

# Photodetektor mit Spannungsausgang Light to Voltage Converter

## SFH 5130



### Wesentliche Merkmale

- Integrierter Fotodetektor mit linearem Spannungsausgang
- Transparentes Plastikgehäuse mit 3 Pins
- Hohe Empfindlichkeit von 350 nm bis 1100 nm
- Runde Fotodiode

### Anwendungen

- Lichtschranken

### Features

- Integrated photodiode with linear voltage output
- Transparent sidelooker package with 3 pins
- High sensitivity from 350 nm to 1100 nm
- Circular photodiode

### Applications

- Photointerrupter

Typ Type	Bestellnummer Ordering Code	Gehäuse Package
SFH 5130	on request	Sidelooker Gehäuse Sidelooker Package

**Grenzwerte**  
**Maximum Ratings**

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Lagertemperatur Storage temperature range	$T_{\text{stg}}$	- 40 ... + 85	°C
Versorgungsspannung Supply Voltage	$V_{\text{DD}}$	6	V
Ausgangsspannung Output voltage	$V_{\text{OUT}}$	< $V_{\text{DD}}$	V
Elektrostatische Entladung Electrostatic Discharge Human Body Model according to EOS/ESD-5.1-1993	<i>ESD</i>	2	kV

**Empfohlener Arbeitsbereich**  
**Recommended Operating Conditions**

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Funktionstemperatur Operating Temperature	$T_{\text{op}}$	- 40	+ 25	+ 75	°C
Betriebsspannung Supply Voltage	$V_{\text{DD}}$	4.5	5	5.5	V
Kapazitive Ausgangslast Output load capacitance	$C_{\text{L}}$			30	nF

**Kennwerte** ( $T_{\text{A}} = 25 \text{ °C}$ ,  $V_{\text{DD}} = 5 \text{ V}$ ,  $R_{\text{L}} = 10 \text{ k}\Omega$ )

**Characteristics**

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Stromaufnahme, $E_{\text{e}} = 0$ Current consumption	$I_{\text{DD}}$	–	1.5	4.5	mA
Dunkelspannung Dark Voltage	$V_{\text{D}}$	–	1.2	15	mV
Spektraler Bereich der Fotoempfindlichkeit Spectral range of sensitivity	$\lambda$	350	–	1100	nm

**Kennwerte** ( $T_A = 25\text{ °C}$ ,  $V_{DD} = 5\text{ V}$ ,  $R_L = 10\text{ k}\Omega$ )

**Characteristics**

Bezeichnung Parameter	Symbol Symbol	Wert Value			Einheit Unit
		min.	typ.	max.	
Wellenlänge der max. Fotoempfindlichkeit Wavelength of max. photosensitivity	$\lambda_{s\text{ max}}$	–	770	–	nm
Durchmesser der aktiven Fläche Diameter of active area	$D$	–	0.75	–	mm
Empfindlichkeit <sup>1)</sup> , $\lambda = 428\text{ nm}$ Irradiance responsivity	$N_e$	–	1180	–	mV/ $\mu\text{W}/\text{cm}^2$
Ausgangsspannung <sup>1)</sup> Output Voltage, $E_e = 1.69\text{ }\mu\text{W}/\text{cm}^2$ , $\lambda = 428\text{ nm}$	$V_O$	1.0	–	3.2	V
Sättigungsspannung, $V_{DD} = 4.5\text{ V}$ , $E_e \geq 7\text{ }\mu\text{W}/\text{cm}^2$ Maximum output voltage swing	$V_{\text{sat}}$	4	4.47	–	V
Anstiegszeit <sup>2)</sup> , $E_e = 0$ to $E_e = 1.69\text{ }\mu\text{W}/\text{cm}^2$ Rise time	$t_r$	–	50	250	$\mu\text{s}$
Abfallzeit, $E_e = 1.69$ to $0\text{ }\mu\text{W}/\text{cm}^2$ Fall time	$t_f$	–	70	250	$\mu\text{s}$
Einschwingzeit, to 99% of nominal Settling time	$t_s$	–	90	–	$\mu\text{s}$
Temperaturkoeffizient der Dunkelspannung, $T = 5$ to $45\text{ °C}$ Temperature coefficient of dark voltage	$\alpha_{\text{vd}}$	– 100	$\pm 8$	+ 100	$\mu\text{V}/\text{K}$
Temperaturkoeffizient der Ausgangsspannung Temperature coefficient of output voltage $E_e = 1.69\text{ }\mu\text{W}/\text{cm}^2$ , $\lambda = 428\text{ nm}$ , $T = 5$ to $45\text{ °C}$	$\alpha_{\text{vo}}$	– 3	$\pm 1$	+ 3	mV/K
Power supply rejection ratio <sup>3)</sup> $f_{\text{ac}} = 100\text{ Hz}$ $f_{\text{ac}} = 1\text{ kHz}$	PSRR PSRR	–	45	–	dB dB
Output noise voltage $f = 0$ to $1\text{ kHz}$ $f = 10\text{ Hz}$ $f = 100\text{ Hz}$ $f = 1\text{ kHz}$		–	< 1	–	$\mu\text{V RMS}$ $\mu\text{V}/\text{Hz}^{(1/2)}$ $\mu\text{V}/\text{Hz}^{(1/2)}$ $\mu\text{V}/\text{Hz}^{(1/2)}$

<sup>1)</sup> The sensitivity is characterized using 428 nm LEDs as light source. A constant irradiance over the whole lens area is created.

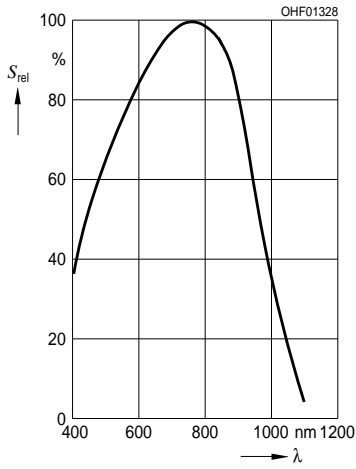
- 2) The light source used is a 428 nm LED with following characteristics:  $t_r > 1 \mu\text{s}$ ,  $t_f < 1 \mu\text{s}$ . The output waveform is monitored on an oscilloscope with  $t_r > 100 \text{ ns}$ ,  $Z_i = 1 \text{ M}\Omega$ ,  $C_i < 20 \text{ pF}$ . The rise time is defined as the time from the 10% to the 90% value, the fall time is defined as the time from the 90% to the 10% value.
- 3) PSRR is defined as  $20 \log (V_{DD}(f) / V_O(f))$  with  $V_{DD}(0 \text{ Hz}) = 4.5 \text{ V}$  and  $V_O(0 \text{ Hz}) = 2 \text{ V}$

### Lötbedingungen Soldering Conditions

Type	Dip, wave and drag soldering		
	Temperature of soldering bath	Max permissible soldering time	Distance between solder joint and package
SFH5130	260 s	10 s	1.5 mm

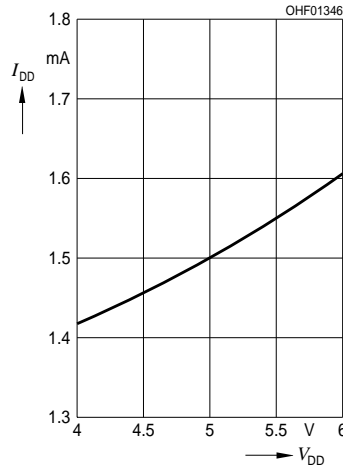
**Spectral Sensitivity**

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



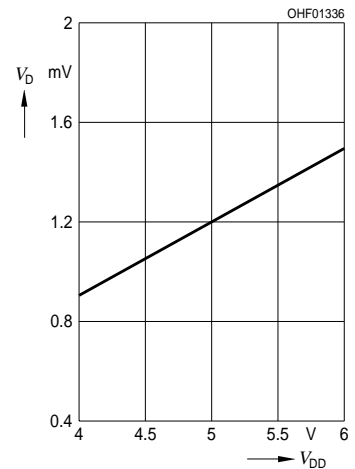
**Current Consumption**

$I_{DD} = f(V_{DD})$

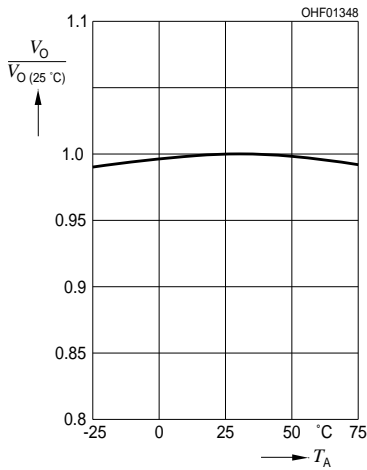


**Dark Voltage**

$V_D = f(V_{DD})$

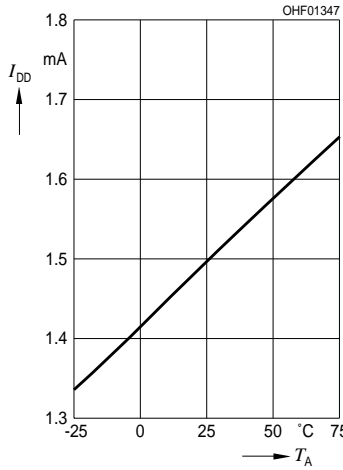


**Output Voltage,  $V_O = f(T_A)$ ,  
 $E_e = 1.69 \mu\text{W}/\text{cm}^2, \lambda = 428\text{nm}$**



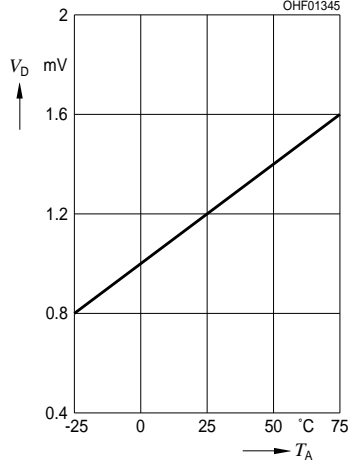
**Current Consumption**

$I_{DD} = f(T_A)$



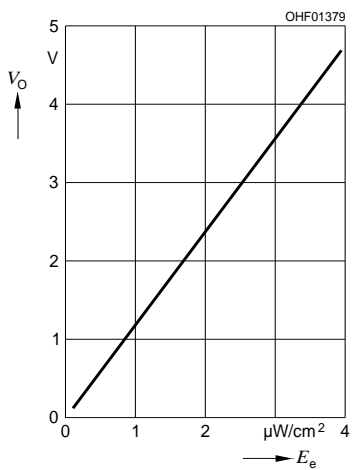
**Dark Voltage**

$V_D = f(T_A)$



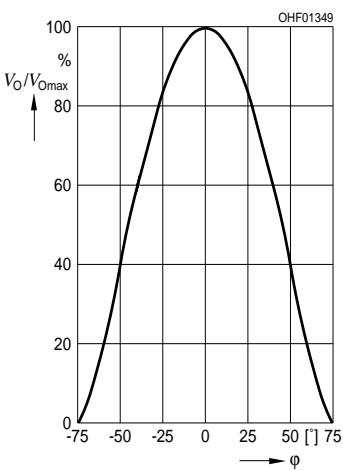
**Linearity**

$V_O = f(E_e)$

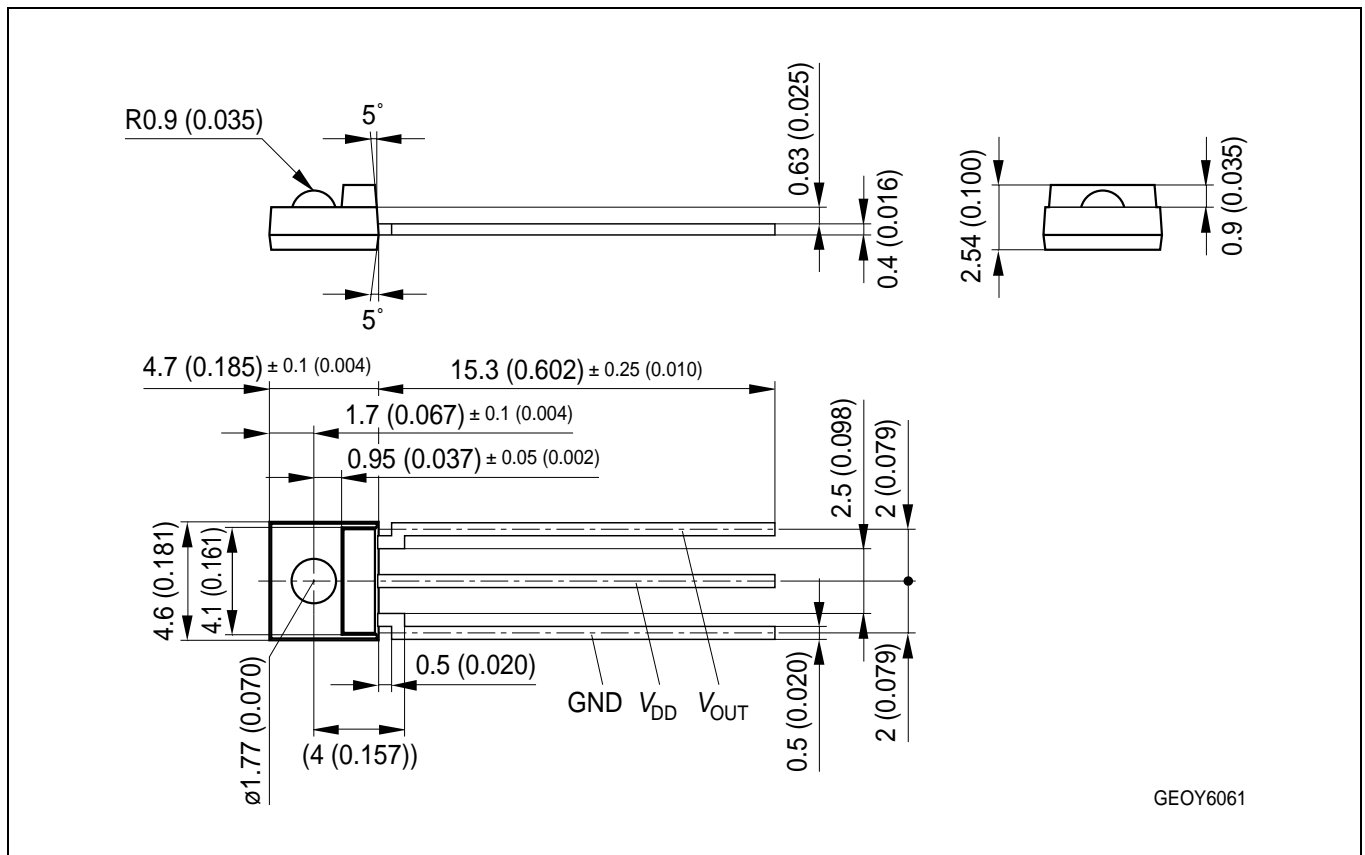


**Directional Characteristics**

$V_O = f(\phi)$



## Maßzeichnung Package Outlines



Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

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