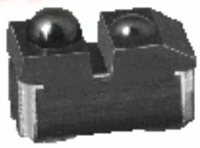
Reflective Sensor for Touchless Switch

Description

TCND3000 is a reflective optical sensor for applications using the HALIOS® (High Ambient Light Independent Optical System) principle. It consists of an infrared emitter and a photodetector forming the optical sensing path. According to the HALIOS principle a second infrared emitter is used for compensation of disturbing ambient light. Optoelectronic parameters of the sensor are matched to the corresponding integrated circuit E909.01, manufactured by ELMOS Semiconductor AG (www.elmos.de).



Features

- Package type: Surface mount
- Detector type: PIN Photodiode
- Dimensions:
  L 4.83 mm x W 2.54 mm x H 2.21 mm
- Peak operating distance: 20 mm
- Peak operating range: 10 mm to 20 mm
- Typical output current under test: I_C = 5.6 µA
- Lead (Pb)-free soldering released
- Lead (Pb)-free component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC
- Emitter wavelength 885 nm
- Daylight blocking filter
- Touch distance: 10 mm*)
- Proximity distance: 20 mm*)
- High ambient light suppression for sunlight: ≤ 200 klx
- High ambient light suppression for CIE standard illuminant A: ≤ 100 klx
- Minimum order quantity 800 pcs, 800 pcs/reel

*) Using E909.01 interface ASIC and Kodak grey card with 20 % diffuse reflection

Applications

- Optical switches for general purpose

Absolute Maximum Ratings

T_{amb} = 25 °C, unless otherwise specified

Sensor

Parameter	Test condition	Symbol	Value	Unit
Power dissipation	$T_{amb} \leq 25$ °C	P_V	180	mW
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 40 to + 85	°C
Thermal resistance junction/ambient		R_{thJA}	450	K/W
Soldering temperature	acc. figure 7	T_{sd}	260	°C

IR Emitter LEDS (Transmitter)

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_{RS}	5	V
Forward current		I_{FS}	50	mA
Peak forward current	T_s = 8 µs t_{ps} = 4 µs	I_{FS}	100	mA
Junction temperature		T_{js}	105	°C

IR Emitter LEDC (Compensation)

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_{RC}	5	V
Forward current		I_{FC}	50	mA
Peak forward current	T_s = 8 µs t_{pc} = 4 µs	I_{FC}	100	mA
Junction temperature		T_{js}	105	°C

Detector

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		V_{RD}	5	V
Junction temperature		T_{jD}	105	°C

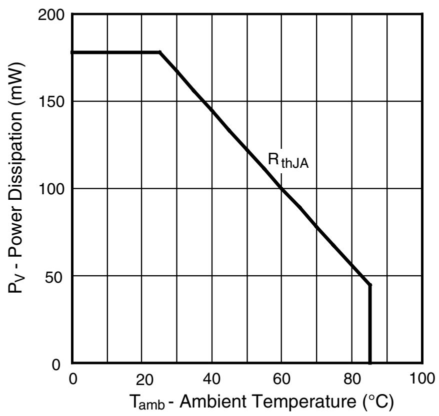


Figure 1. Power Dissipation Limit vs. Ambient Temperature

Electrical Characteristics

T_{amb} = 25 °C, unless otherwise specified

Sensor

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Light current	Kodak Grey Card 20 % diffuse reflection distance: 1 cm I_{FS} = 10 mA	I_{CA}		1.2		µA
Optical crosstalk sensing path	no reflective medium I_{FS} = 10 mA	I_{CA}		0.9		µA
Compensation current	I_{FC} = 2 mA	I_{CR}		5		µA

IR Emitter LEDS (Transmitter)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_{FS} = 10 mA t_p = 20 ms	V_{FS}		1.3		V
Reverse voltage	I_{RS} = 10 µA	V_{RS}	5			V
Junction capacitance		C_{jS}		50		pF
Radiant intensity	I_{FS} = 10 mA t_p = 20 ms	I_e		2	22	mW/sr
Angle of half intensity		φ_S		± 20		deg
Peak wavelength	I_{FS} = 10 mA	λ_{ps}	875	885		nm
Spectral bandwidth	I_{FS} = 10 mA	$\Delta\lambda_s$		42		nm
Virtual source diameter	DIN EN ISO 1146/1:2005	Ø		1.4		mm

IR Emitter LEDC (Compensation)

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_{FC} = 10 mA t_{pC} = 20 ms	V_{FC}		1.3		V
Reverse voltage	I_{RC} = 10 µA	V_{RC}	5			V
Junction capacitance		C_{jC}		50		pF
Peak wavelength	I_{FC} = 10 mA	λ_{pC}		885		nm
Spectral bandwidth	I_{FC} = 10 mA	$\Delta\lambda_C$		42		nm

Detector

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I_{FD} = 50 mA	V_{FD}		1.0	1.3	V
Breakdown voltage	I_{RD} = 100 µA E = 0	$V_{(BR)}$	5			V
Reverse dark current	V_{RD} = 10 V, E = 0	I_{r0}		1	10	nA
Reverse light current	E_e = 1 mW/cm^2 λ = 870 nm V_{RD} = 5 V	I_{ra}		5.6		µA
Temp. coefficient of I_{ra}	V_{RD} = 5 V λ = 870 nm	TK_{Ira}		0.2		%/K
Angle of half sensitivity		φ_D		± 20		deg
Wavelength of peak sensitivity		λ_p		910		nm
Range of spectral bandwidth		$\lambda_{0.5}$		790...1020		nm

Typical Characteristics

T_{amb} = 25 °C unless otherwise specified

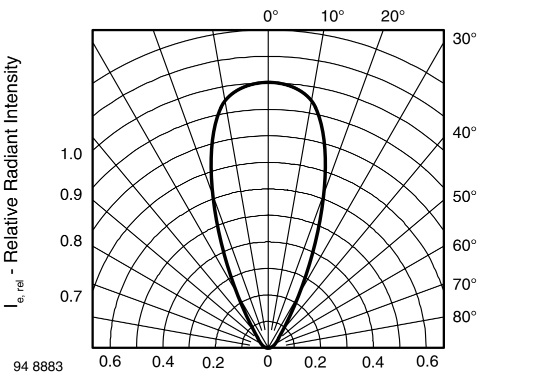


Figure 2. Relative Radiant Intensity vs. Angular Displacement

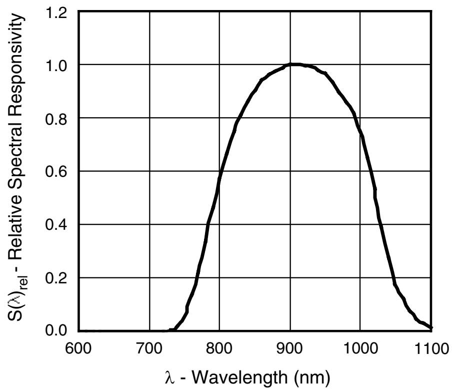


Figure 4. Relative Spectral Sensitivity vs. Wavelength

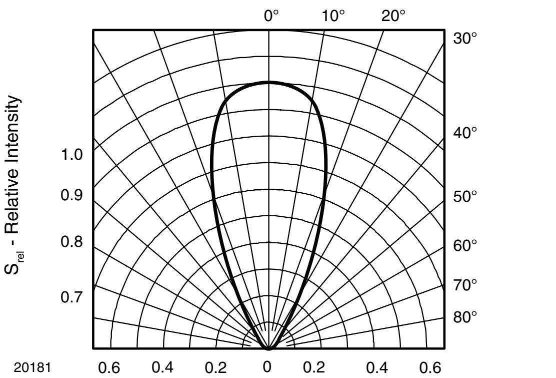


Figure 3. Relative Radiant Sensitivity vs. Angular Displacement

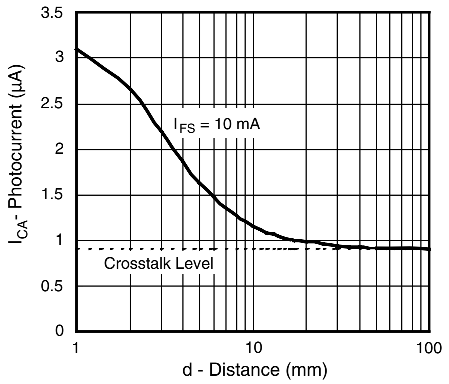


Figure 5. Photocurrent vs. Distance

Application Circuit

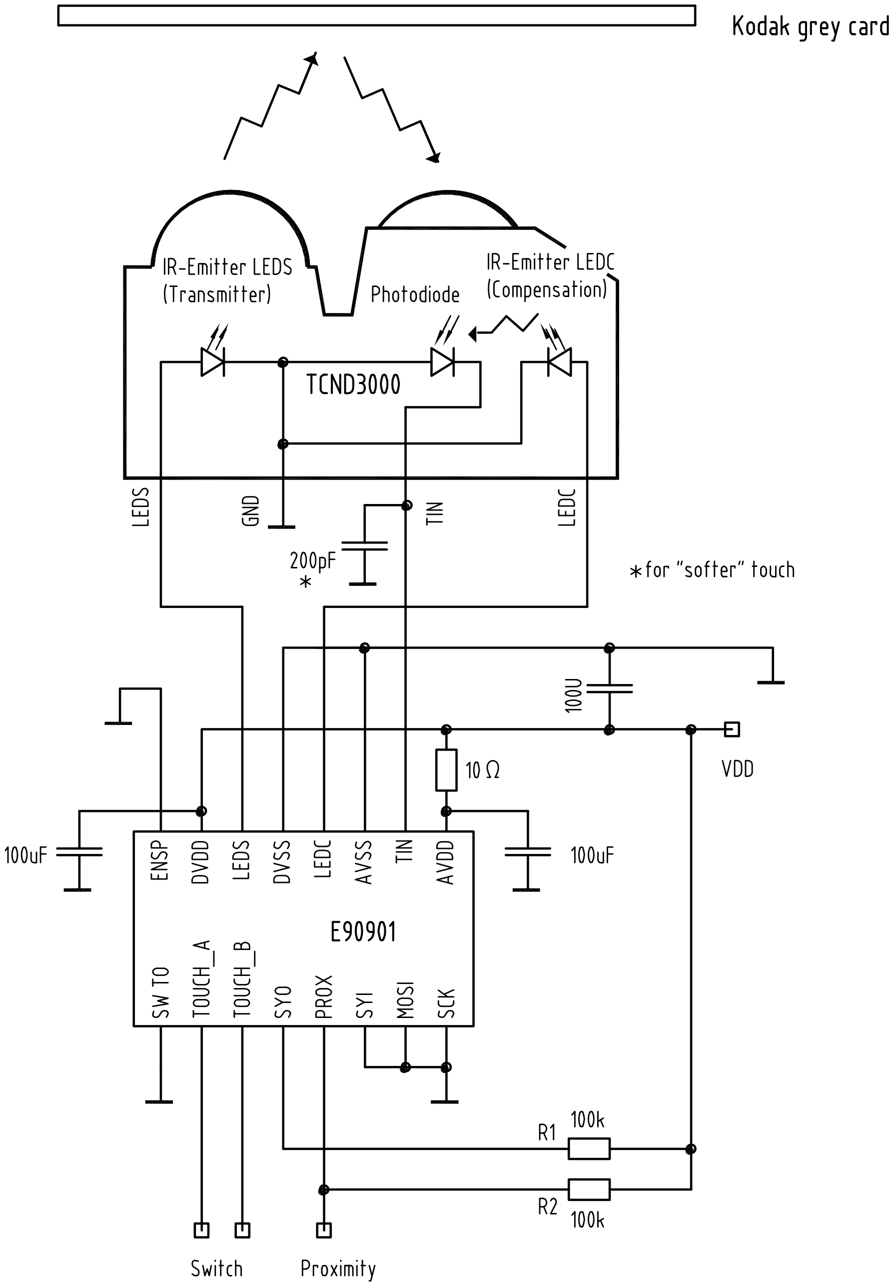
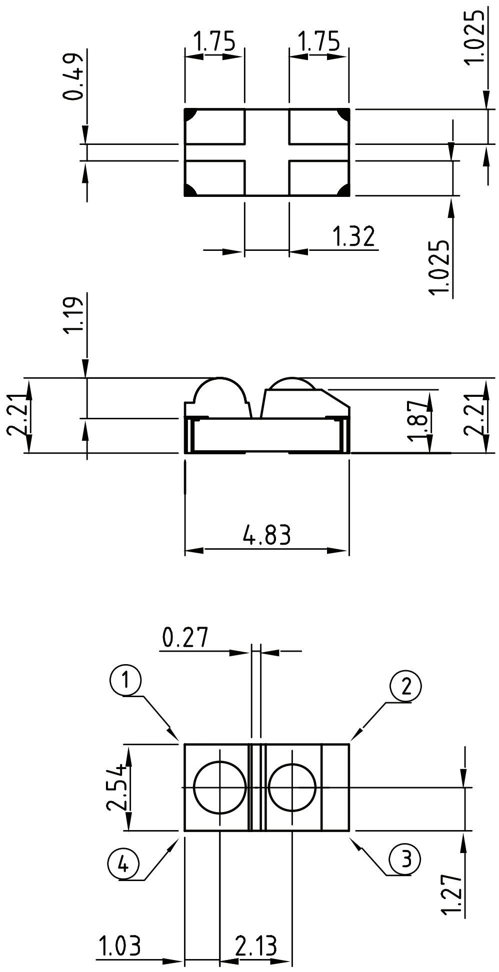


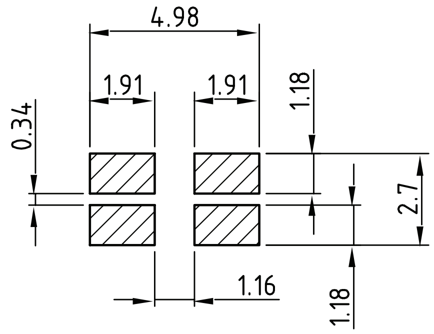
Figure 6. Test circuit

Dimensions

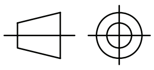
Backside Contact Metalization



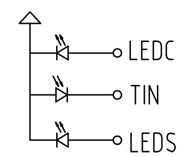
Recommened PCB Footprint



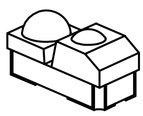
PIN	ID	FUNCTION	DESCRIPTION
1	①	LEDS	Transmit LED
2	②	TIN	Receiver Output
3	③	LEDC	Compensation LED
4	④	GND	Ground



technical drawings according to DIN specifications



SCHEMATIC



Dimensions in mm

Not indicated tolerances ±0.2

Drawing-No.: 6.550-5265.01-4

Issue: 2; 25.10.04

Reflow Solder Profiles

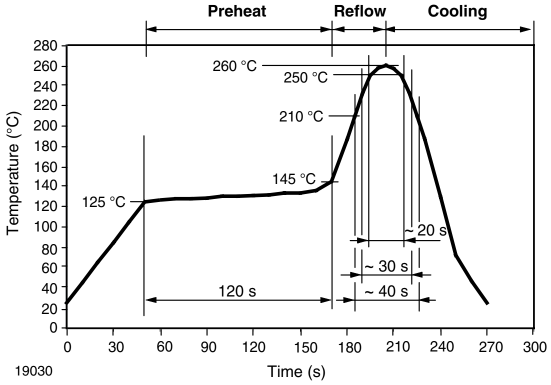


Figure 7. Lead (Pb)-Free (Sn) Reflow Solder Profile

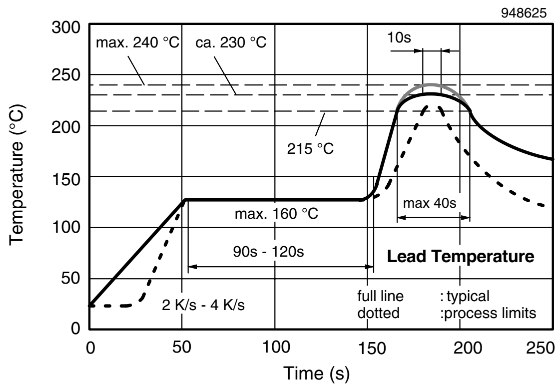


Figure 8. Lead Tin (SnPb) Reflow Solder Profile

Drypack

Devices are packed in moisture barrier bags (MBB) to prevent products from moisture absorption during transportation and storage. Each bag contains a desiccant.

Floor Life

Floor life (time between soldering and removing from MBB) must not exceed the time indicated in J-STD-020. TCND3000 is released for: Moisture Sensitivity Level 4, according to JEDEC, J-STD-020.
Floor Life: 72 h
Conditions: T_{amb} < 30 °C, RH < 60 %

Drying

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or label. Devices taped on reel dry using recommended conditions 192 h at 40 °C (± 5 °C), RH < 5 % or 96 h at 65 °C (± 5 °C), RH < 5 %.

Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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