm; V_R = 5 V



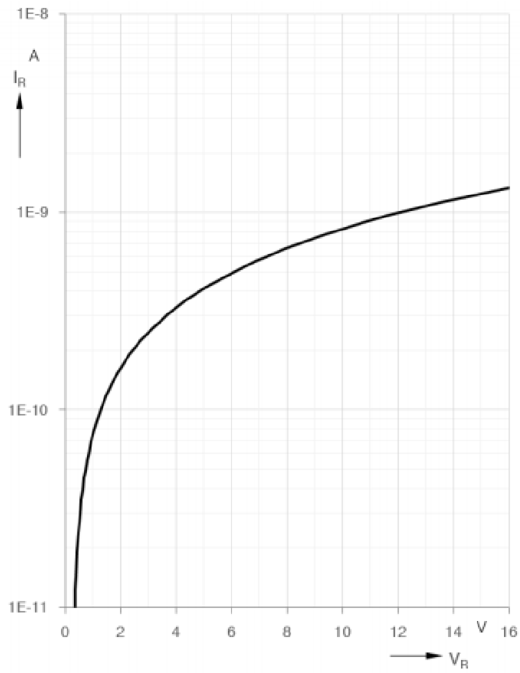
Dark Current [1), 2)]

■ photodiode BB: $I_R = f(V_R)$; E = 0



Dark Current [1), 2)]

■ photodiode IR-Cut: $I_R = f(V_R)$; E = 0



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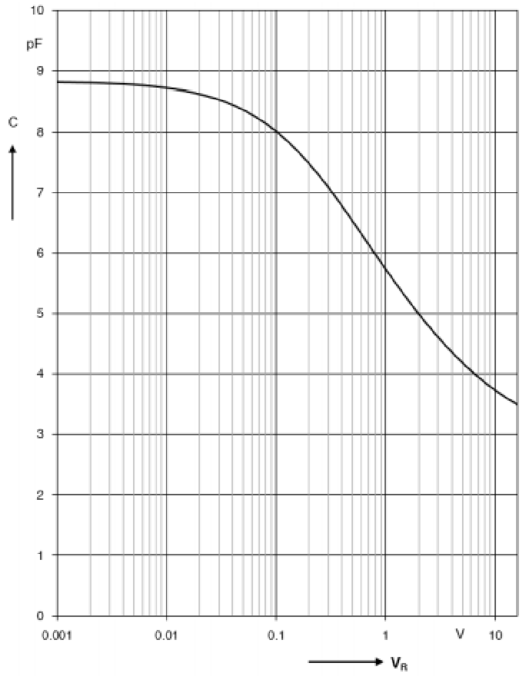
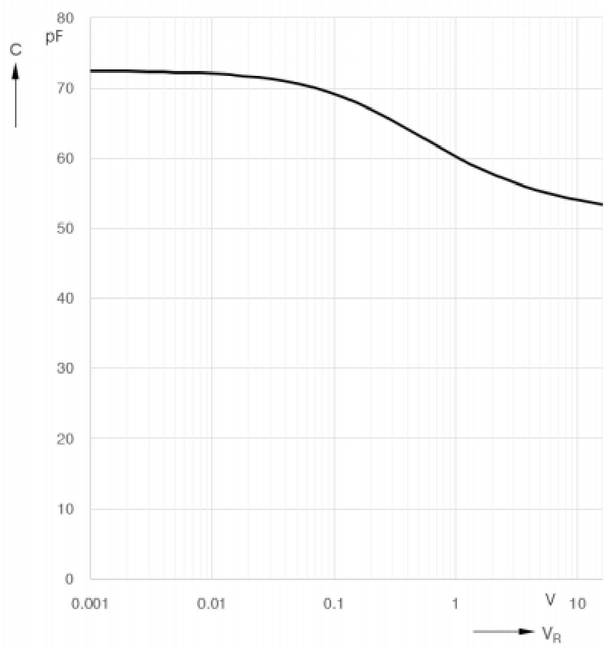
Capacitance [1), 2)]

■ photodiode BB: $C = f(V_R)$; f = 1MHz; E = 0



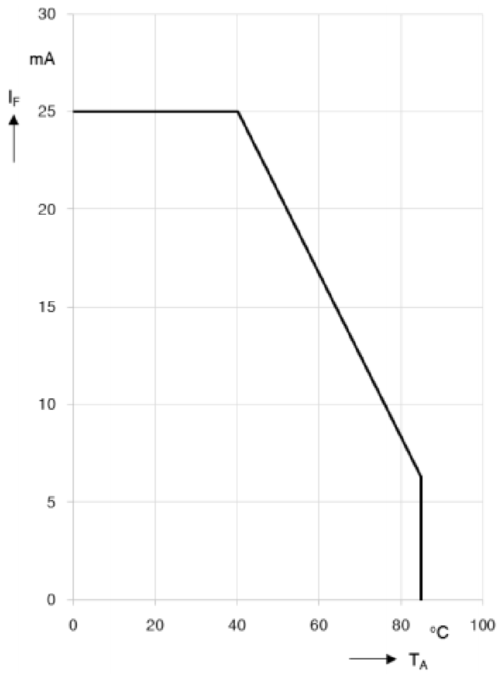
Capacitance [1), 2)]

■ photodiode IR-Cut: $C = f(V_R)$; f = 1MHz; E = 0



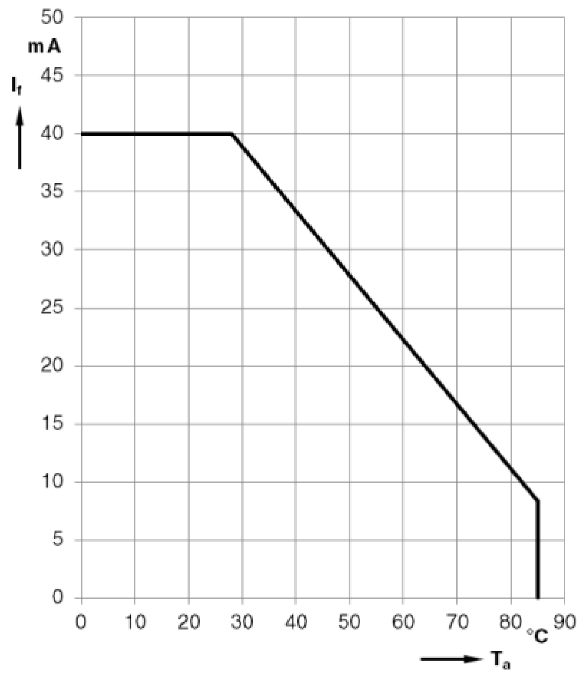
Max. Permissible Forward Current

● true green: $I_{F,max} = f(T_A)$



Max. Permissible Forward Current

● hyper red: $I_{F,max} = f(T_A)$



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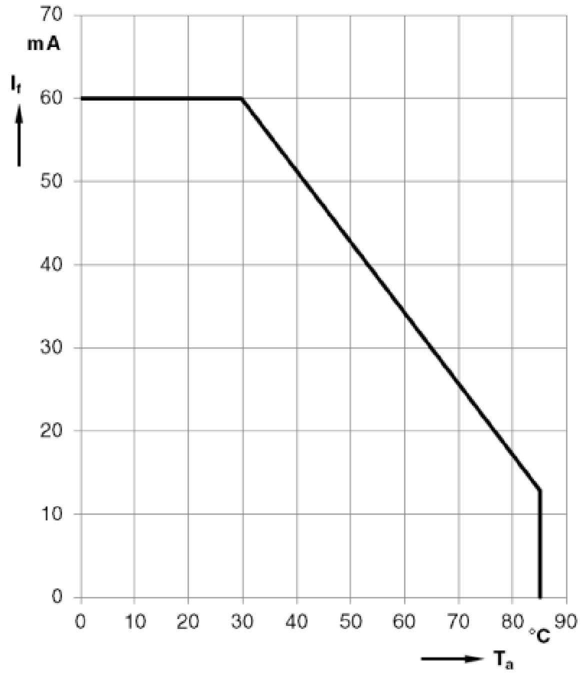
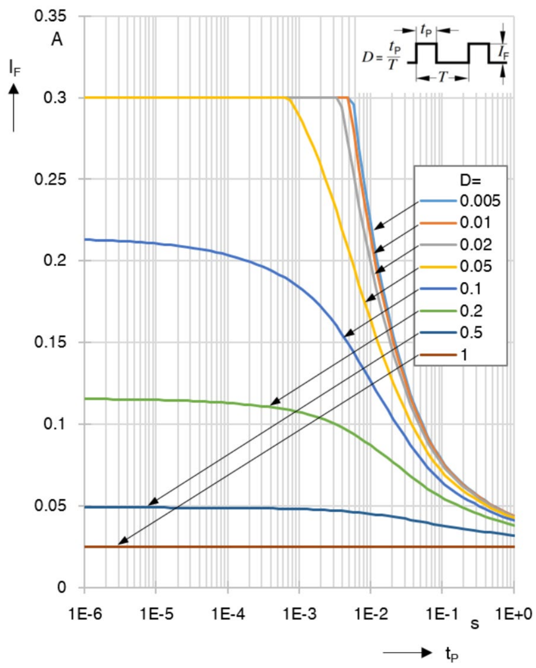
Max. Permissible Forward Current

● infrared (940 nm): $I_{F,max} = f(T_A)$



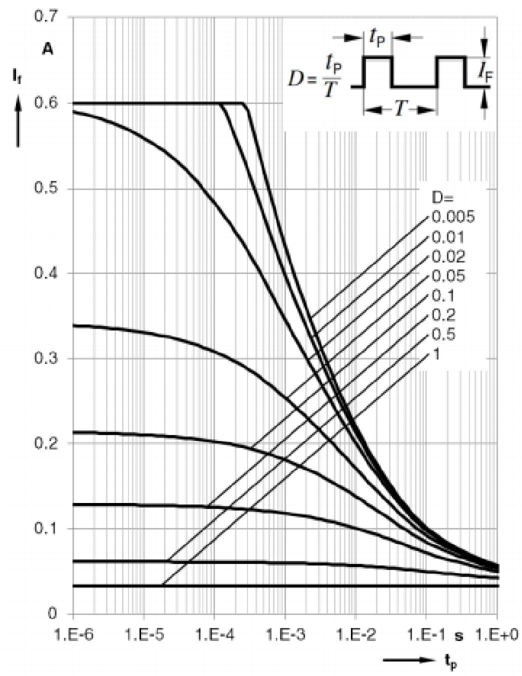
Permissible Pulse Handling Capability

● true green: $I_F = f(t_p)$; D = parameter; $T_A = 25°C$



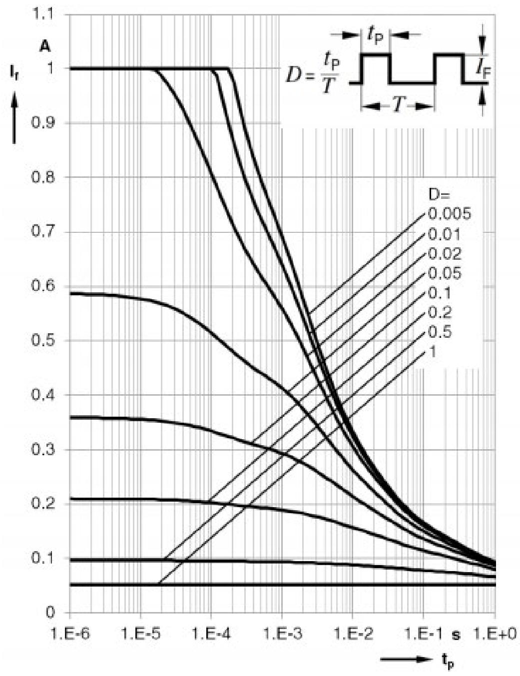
Permissible Pulse Handling Capability

● hyper red: $I_F = f(t_p)$; D = parameter; $T_A = 25°C$



Permissible Pulse Handling Capability

● infrared (940 nm): $I_F = f(t_p)$; D = parameter; $T_A = 25°C$



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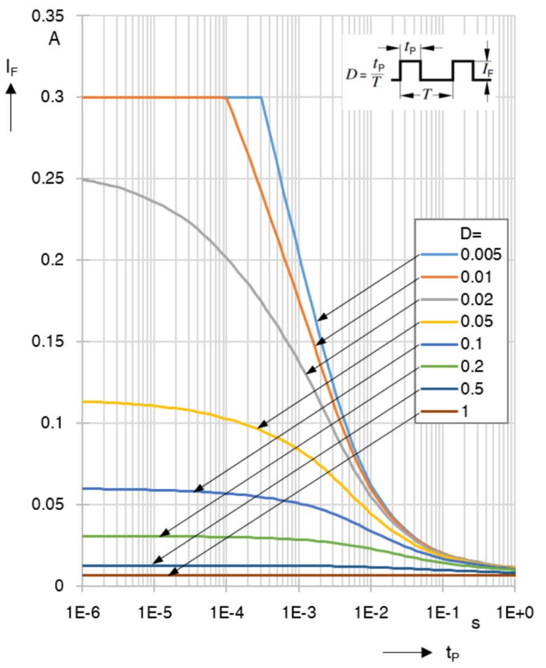
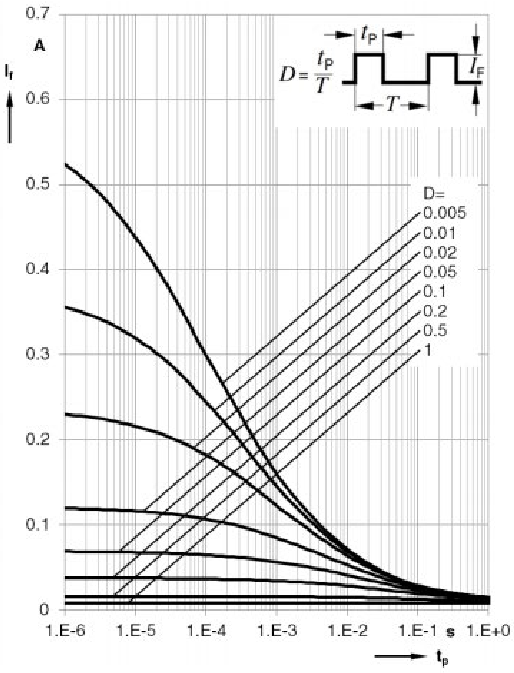
Permissible Pulse Handling Capability

● true green: $I_F = f(t_p)$; D = parameter; T_A = 85°C



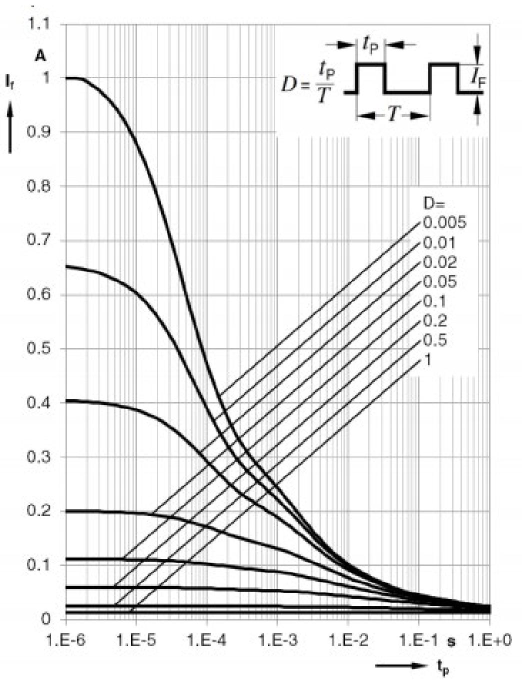
Permissible Pulse Handling Capability

● hyper red: $I_F = f(t_p)$; D = parameter; T_A = 85°C

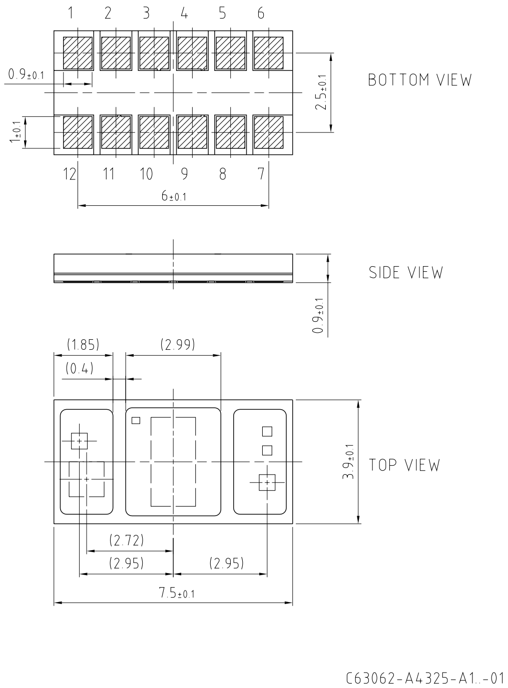


Permissible Pulse Handling Capability

● infrared (940 nm): $I_F = f(t_p)$; D = parameter; T_A = 85°C



Dimensional Drawing [3)]

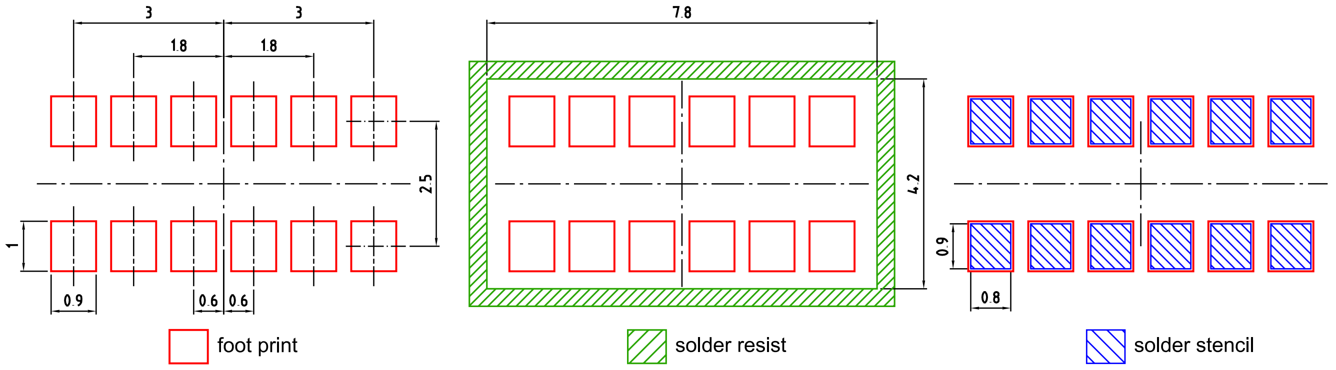


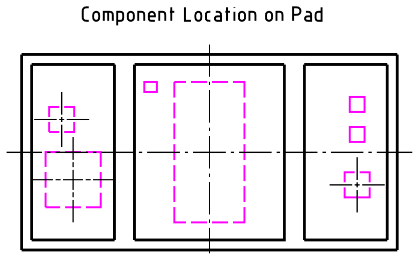
Further Information:

Approximate Weight: 44.0 mg

Pin	Description
1	PD1 (BB) Cathode
2	PD1 (BB) Anode
3	PD2 (IR-Cut) Cathode
4	IR LED Anode
5	Green 1 LED Anode
6	Green 1 LED Cathode
7	Red LED Anode
8	Red LED Cathode
9	IR LED Cathode
10	PD2 (IR-Cut) Anode
11	Green 2 LED Anode
12	Green 2 LED Cathode

Recommended Solder Pad [3)]





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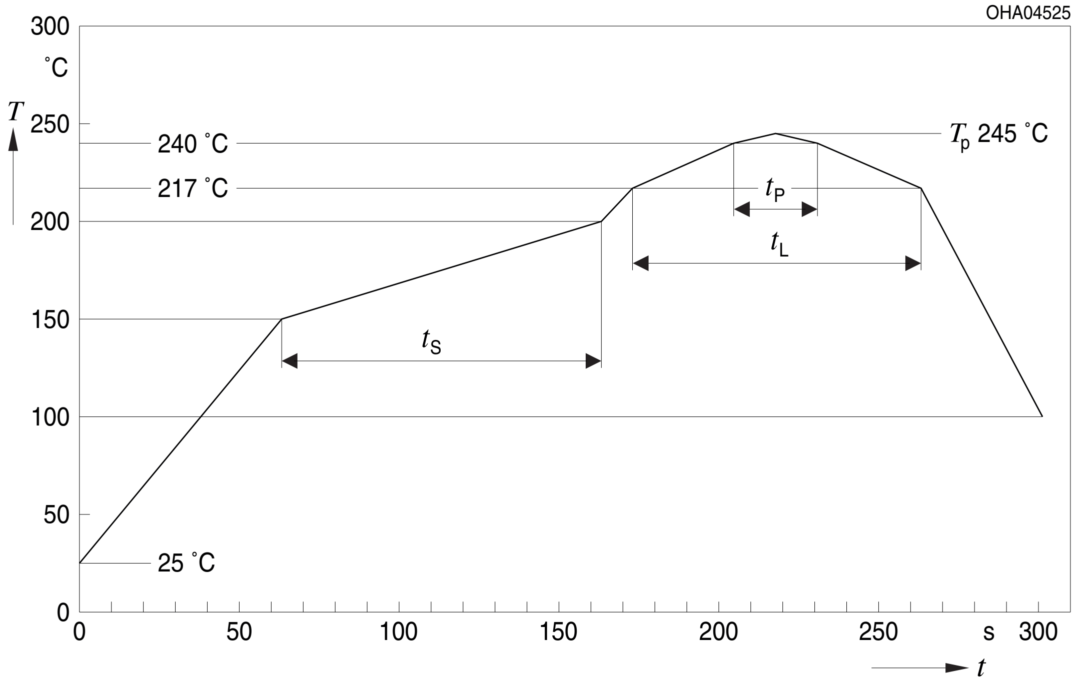
Reflow Soldering Profile

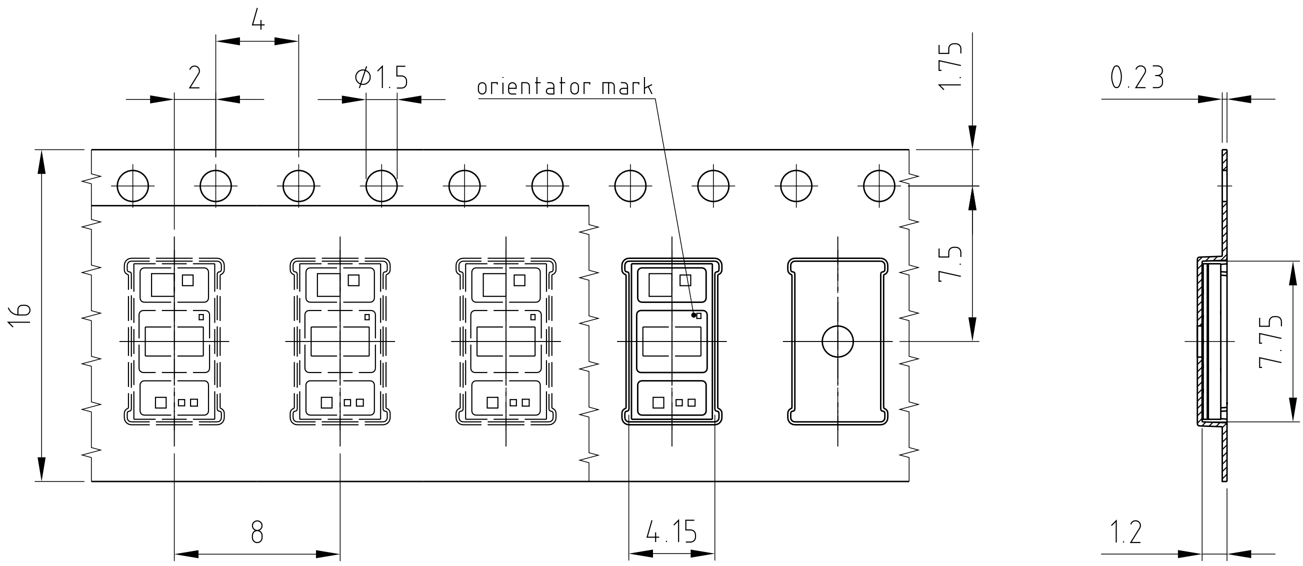
Product complies to MSL Level 4 acc. to JEDEC J-STD-020E



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 [3)]



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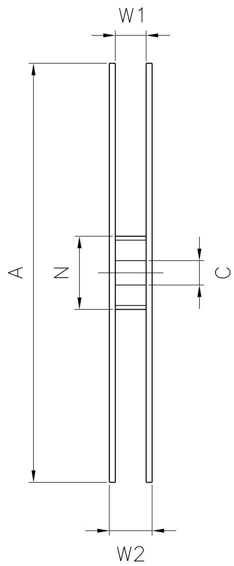
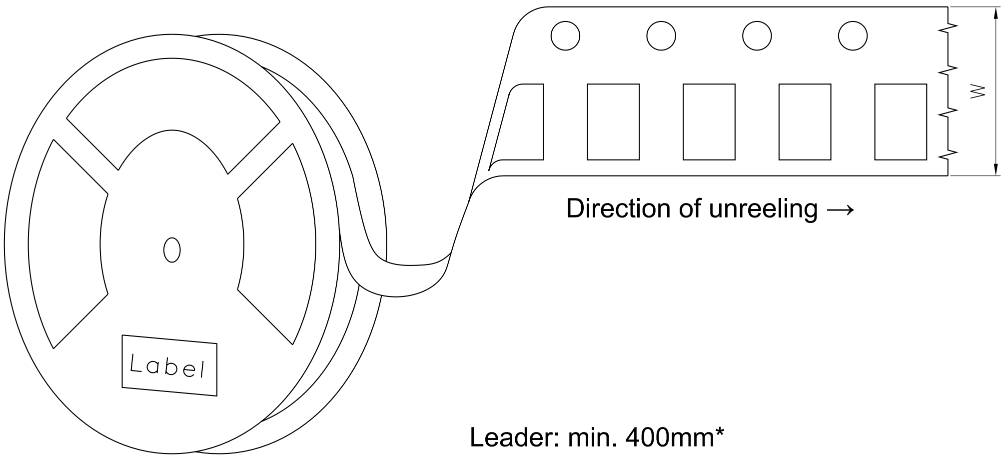
Tape and Reel [4)]





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

Reel Dimensions

A	W	N_{min}	W_1	$W_{2\,max}$	Pieces per PU
180 mm	16 + 0.3 / - 0.1 mm	60/100 mm	16.4 + 2 mm	22.4 mm	1500

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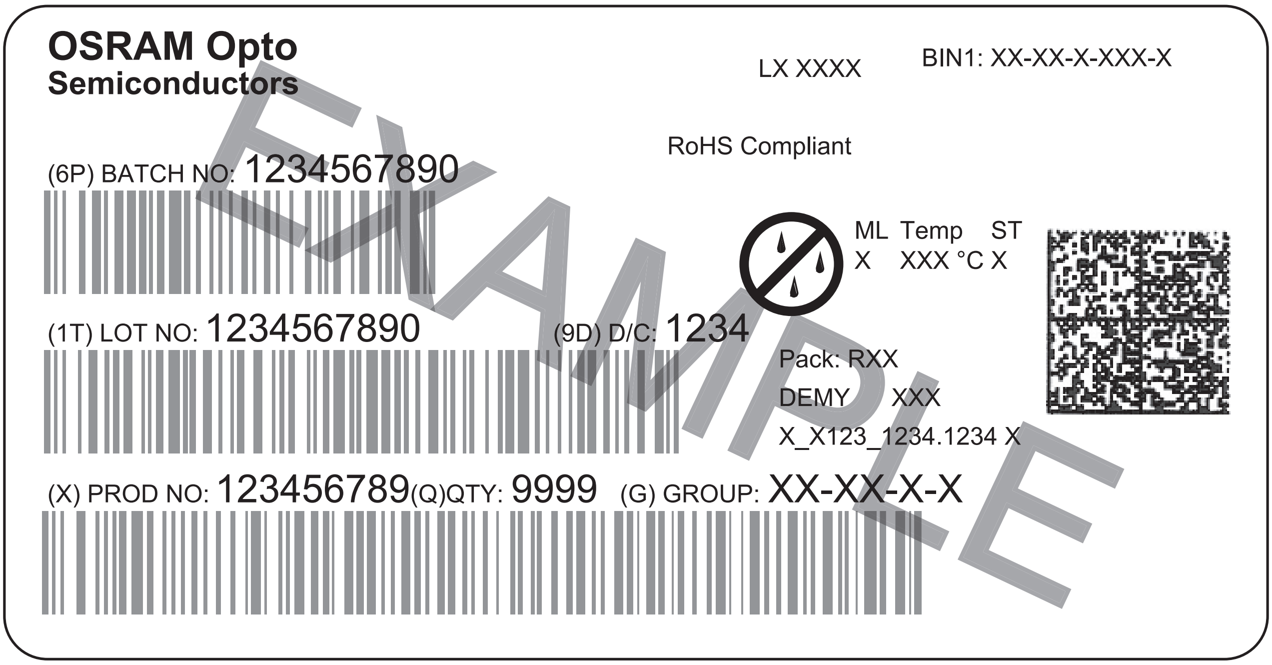
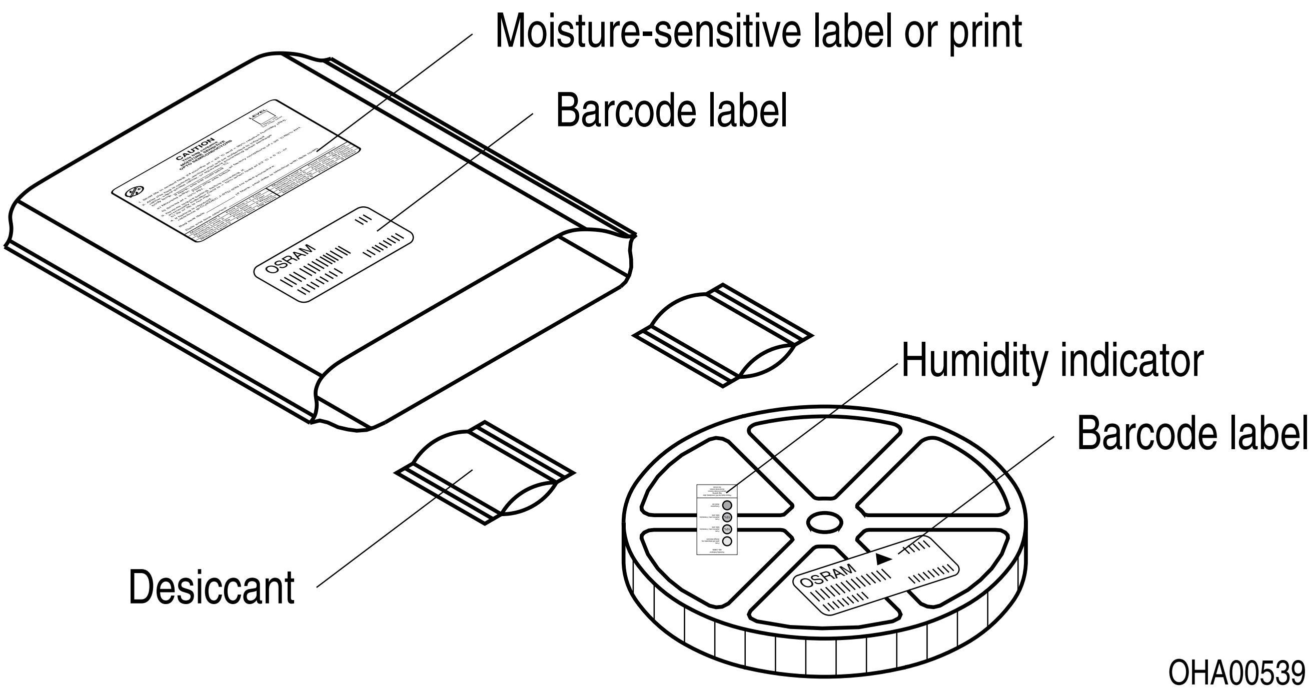
Barcode-Product-Label (BPL)



OHA04563

Dry Packing Process and Materials [3)]



OHA00539

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) **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.
2) **Testing temperature:** TA = 25°C (unless otherwise specified)
3) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ±0.1 and dimensions are specified in mm.
4) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.
5) **Reverse Operation:** This product is intended to be operated applying a forward current within the specified range. Applying any continuous reverse bias or forward bias below the voltage range of light emission shall be avoided because it may cause migration which can change the electro-optical characteristics or damage the LED.
6) **Wavelength:** The wavelengths are measured with a tolerance of ±1 nm.
7) **Forward Voltage:** The forward voltages are measured with a tolerance of ±0.1 V.
8) **Brightness:** The brightness values are measured with a tolerance of ±11%.
9) **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 ±11 %.

Revision History

Version	Date	Change
1.1	2019-04-24	Characteristics
1.2	2020-07-10	Derating (Diagrams) Schematic Transportation Box Dimensions of Transportation Box
1.3	2021-04-27	Characteristics New Layout
1.4	2021-08-12	Features

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