

# Silicon NPN Phototransistor

## Version 1.3

### SFH 309



#### Features:

- **Spectral range of sensitivity:** (typ) 380 ... 1150 nm
- **Package:** 3mm Radial (T 1), Epoxy
- **Special:** High photosensitivity
- High linearity
- Available in groups

#### Applications

- Photointerrupters
- Industrial electronics
- For control and drive circuits

#### Ordering Information

Type:	Photocurrent $I_{PCE}$ [ $\mu$ A] $\lambda = 950 \text{ nm}$ , $E_e = 0.5 \text{ mW/cm}^2$ , $V_{CE} = 5 \text{ V}$	Ordering Code
SFH 309	400 ... 5000	Q62702P0859
SFH 309-3/4	630 ... 2000	Q62702P3592
SFH 309-4	1000 ... 2000	Q62702P0998
SFH 309-4/5	1000 ... 3200	Q62702P3593
SFH 309-5	1600 ... 3200	Q62702P0999
SFH 309-5/6	1600 ... 5000	Q62702P3594

*Note:* Only one bin within one packing unit (variation less than 2:1)

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

Parameter	Symbol	Values	Unit
Operating and storage temperature range	$T_{op}; T_{stg}$	-40 ... 100	°C
Collector-emitter voltage	$V_{CE}$	35	V
Collector current	$I_C$	15	mA
Collector surge current ( $\tau < 10\ \mu\text{s}$ )	$I_{CS}$	75	mA
Total Power dissipation	$P_{tot}$	165	mW
Thermal resistance	$R_{thJA}$	450	K / W
ESD withstand voltage (acc. to ANSI/ ESDA/ JEDEC JS-001 - HBM)	$V_{ESD}$	2000	V

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

Parameter		Symbol	Values	Unit
Wavelength of max. sensitivity	(typ)	$\lambda_{S\ max}$	860	nm
Spectral range of sensitivity	(typ)	$\lambda_{10\%}$	(typ) 380 ... 1150	nm
Radiant sensitive area ( $\varnothing\ 220\ \mu\text{m}$ )	(typ)	A	0.038	mm <sup>2</sup>
Dimensions of chip area	(typ)	L x W	(typ) 0.45 x 0.45	mm x mm
Distance chip front to case surface	(min ... max)	H	(min ... max) 2.4 ... 2.8	mm
Half angle	(typ)	$\varphi$	$\pm 12$	°
Capacitance ( $V_{CE} = 0\ \text{V}$ , $f = 1\ \text{MHz}$ , $E = 0$ )	(typ)	$C_{CE}$	5	pF
Dark current ( $V_{CE} = 20\ \text{V}$ , $E = 0$ )	(typ (max))	$I_{CE0}$	1 ( $\leq 50$ )	nA

Grouping ( $T_A = 25\text{ °C}$ ,  $\lambda = 950\text{ nm}$ )

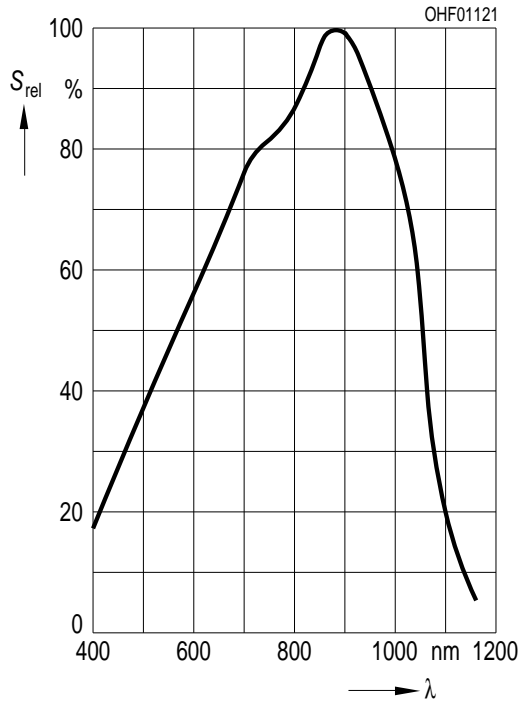
Group	Min Photocurrent $E_e = 0.5\text{ mW/cm}^2$ , $V_{CE} = 5\text{ V}$ $I_{PCE, min}\text{ }[\mu\text{A}]$	Max Photocurrent $E_e = 0.5\text{ mW/cm}^2$ , $V_{CE} = 5\text{ V}$ $I_{PCE, max}\text{ }[\mu\text{A}]$	Typ Photocurrent $E_V = 1000\text{ lx, Std. Light A, } V_{CE} = 5\text{ V}$ $I_{PCE}\text{ }[\mu\text{A}]$	Rise and fall time $I_C = 1\text{ mA, } V_{CC} = 5\text{ V, } R_L = 1\text{ k}\Omega$ $t_r, t_f\text{ }[\mu\text{s}]$
-2	400	800	1500	5
-3	630	1250	2800	6
-4	1000	2000	4500	7
-5	1600	3200	7200	8
-6	2500	5000	11200	9

Group	Collector-emitter saturation voltage $I_C = I_{PCEmin} \times 0.3, E_e = 0.5\text{ mW/cm}^2$ $V_{CEsat}\text{ }[\text{mV}]$
-2	200
-3	200
-4	200
-5	200
-6	200

Note.:  $I_{PCEmin}$  is the min. photocurrent of the specified group.

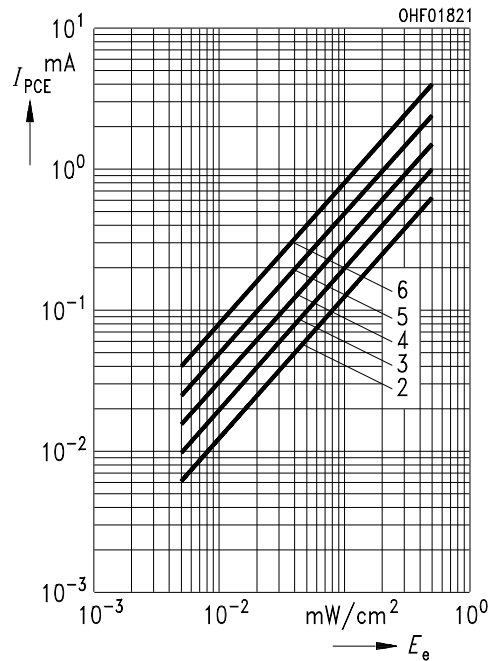
**Relative Spectral Sensitivity** <sup>1) page 9</sup>

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



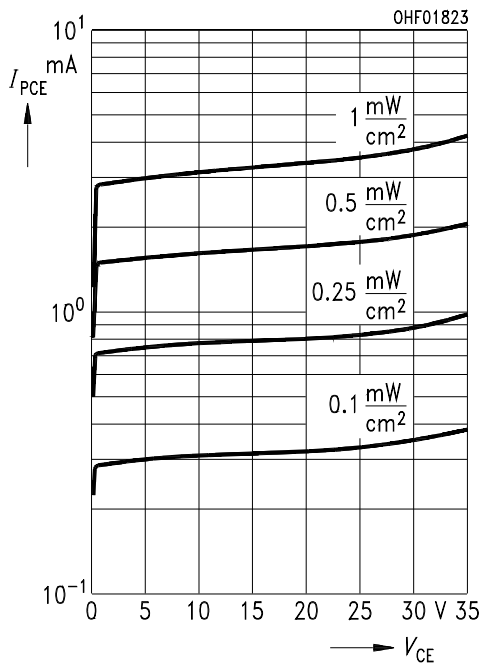
**Photocurrent** <sup>1) page 9</sup>

$I_{PCE} = f(E_e), V_{CE} = 5 V$



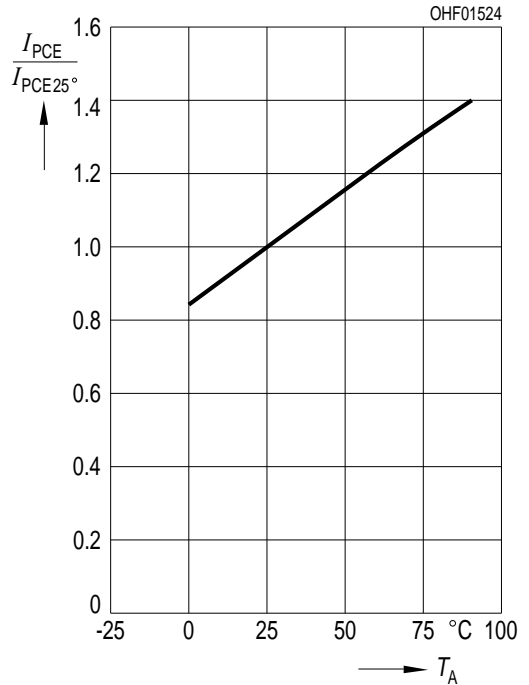
**Photocurrent** <sup>1) page 9</sup>

$I_{PCE} = f(V_{CE}), E_e = \text{Parameter}$



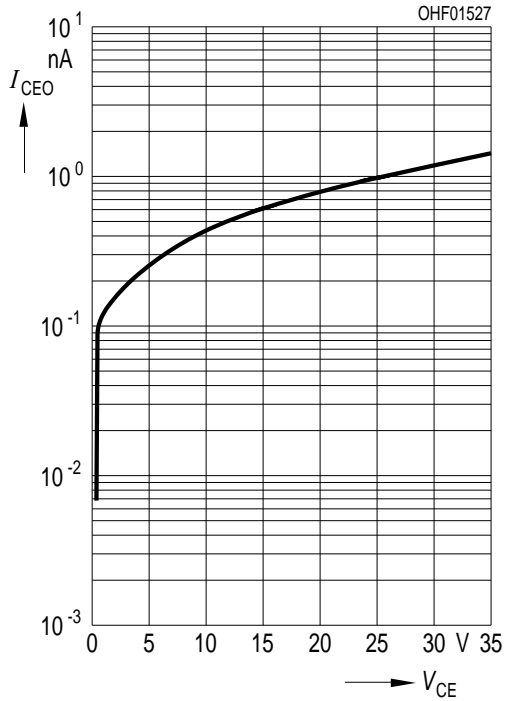
**Photocurrent** <sup>1) page 9</sup>

$I_{PCE} / I_{PCE}(25^\circ C) = f(T_A), V_{CE} = 5 V$



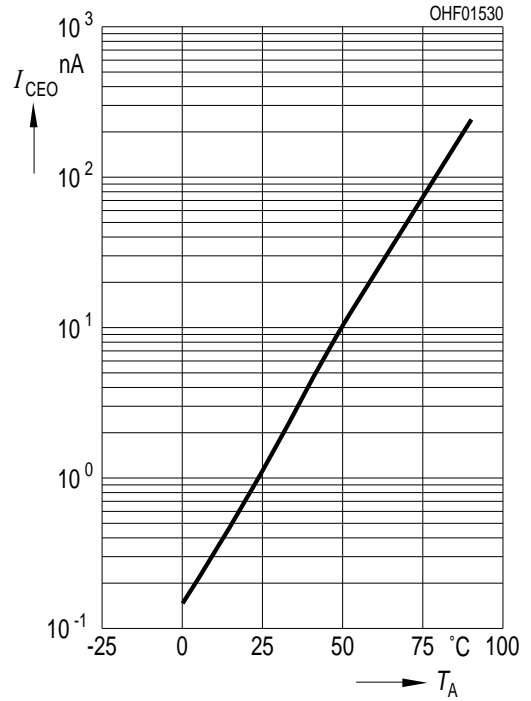
**Dark Current** <sup>1) page 9</sup>

$I_{CE0} = f(V_{CE}), E = 0$



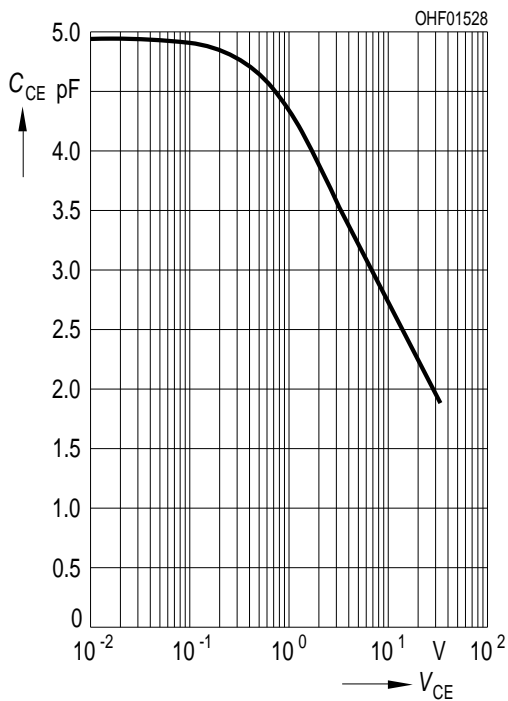
**Dark Current** <sup>1) page 9</sup>

$I_{CE0} = f(T_A), V_{CE} = 20 \text{ V}, E = 0$



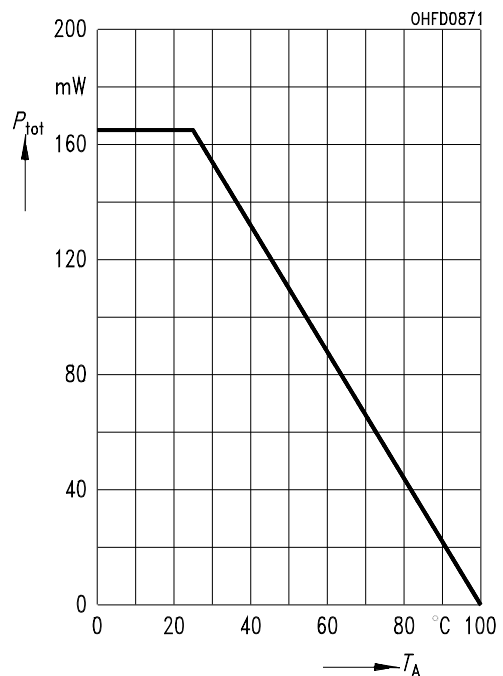
**Collector-Emitter Capacitance** <sup>1) page 9</sup>

$C_{CE} = f(V_{CE}), f = 1 \text{ MHz}, E = 0$



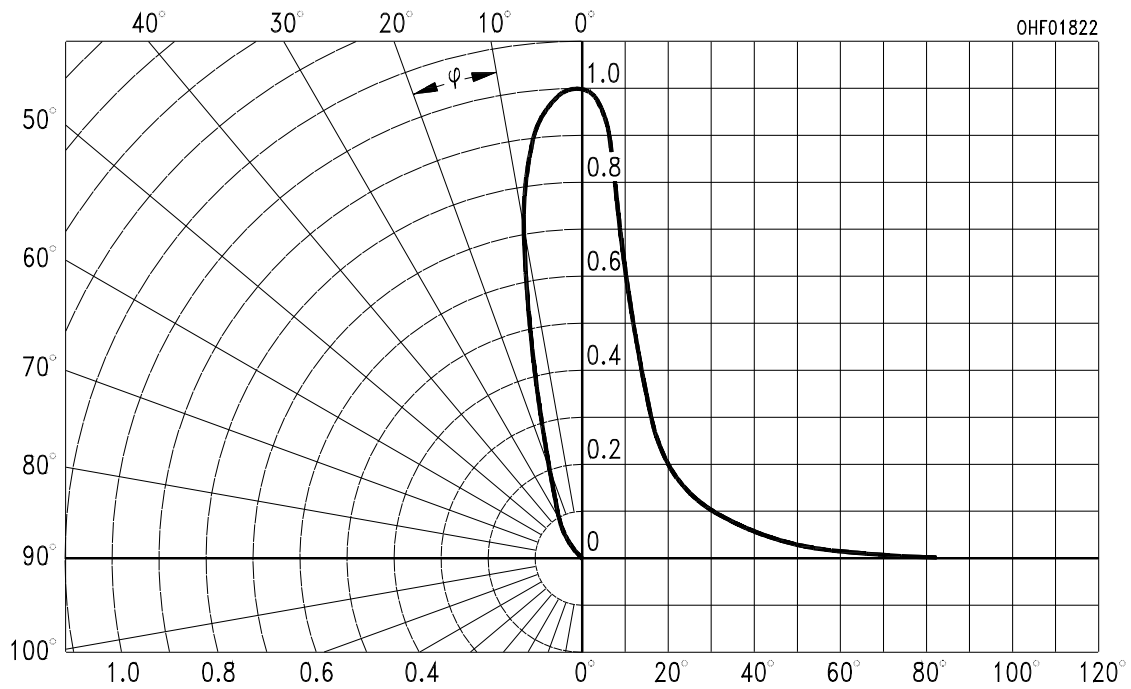
**Power Consumption**

$P_{tot} = f(T_A)$

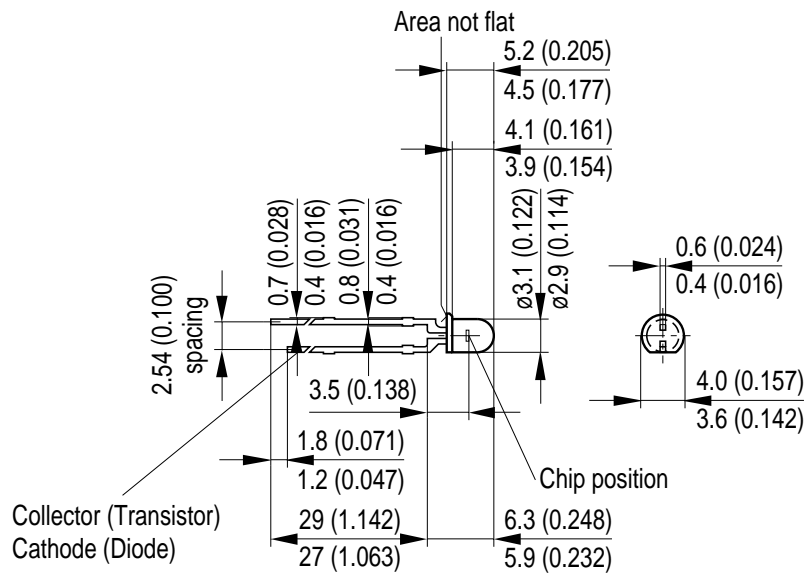


**Directional Characteristics** <sup>1) page 9</sup>

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



**Package Outline**



*Dimensions in mm (inch).*

**Package**

3mm Radial (T 1), Epoxy

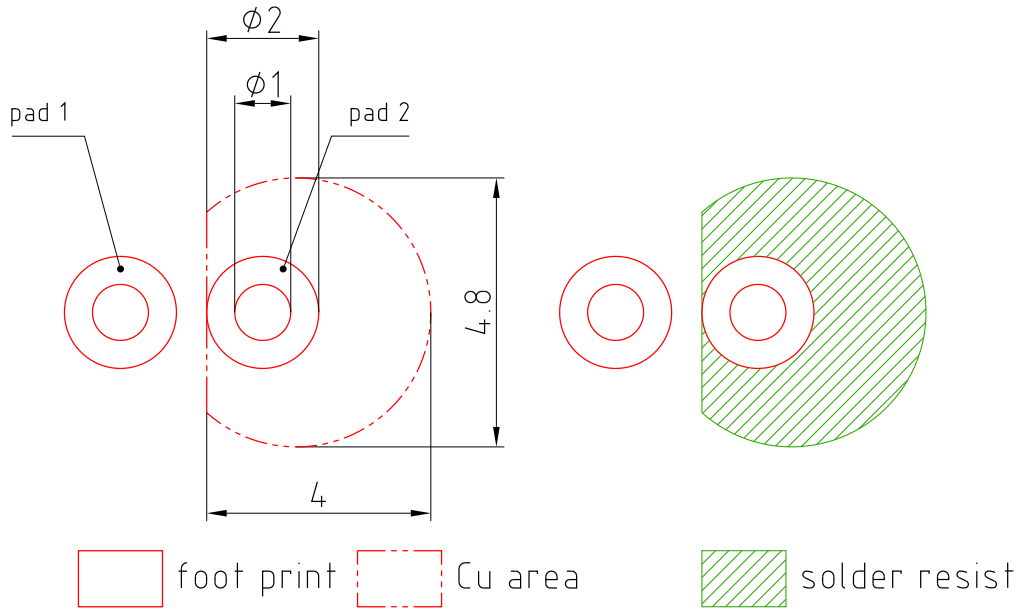
**Approximate Weight:**

0.2 g

**Note**

Packing information is available on the internet (online product catalog).

**Recommended Solder Pad**



E062.3010.188-01

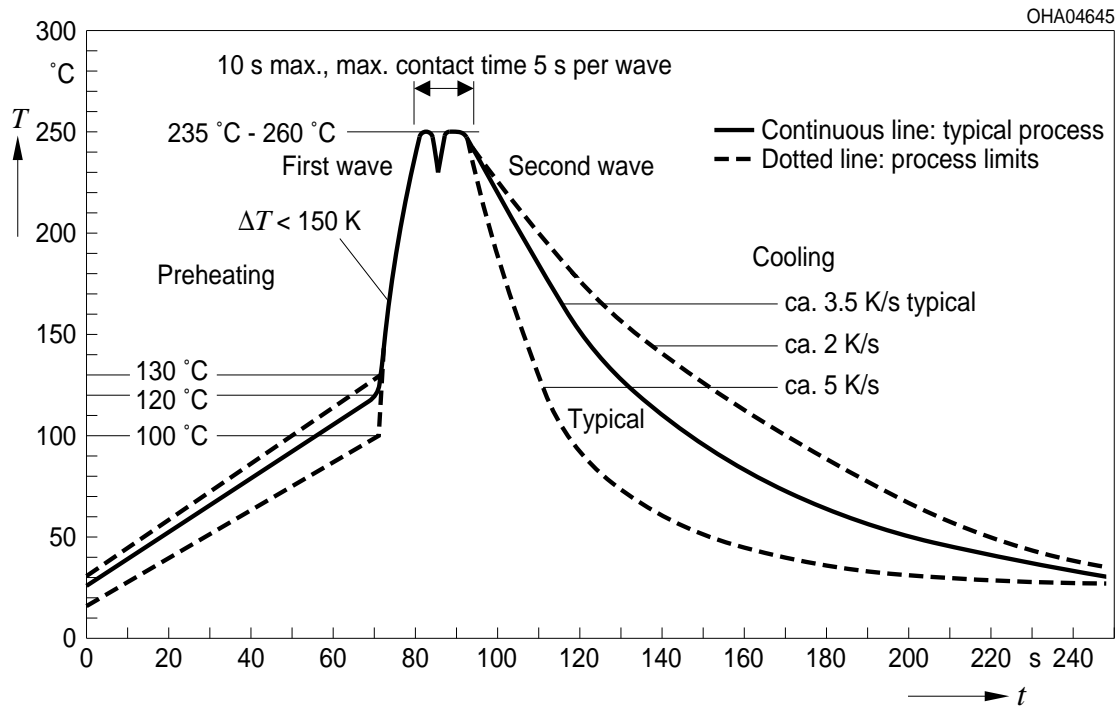
Dimensions in mm.

**Note:**

pad 1: emitter

**TTW Soldering**

IEC-61760-1 TTW

**Disclaimer**

Language english will prevail in case of any discrepancies or deviations between the two language wordings.

**Attention please!**

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**Glossary**

- <sup>1)</sup> **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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