SFH7050 BioMon

Draft - This design is for Reference only. Subject to change.

Features:
- Multi chip package featuring 3 emitters and one detector
- Small package:
  (WxDxH) 4.7 mm x 2.5 mm x 0.9 mm
- Light Barrier to block optical crosstalk

Besondere Merkmale:
- Multi-Chip-Gehäuse mit 3 Emittern und einem Detektor
- Kleines Gehäuse:
  (BxTxH) 4.7 mm x 2.5 mm x 0.9 mm
- Lichtsperre zur Unterdrückung von optischem Übersprechen

Applications
- Heart rate monitoring
- Pulse oximetry

  for:
- Wearable devices (e.g. smartwatches, fitnesstrackers, ...)
- Mobile devices

Anwendungen
- Herzfrequenzüberwachung
- Blutsauerstoff-Messung

  für:
- Tragbare Geräte (z.B. Smartwatches, Fitnesstracker, ...)
- Mobile Geräte

Ordering Information SFH7050 BioMon
Bestellinformation

Type:	Ordering Code
Typ:	**Bestellnummer**
SFH7050	Q65111A6271

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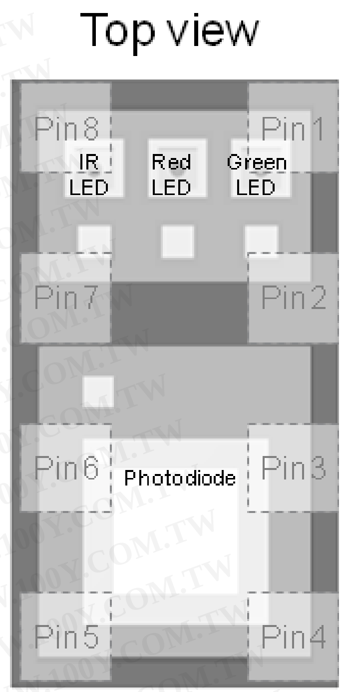
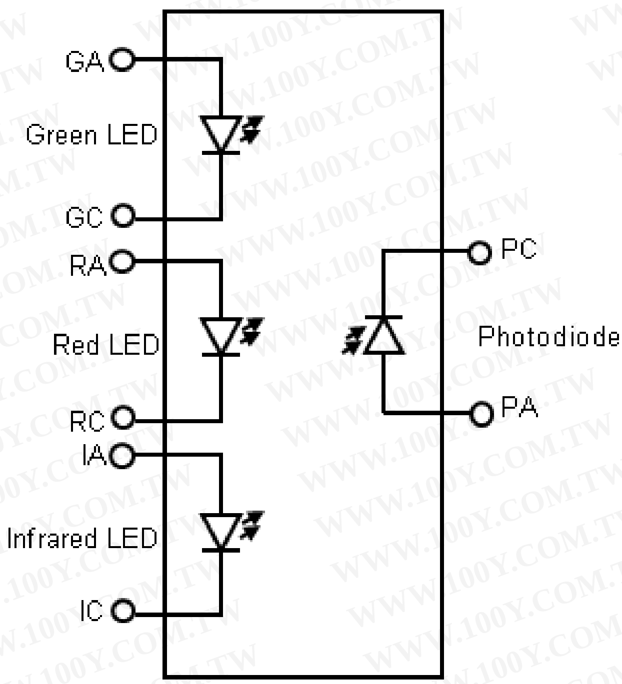
OSRAM
Opto Semiconductors

Pin configuration

Pin	Name	Function
1	GC	Green LED Cathode
2	GA	Green LED Anode
3	RA	Red LED Anode
4	PA	Photodiode Anode
5	PC	Photodiode Cathode
6	RC	Red LED Cathode
7	IA	Infrared LED Anode
8	IC	Infrared LED Cathode



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	$I_{F (DC)}$	100	mA
Surge current (t_p = 100 µs, D = 0)	I_{FSM}	1	A
Red Emitter			
Reverse voltage	V_R	12	V
Forward current	$I_{F (DC)}$	70	mA
Surge current (t_p = 100 µs, D = 0)	I_{FSM}	600	mA
Green Emitter			
Reverse voltage	V_R	not designed for reverse operation	V
Forward current	$I_{F (DC)}$	50	mA
Surge current (t_p = 100 µs, D = 0)	I_{FSM}	300	mA
Detector			
Reverse voltage (I_R = 100 µA, E_e = 0 mW/cm^2)	V_R	16	V

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		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	(typ. (max.))	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				
Wavelength of peak emission (I_F = 20 mA)	(typ.)	λ_{peak}	525	nm
Centroid Wavelength (I_F = 20 mA)	(typ. (max.))	$\lambda_{centroid}$	530 (±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	3.4 (≤ 4.4)	V
Reverse current		I_R	not designed for reverse operation	µA
Radiant intensity (I_F = 20 mA, t_p = 20 ms)	(typ.)	I_e	1.3	mW / sr
Total radiant flux (I_F = 20 mA, t_p = 20 ms)	(typ.)	Φ_e	2.9	mW
Temperature coefficient of $\lambda_{centroid}$ (I_F = 20 mA, -10°C ≤ T ≤ 100°C)	(typ.)	$TC_{\lambda centroid}$	0.03	nm / K
Temperature coefficient of V_F (I_F = 20 mA, -10°C ≤ T ≤ 100°C)	(typ.)	TC_V	-3.60	mV / K

Characteristics (T_A = 25 °C)

Parameter		**Symbol**	**Value**	**Unit**
Detector				
Photocurrent (E_e = 0.1 mW/cm^2, λ = 530 nm, V_R = 5 V)	(typ.)	$I_{P,530}$	0.42	µA
Photocurrent (E_e = 0.1 mW/cm^2, λ = 655 nm, V_R = 5 V)	(typ.)	$I_{P,655}$	0.76	µA
Photocurrent (E_e = 0.1 mW/cm^2, 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
Radiant sensitive area	(typ.)	A	1.7	mm^2
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/cm^2)	(typ. (max.))	I_R	1 (≤ 5)	nA
Spectral sensitivity of the chip (λ = 530 nm)	(typ.)	$S_{\lambda 530}$	0.26	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/cm^2, λ = 530 nm)	(typ.)	$V_{O,530}$	240	mV
Short-circuit current (E_e = 0.1 mW/cm^2, λ = 530 nm)	(typ.)	$I_{SC,530}$	0.40	µA
Open-circuit voltage (E_e = 0.1 mW/cm^2, λ = 655nm)	(typ.)	$V_{O,655}$	250	mV
Short-circuit current (E_e = 0.1 mW/cm^2, λ = 655 nm)	(typ.)	$I_{SC,655}$	0.71	µA
Open-circuit voltage (E_e = 0.1 mW/cm^2, λ =940 nm)	(typ.)	$V_{O,940}$	270	mV
Short-circuit current (E_e = 0.1 mW/cm^2, λ = 940 nm)	(typ.)	$I_{SC,940}$	1.2	µA

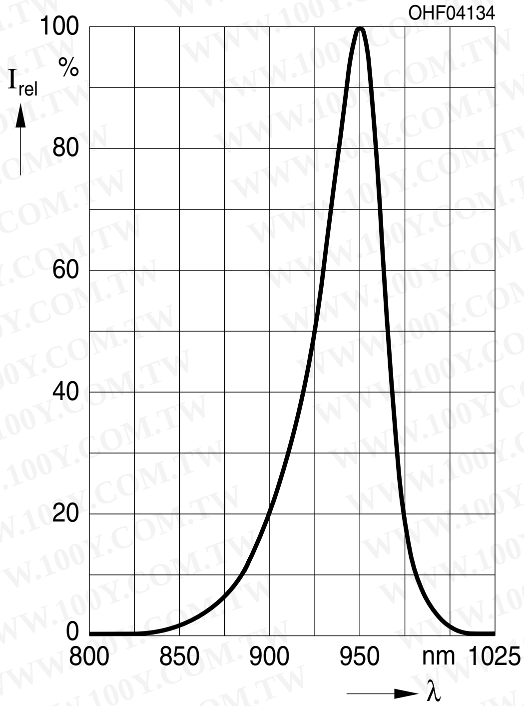
Characteristics (T_A = 25 °C)

Parameter		Symbol	Value	Unit
Rise and fall time (V_R = 5 V, R_L = 50 Ω, λ = 940 nm)	(typ.)	t_r, t_f	tbd.	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

Diagrams for infrared emitter

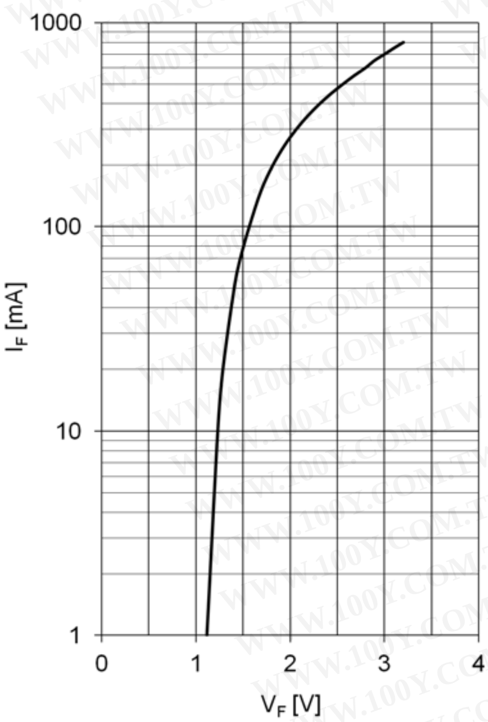
Relative spectral emission [1)]

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



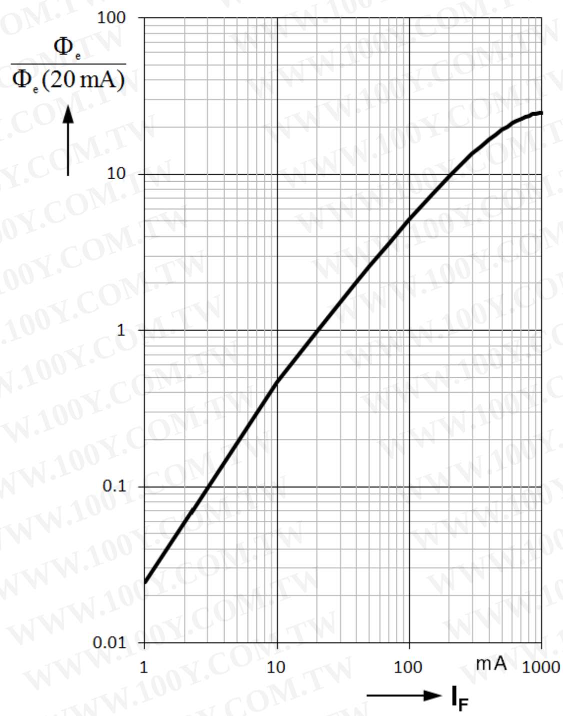
Forward current [1)]

$I_F = f(V_F)$, 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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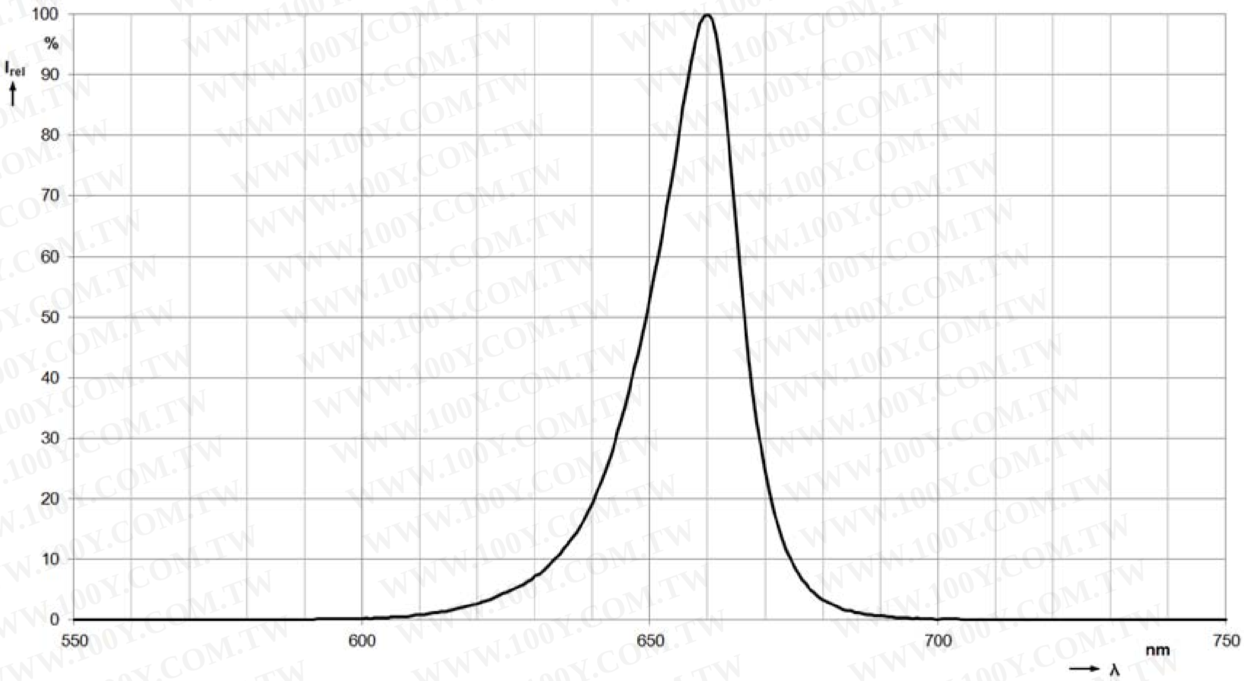
Diagrams for red emitter

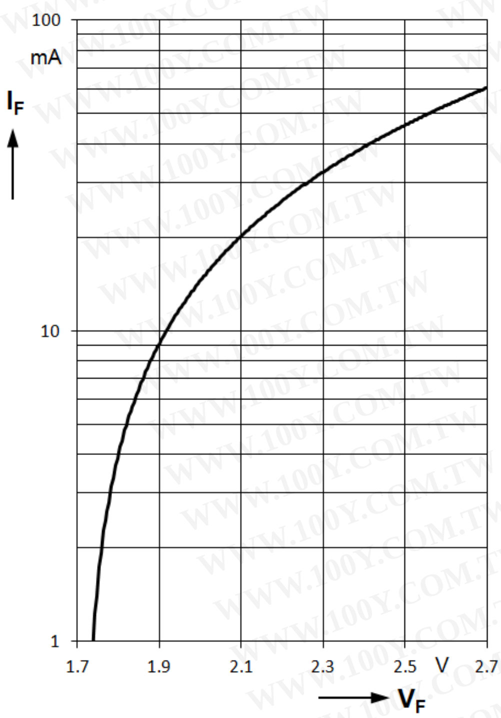
Relative spectral emission [1)]

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



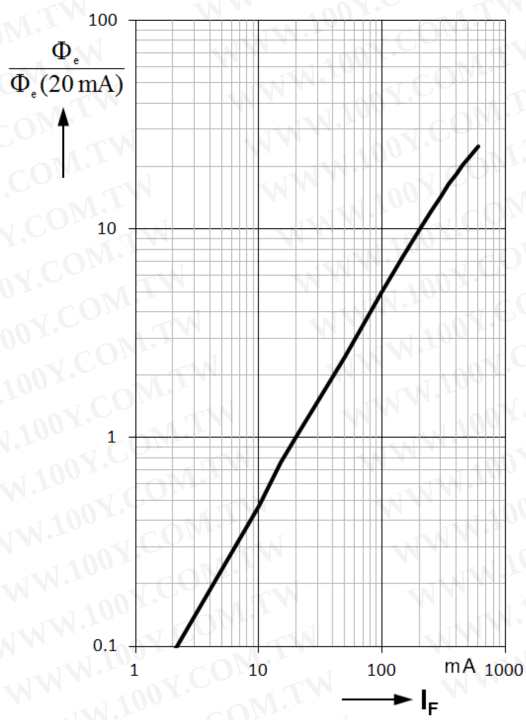
Forward current [1)]

$I_F = f(V_F)$, T_A= 25°C



Relative radiant flux [1)]

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



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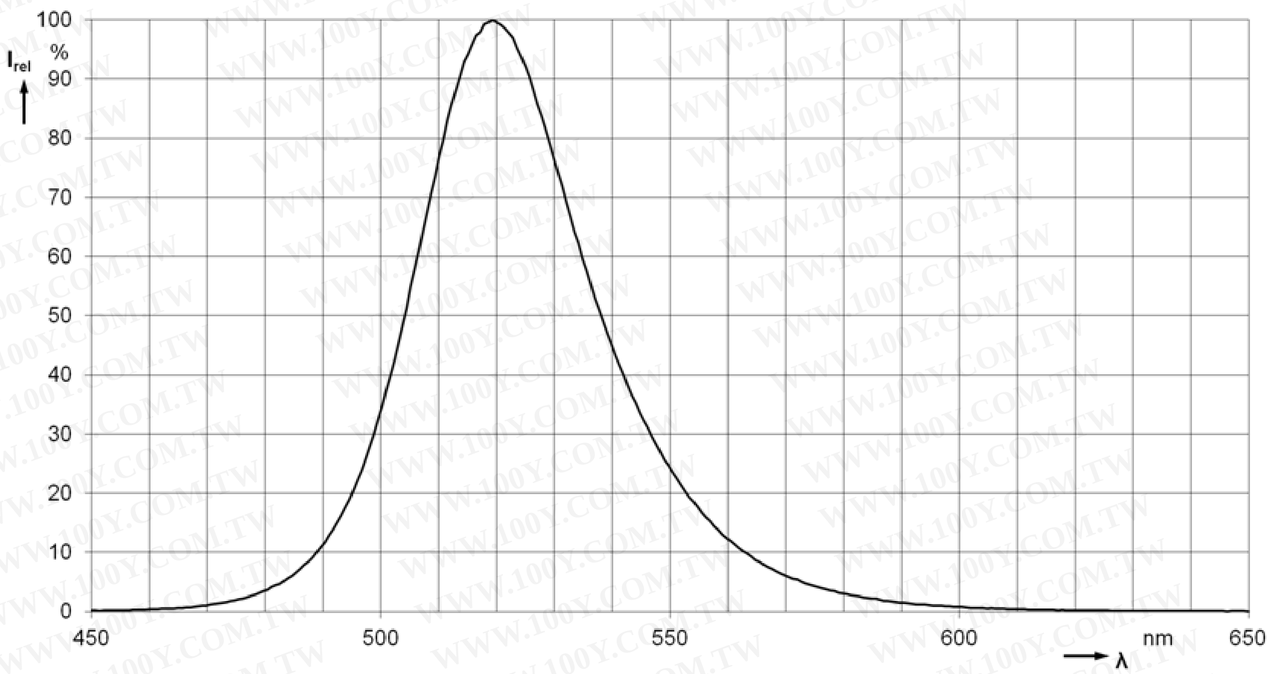
Diagrams for green emitter

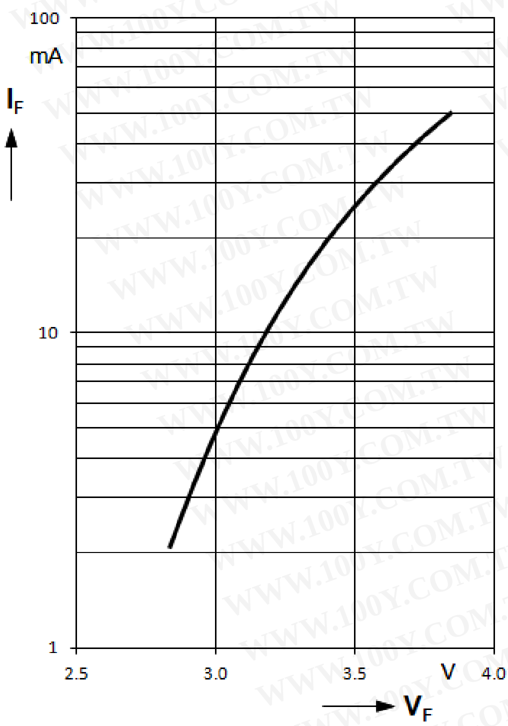
Relative spectral emission [1)]

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



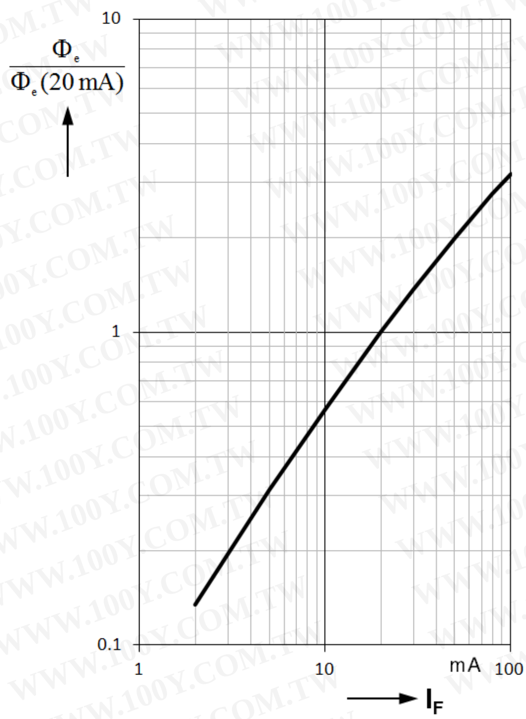
Forward current [1)]

$I_F = f(V_F)$, T_A= 25°C



Relative radiant flux [1)]

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



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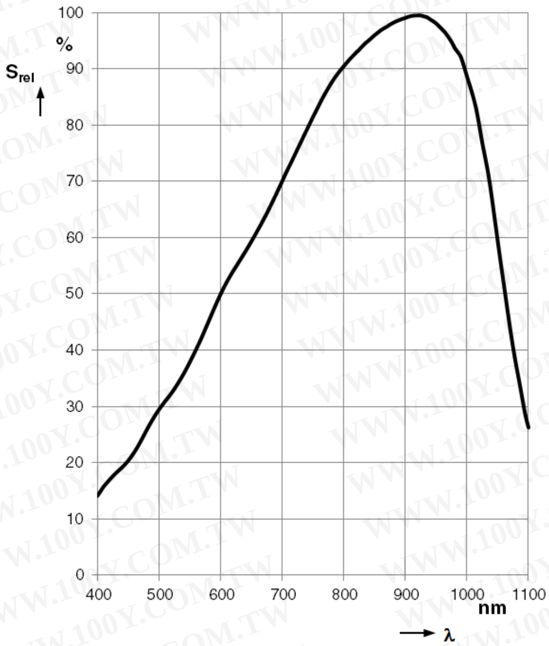
Diagrams for detector

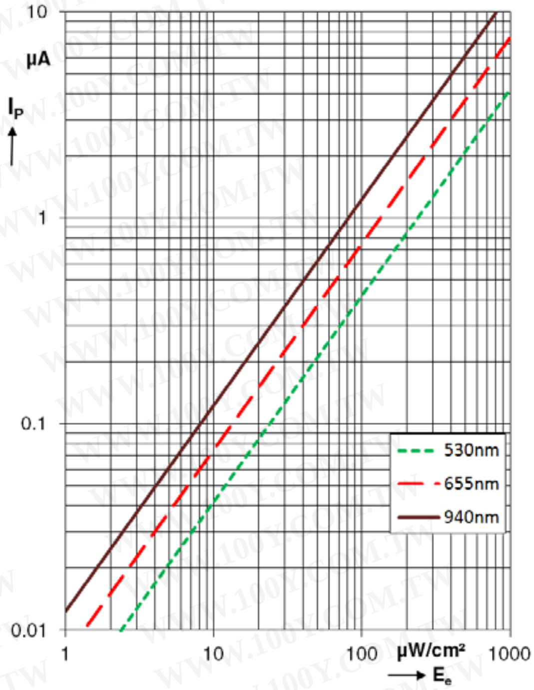
Relative spectral sensitivity [1)]

$S_{rel} = f(\lambda)$, $T_A = 25\ °C$



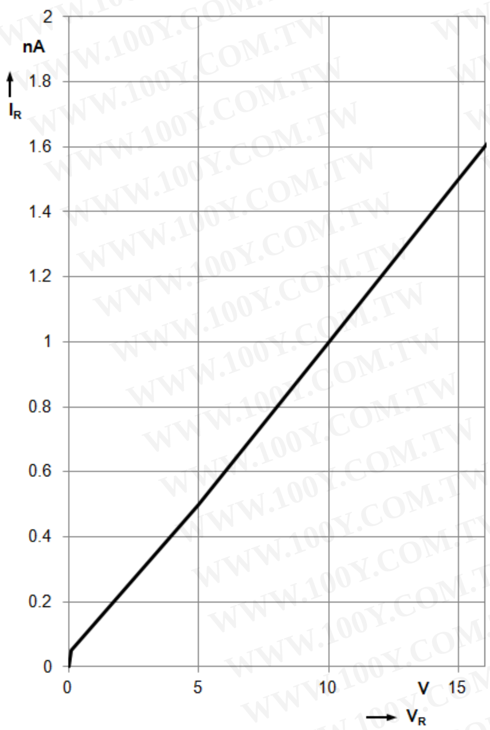
Photocurrent [1)]

$I_P(V_R = 5\ V)$, $T_A = 25\ °C$



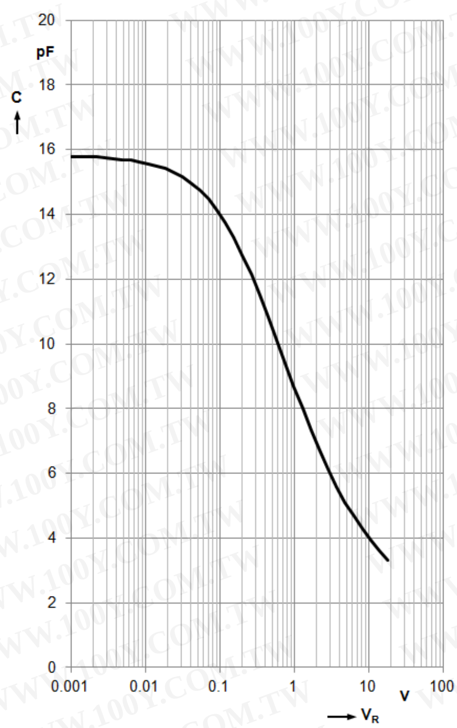
Dark current [1)]

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



Capacitance [1)]

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



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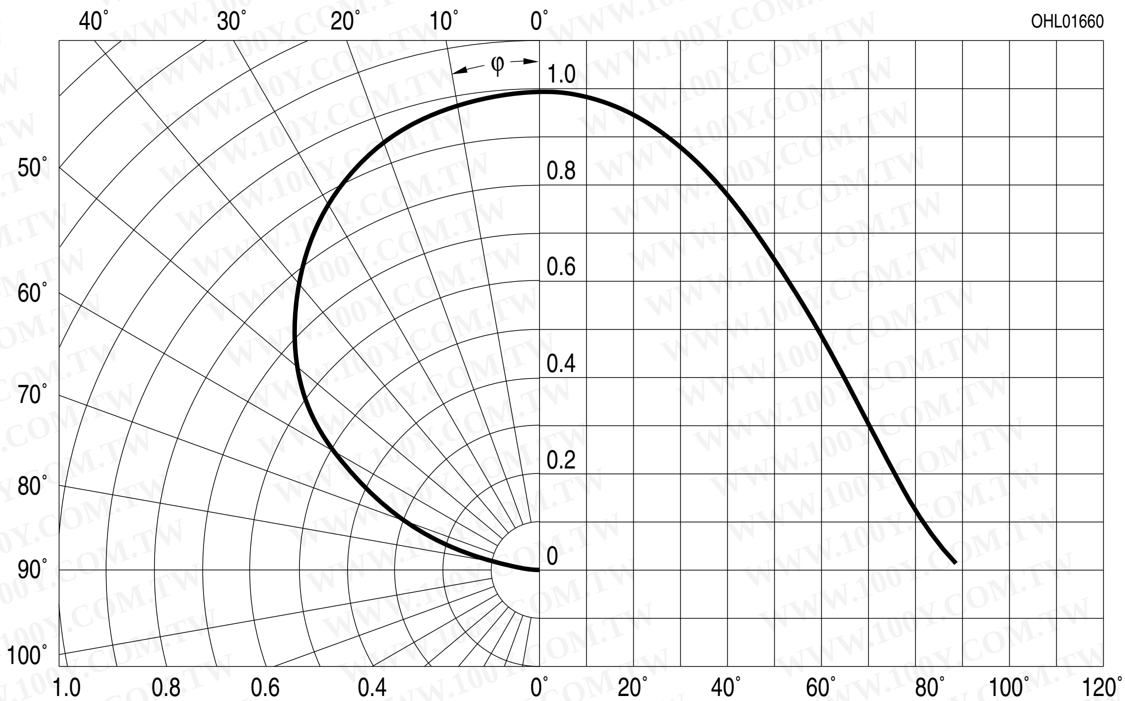
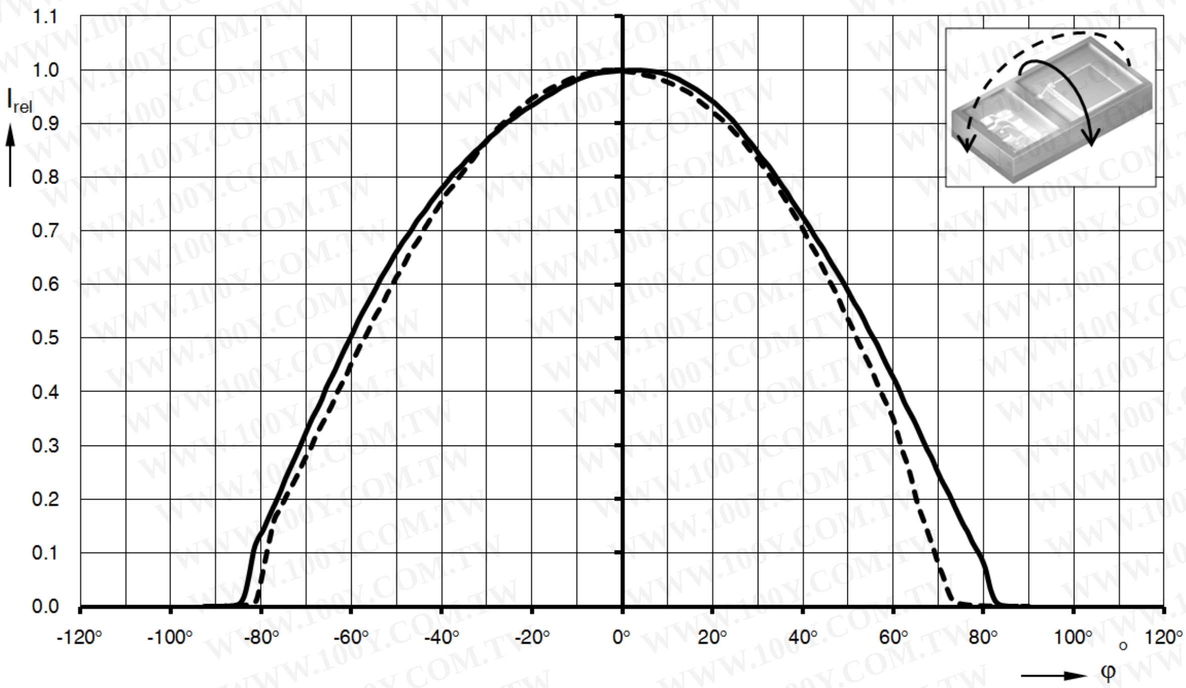
Directional characteristics of detector [1)]

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



Radiation characteristics of emitters [1)]

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



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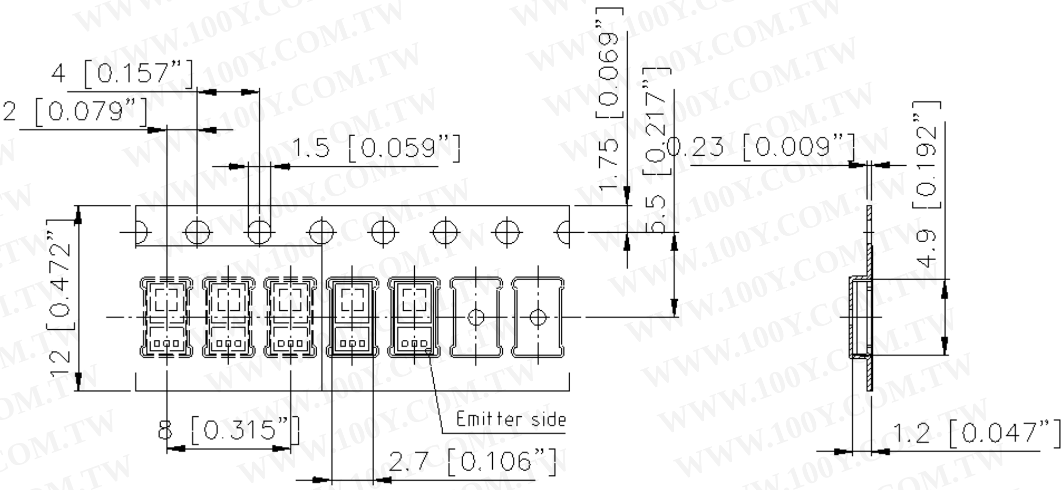
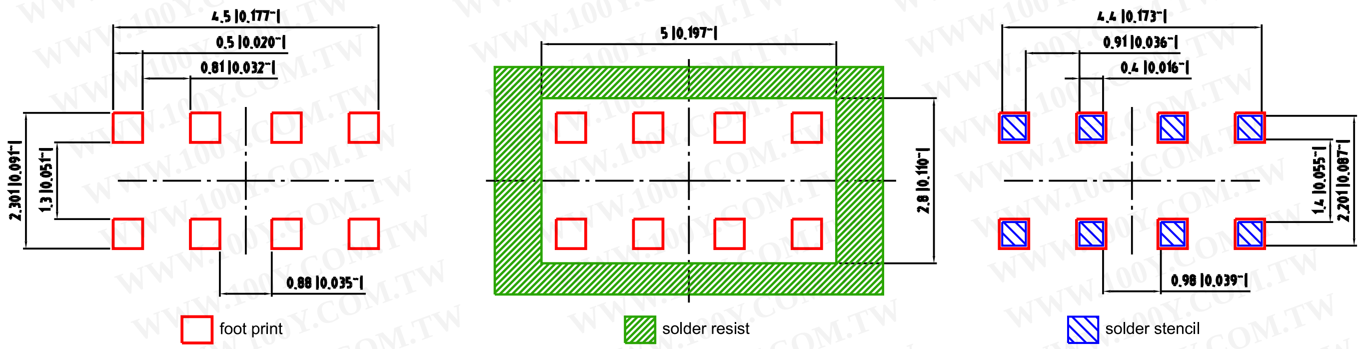
Method of Taping

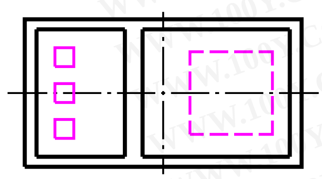


Dimensions in mm [inch]. / Maße in mm [inch].

Recommended solder pad design

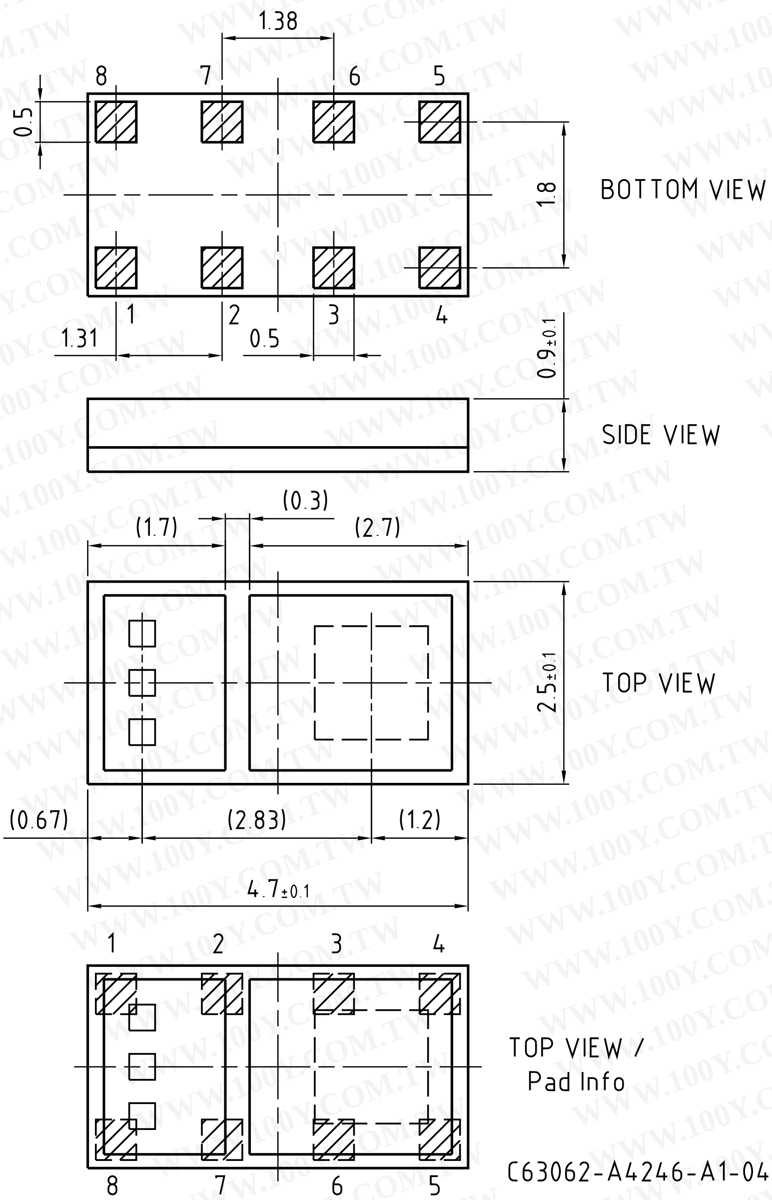


Component Location on Pad



Dimensions in mm (inch). / Maße in mm (inch).

Package Outline



Pin1	Green LED cathode
Pin2	Green LED anode
Pin3	Red LED anode
Pin4	PD anode
Pin5	PD cathode
Pin6	Red LED cathode
Pin7	IR LED anode
Pin8	IR LED cathode

Dimensions in mm / Maße in mm.

Package: chip on board

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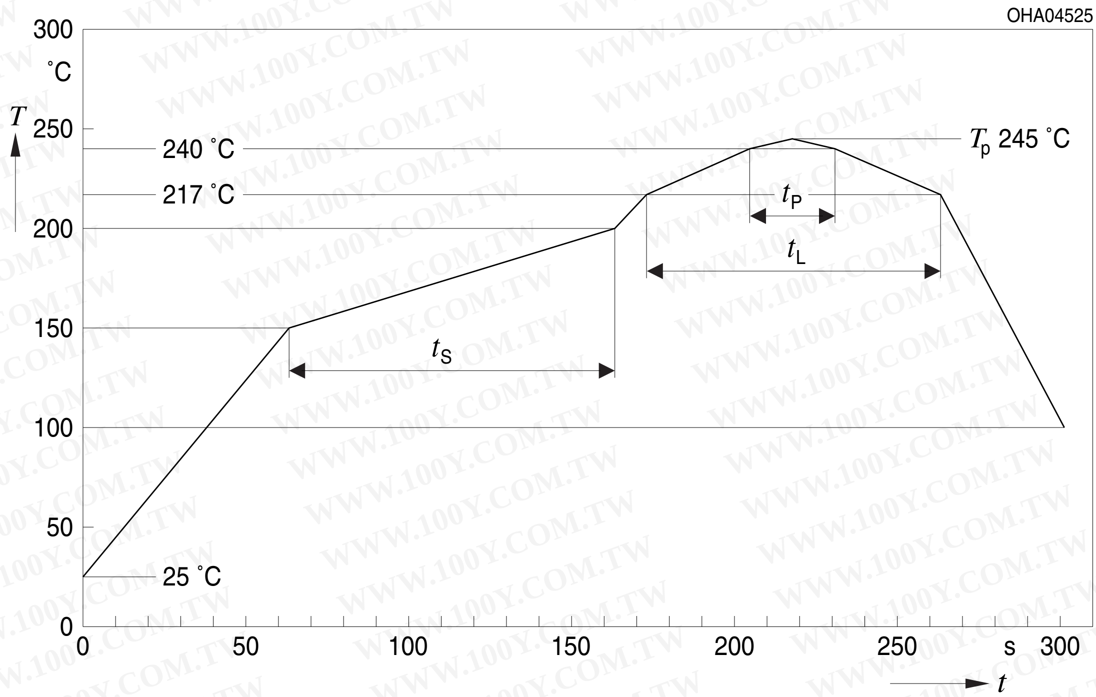
Reflow Soldering Profile

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

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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.

Glossar

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