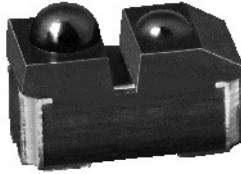


## Reflective Sensor for Touchless Switch



84606 3D

### 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 x W x H in mm): 4.83 x 2.54 x 2.21
- 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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Emitter wavelength: 885 nm
- Daylight blocking filter
- Touch distance: 10 mm <sup>(1)</sup>
- Proximity distance: 20 mm <sup>(1)</sup>
- High ambient light suppression for sunlight:  $\leq 200 \text{ klx}$
- High ambient light suppression for CIE standard illuminant A:  $\leq 100 \text{ klx}$


**RoHS**  
COMPLIANT

### Note

<sup>(1)</sup> Using E909.01 interface ASIC and Kodak grey card with 20 % diffuse reflection

### APPLICATIONS

- Optical switches for general purpose

### PRODUCT SUMMARY

PART NUMBER	DISTANCE FOR MAXIMUM CTR <sub>rel</sub> <sup>(1)</sup> (mm)	DISTANCE RANGE FOR RELATIVE I <sub>out</sub> > 20 % (mm)	TYPICAL OUTPUT CURRENT UNDER TEST <sup>(2)</sup> (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCND3000	0	Not applicable	IC interface	Yes

### Notes

<sup>(1)</sup> CTR: current transfere ratio,  $I_{out}/I_{in}$

<sup>(2)</sup> Conditions like in table basic characteristics/sensors

### ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME <sup>(1)</sup>	REMARKS
TCND3000	Tape and reel	MOQ: 800 pcs, 800 pcs/reel	Drypack

### Note

<sup>(1)</sup> MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>SENSOR</b>				
Power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	$P_V$	180	mW
Storage temperature range		$T_{stg}$	- 40 to + 100	$^{\circ}\text{C}$
Ambient temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}\text{C}$
Thermal resistance junction/ambient		$R_{thJA}$	450	K/W
Soldering temperature	Acc. fig. 7	$T_{sd}$	260	$^{\circ}\text{C}$
<b>IR EMITTER LEDS (TRANSMITTER)</b>				
Reverse voltage		$V_{RS}$	5	V
Forward current		$I_{FS}$	50	mA
Peak forward current	$t_{ps} = 4\text{ }\mu\text{s}, t_S = 8\text{ }\mu\text{s}$	$I_{FS}$	100	mA
Junction temperature		$T_{JS}$	105	$^{\circ}\text{C}$
<b>IR EMITTER LEDC (COMPENSATION)</b>				
Reverse voltage		$V_{RC}$	5	V
Forward current		$I_{FC}$	50	mA
Peak forward current	$t_{pc} = 4\text{ }\mu\text{s}, t_S = 8\text{ }\mu\text{s}$	$I_{FC}$	100	mA
Junction temperature		$T_{JC}$	105	$^{\circ}\text{C}$
<b>DETECTOR</b>				
Reverse voltage		$V_{RD}$	5	V
Junction temperature		$T_{JD}$	105	$^{\circ}\text{C}$

**Note**

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

**ABSOLUTE MAXIMUM RATINGS**

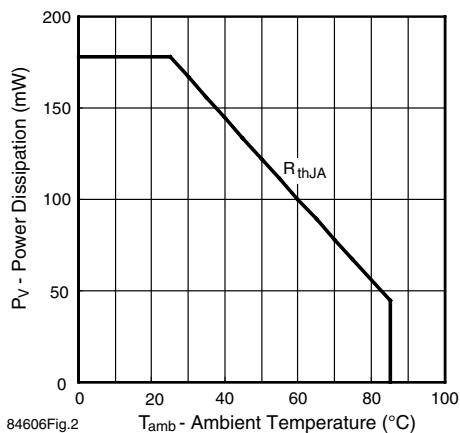


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

BASIC CHARACTERISTICS (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>SENSOR</b>						
Light Current	Kodak grey card, 20 % diffuse reflection, distance: 1 cm, $I_{FS} = 10\text{ mA}$	$I_{CA}$		1.2		$\mu\text{A}$
Optical crosstalk sensing path	no reflective medium, $I_{FS} = 10\text{ mA}$	$I_{CA}$		0.9		$\mu\text{A}$
Compensation current	$I_{FC} = 2\text{ mA}$	$I_{CR}$		5		$\mu\text{A}$

<b>BASIC CHARACTERISTICS (1)</b>						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>IR EMITTER LEDS (TRANSMITTER)</b>						
Forward voltage	$I_{FS} = 10 \text{ mA}$ , $t_p = 20 \text{ ms}$	$V_{FS}$		1.3		V
Reverse voltage	$I_{RS} = 10 \text{ }\mu\text{A}$	$V_{RS}$	5			V
Junction capacitance		$C_{js}$		50		pF
Radiant intensity	$I_{FS} = 10 \text{ mA}$ , $t_p = 20 \text{ ms}$	$I_e$		2	22	mW/sr
Angle of half intensity		$\phi_S$		$\pm 20$		deg
Peak wavelength	$I_{FS} = 10 \text{ mA}$	$\lambda_{pS}$	875	885		nm
Spectral bandwidth	$I_{FS} = 10 \text{ mA}$	$\Delta\lambda_S$		42		nm
Virtual source diameter	DIN EN ISO 1146/1:2005	d		1.4		mm
<b>IR EMITTER LEDC (COMPENSATION)</b>						
Forward voltage	$I_{FC} = 10 \text{ mA}$ , $t_{pC} = 20 \text{ ms}$	$V_{FC}$		1.3		V
Reverse voltage	$I_{RC} = 10 \text{ }\mu\text{A}$	$V_{RC}$	5			V
Junction capacitance		$C_{jC}$		50		pF
Peak wavelength	$I_{FC} = 10 \text{ mA}$	$\lambda_{pC}$		885		nm
Spectral bandwidth	$I_{FC} = 10 \text{ mA}$	$\Delta\lambda_C$		42		nm
<b>DETECTOR</b>						
Forward voltage	$I_{FD} = 50 \text{ mA}$	$V_{FD}$		1	1.3	V
Breakdown voltage	$I_{RD} = 100 \text{ }\mu\text{A}$ , $E = 0 \text{ lx}$	$V_{BR}$	5			V
Reverse dark current	$V_{RD} = 10 \text{ V}$ , $E = 0 \text{ lx}$	$I_{r0}$		1	10	nA
Reverse light current	$E_e = 1 \text{ mW/cm}^2$ , $\lambda = 870 \text{ nm}$ , $V_{RD} = 5 \text{ V}$	$I_{ra}$		5.6		$\mu\text{A}$
Temperature coefficient of $I_{ra}$	$\lambda = 870 \text{ nm}$ , $V_{RD} = 5 \text{ V}$	$TK_{Ira}$		0.2		%/K
Angle of half intensity		$\phi_D$		$\pm 20$		deg
Wavelength of peak sensitivity		$\lambda_p$		910		nm
Range of spectral bandwidth		$\lambda_{0.5}$		790 to 1020		nm

**Note**

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

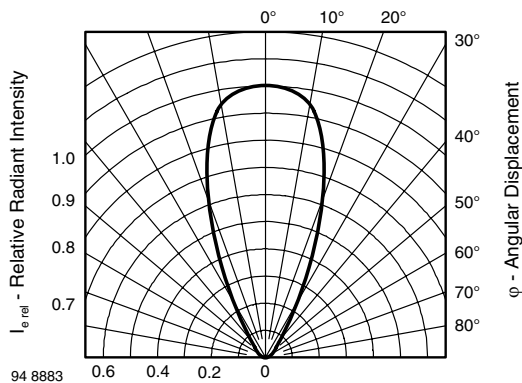
**BASIC CHARACTERISTICS**
 $T_{amb} = 25 \text{ }^\circ\text{C}$ , unless otherwise specified


Fig. 2 - Relative Radiant Intensity vs. Angular Displacement

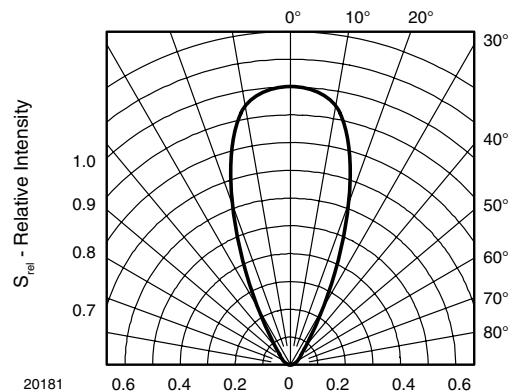
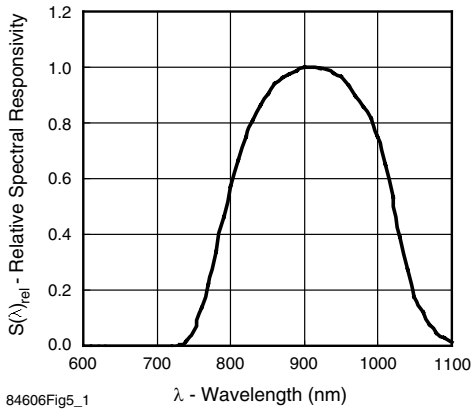
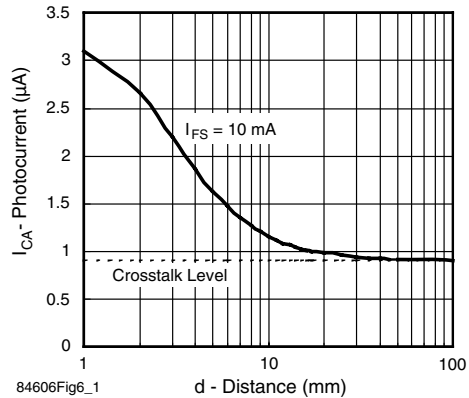


Fig. 3 - Relative Radiant Sensitivity vs. Angular Displacement

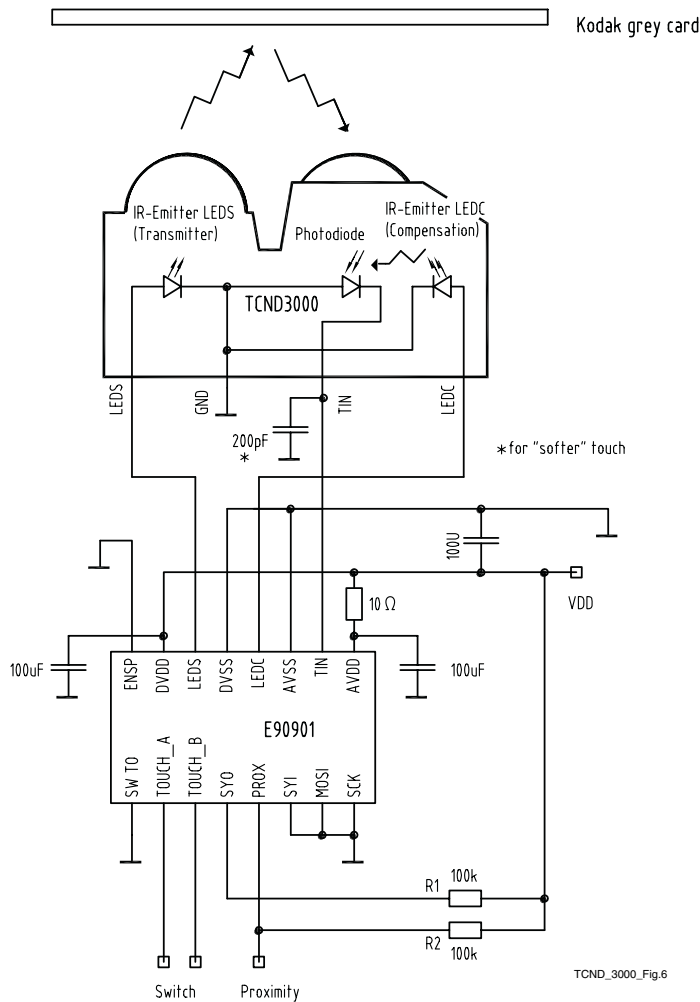


84606Fig5\_1  
Fig. 4 - Relative Spectral Sensitivity vs. Wavelength



84606Fig6\_1  
Fig. 5 - Photocurrent vs. Distance

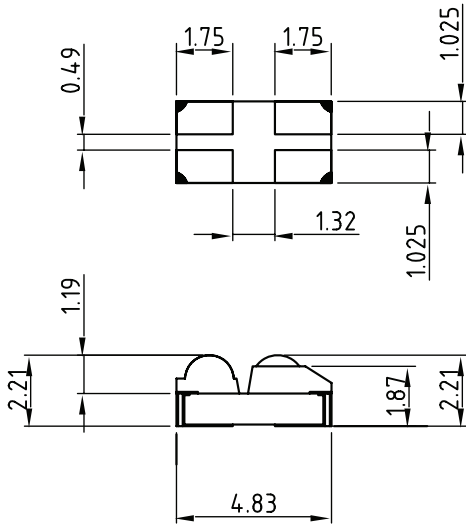
## APPLICATION CIRCUIT



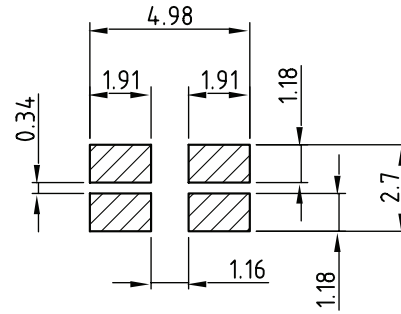
TCND\_3000\_Fig.6  
Fig. 6 - Test Circuit

### PACKAGE DIMENSIONS in millimeters

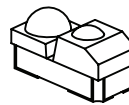
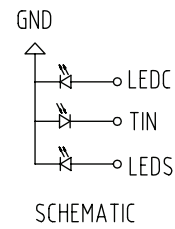
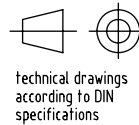
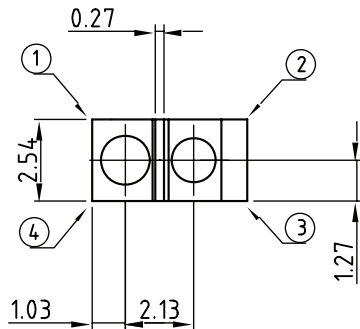
Backside Contact Metalization



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



Not indicated tolerances  $\pm 0.2$

Drawing-No.: 6.550-5265.01-4

Issue: 2; 25.10.04

84606 Dimensions

**REFLOW SOLDER PROFILES**

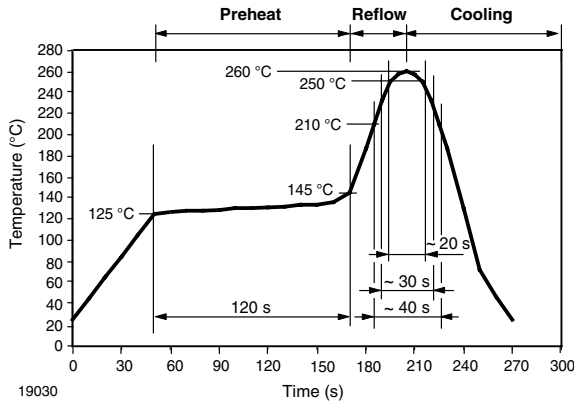


Fig. 7 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

**DRYPACK**

Devices are packed in moisture barrier bags (MBB) to prevent the 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 on MBB label:  
 Floor life: 4 weeks  
 Conditions:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ ,  $\text{RH} < 60\%$   
 Moisture sensitivity level 2a, acc. to J-STD-020.

**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  $40\text{ }^{\circ}\text{C}$  (+  $5\text{ }^{\circ}\text{C}$ ),  $\text{RH} < 5\%$ .

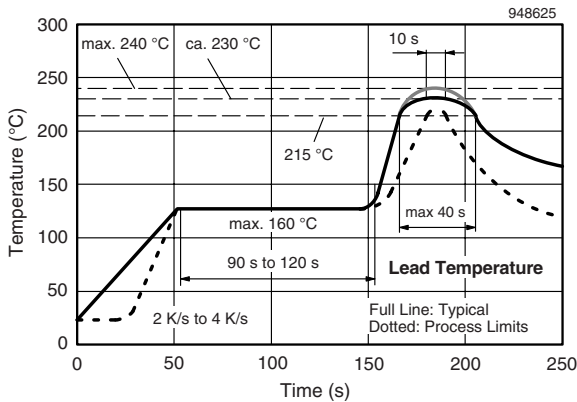


Fig. 8 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020



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