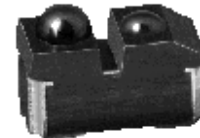


## Reflective Sensor for Touchless Switch

### 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](http://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:  $I_C = 5.6 \mu A$
- 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:  
 $\leq 200 \text{ klx}$
- High ambient light suppression for CIE standard illuminant A:  $\leq 100 \text{ klx}$
- 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

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

#### Sensor

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

#### IR Emitter LEDES (Transmitter)

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		$V_{RS}$	5	V
Forward current		$I_{FS}$	50	mA
Peak forward current	$T_s = 8\text{ }\mu\text{s}$ $t_{ps} = 4\text{ }\mu\text{s}$	$I_{FS}$	100	mA
Junction temperature		$T_{js}$	105	$^{\circ}\text{C}$

#### 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	$T_s = 8\text{ }\mu\text{s}$ $t_{pc} = 4\text{ }\mu\text{s}$	$I_{FC}$	100	mA
Junction temperature		$T_{js}$	105	$^{\circ}\text{C}$

#### Detector

Parameter	Test condition	Symbol	Value	Unit
Reverse voltage		$V_{RD}$	5	V
Junction temperature		$T_{jD}$	105	$^{\circ}\text{C}$

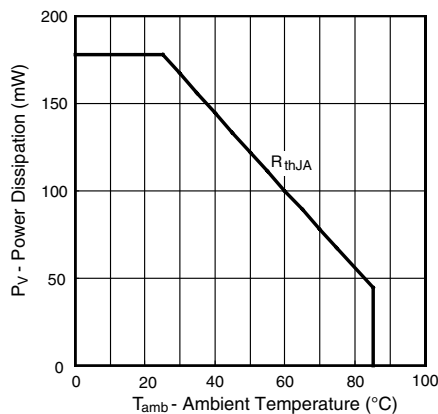


Figure 1. Power Dissipation Limit vs. Ambient Temperature

**Electrical Characteristics**T<sub>amb</sub> = 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 <sub>FS</sub> = 10 mA	I <sub>CA</sub>		1.2		μA
Optical crosstalk sensing path	no reflective medium I <sub>FS</sub> = 10 mA	I <sub>CA</sub>		0.9		μA
Compensation current	I <sub>FC</sub> = 2 mA	I <sub>CR</sub>		5		μA

**IR Emitter LEDs (Transmitter)**

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I <sub>FS</sub> = 10 mA t <sub>p</sub> = 20 ms	V <sub>FS</sub>		1.3		V
Reverse voltage	I <sub>RS</sub> = 10 μA	V <sub>RS</sub>	5			V
Junction capacitance		C <sub>JS</sub>		50		pF
Radiant intensity	I <sub>FS</sub> = 10 mA t <sub>p</sub> = 20 ms	I <sub>e</sub>		2	22	mW/sr
Angle of half intensity		φ <sub>S</sub>		± 20		deg
Peak wavelength	I <sub>FS</sub> = 10 mA	λ <sub>ps</sub>	875	885		nm
Spectral bandwidth	I <sub>FS</sub> = 10 mA	Δλ <sub>s</sub>		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 <sub>FC</sub> = 10 mA t <sub>pC</sub> = 20 ms	V <sub>FC</sub>		1.3		V
Reverse voltage	I <sub>RC</sub> = 10 μA	V <sub>RC</sub>	5			V
Junction capacitance		C <sub>JC</sub>		50		pF
Peak wavelength	I <sub>FC</sub> = 10 mA	λ <sub>pC</sub>		885		nm
Spectral bandwidth	I <sub>FC</sub> = 10 mA	Δλ <sub>C</sub>		42		nm

**Detector**

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Forward voltage	I <sub>FD</sub> = 50 mA	V <sub>FD</sub>		1.0	1.3	V
Breakdown voltage	I <sub>RD</sub> = 100 μA E = 0	V <sub>(BR)</sub>	5			V
Reverse dark current	V <sub>RD</sub> = 10 V, E = 0	I <sub>r0</sub>		1	10	nA
Reverse light current	E <sub>e</sub> = 1 mW/cm <sup>2</sup> λ = 870 nm V <sub>RD</sub> = 5 V	I <sub>ra</sub>		5.6		μA
Temp. coefficient of I <sub>ra</sub>	V <sub>RD</sub> = 5 V λ = 870 nm	TK <sub>Ira</sub>		0.2		%/K
Angle of half sensitivity		φ <sub>D</sub>		± 20		deg
Wavelength of peak sensitivity		λ <sub>p</sub>		910		nm
Range of spectral bandwidth		λ <sub>0.5</sub>		790...1020		nm

## Typical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

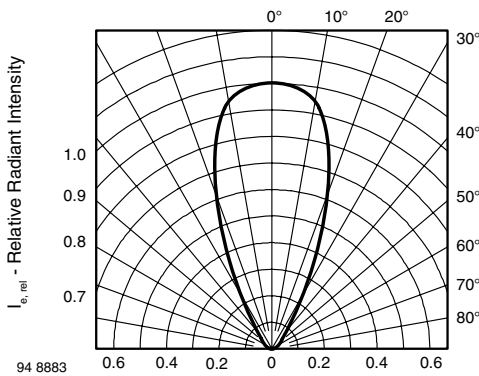


Figure 2. Relative Radiant Intensity vs. Angular Displacement

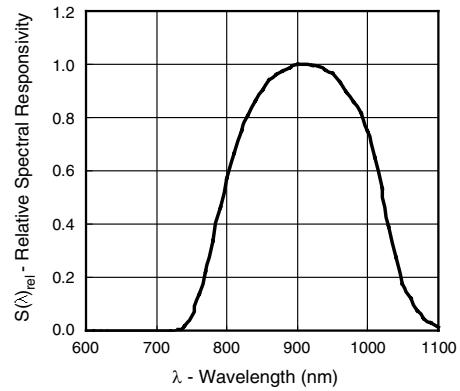


Figure 4. Relative Spectral Sensitivity vs. Wavelength

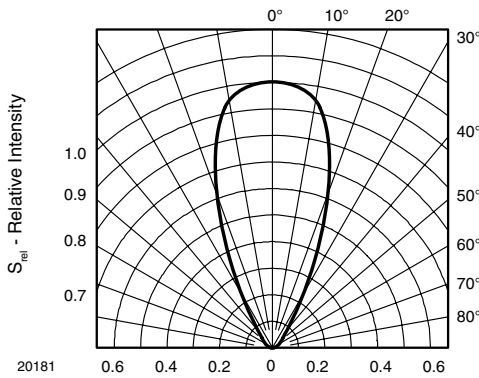


Figure 3. Relative Radiant Sensitivity vs. Angular Displacement

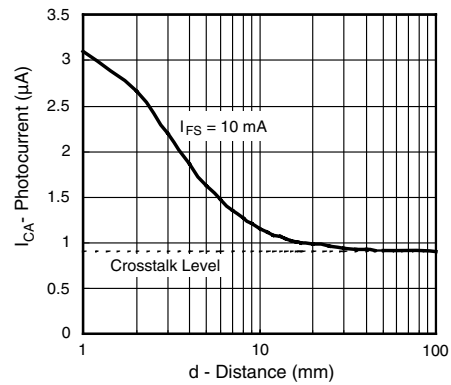


Figure 5. Photocurrent vs. Distance

**Application Circuit**

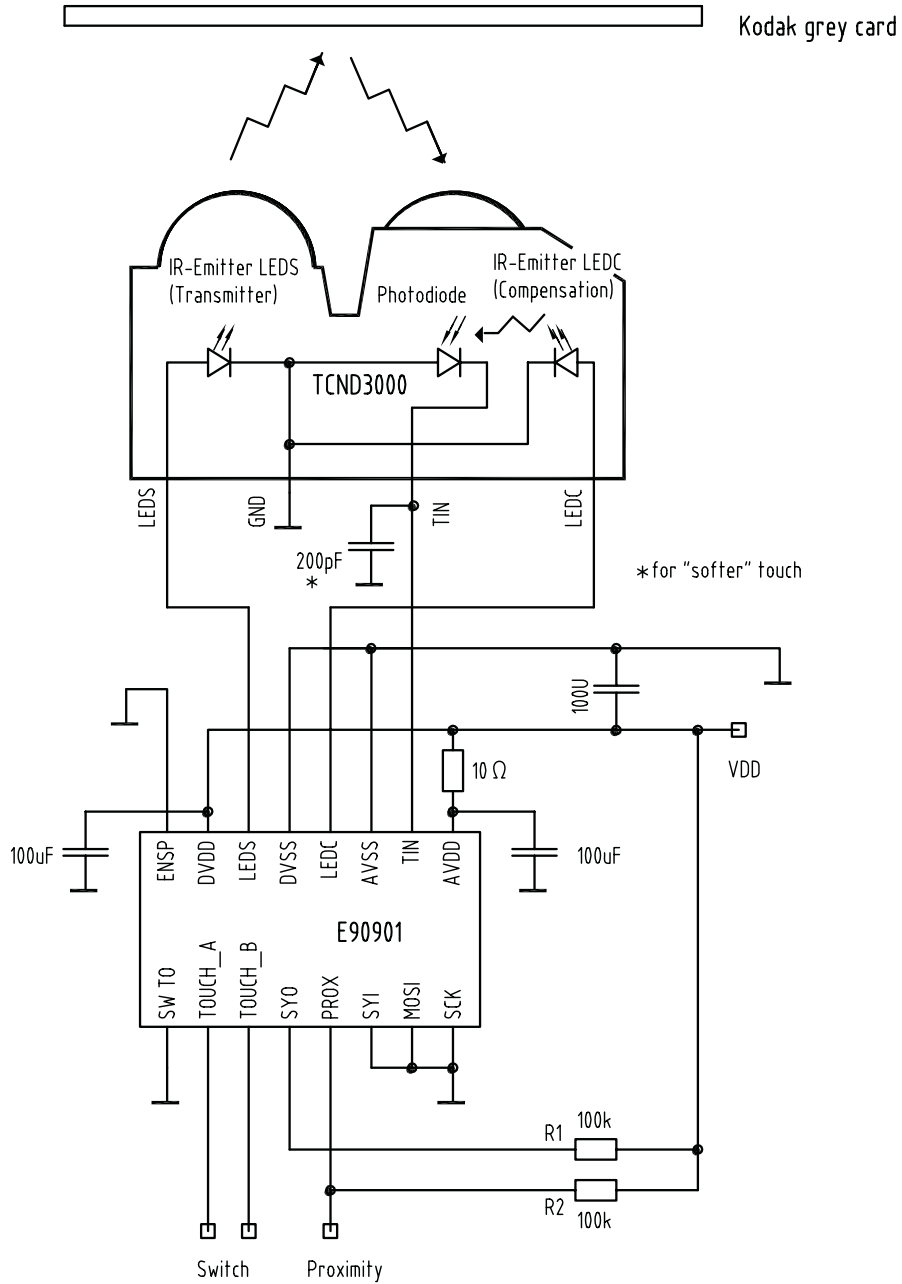
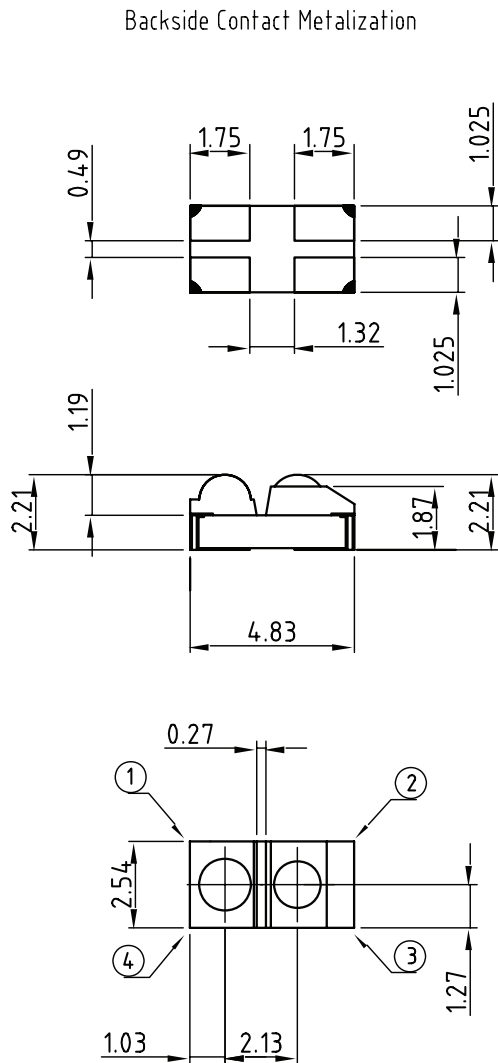
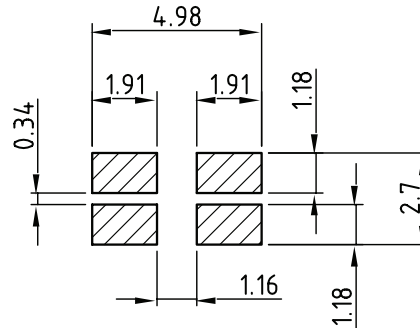


Figure 6. Test circuit

## Dimensions

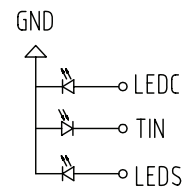


Recommended PCB Footprint

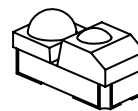


PIN	ID	FUNCTION	DESCRIPTION
1	①	LEDS	Transmit LED
2	②	TIN	Receiver Output
3	③	LEDC	Compensation LED
4	④	GND	Ground

technical drawings according to DIN specifications



SCHEMATIC



Dimensions in mm  
 Not indicated tolerances  $\pm 0.2$   
 Drawing-No.: 6.550-5265.01-4  
 Issue: 2; 25.10.04

## Reflow Solder Profiles

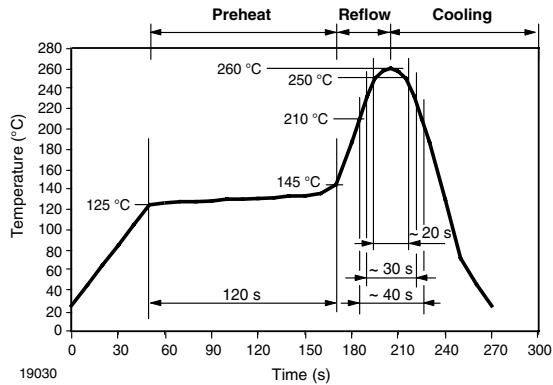


Figure 7. Lead (Pb)-Free (Sn) Reflow Solder Profile

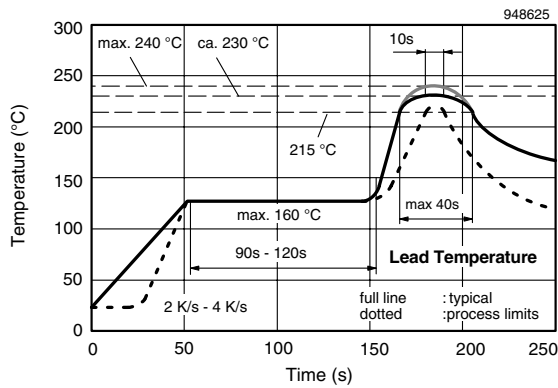


Figure 8. Lead Tin (SnPb) Reflow Solder Profile

## 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:  $T_{amb} < 30\text{ °C}$ ,  $RH < 60\%$

## 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 ( $\pm 5\text{ °C}$ ),  $RH < 5\%$  or 96 h at 65 °C ( $\pm 5\text{ °C}$ ),  $RH < 5\%$ .

### 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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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





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