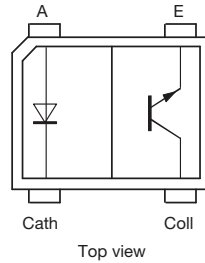


## Reflective Optical Sensor with Transistor Output



17091-2



### FEATURES

- Package type: SMD
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 3.4 x 2.7 x 1.5
- Operating range within > 20 % relative collector current: 0.2 mm to 5 mm
- Emitter wavelength: 940 nm
- Moisture sensitivity level (MSL): 3
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### DESCRIPTION

The TCNT2000 is a reflective sensor in a miniature SMD package. It has a compact construction where the emitting light source and the detector are arranged in the same plane. The operating infrared wavelength is 940 nm. The detector consists of a silicon phototransistor. The sensor analog output signal (photo current) is triggered by detection of reflected infrared light from a close by object.

The sensor has a built in daylight blocking filter, which greatly suppresses disturbing ambient light and therefore increases signal to noise ratio.

### APPLICATIONS

- Position sensor
- Optical switch
- Optical encoder (e.g. disc and tape drives for DVD and/or camera applications)
- Object detection (e.g. paper presence in printer and copy machines)

### PRODUCT SUMMARY

PART NUMBER	DISTANCE FOR MAXIMUM CTR <sub>rel</sub> (1) (mm)	DISTANCE RANGE FOR RELATIVE I <sub>out</sub> > 20 % (mm)	TYPICAL OUTPUT CURRENT UNDER TEST (2) (mA)	DAYLIGHT BLOCKING FILTER INTEGRATED
TCNT2000	1	0.2 to 5	1.5	Yes

#### Notes

(1) CTR: current transference ratio, I<sub>out</sub>/I<sub>in</sub>

(2) Conditions like in table basic characteristics/sensors

### ORDERING INFORMATION

ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
TCNT2000	Tape and reel	MOQ: 1000 pcs	Drypack, MSL 3

#### Note

(1) MOQ: minimum order quantity

### ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT (EMITTER)</b>				
Reverse voltage		V <sub>R</sub>	5	V
Forward current		I <sub>F</sub>	100	mA
Forward surge current	t <sub>p</sub> ≤ 100 μs	I <sub>FSM</sub>	500	mA
<b>OUTPUT (DETECTOR)</b>				
Collector emitter breakdown voltage		V <sub>(BR)CEO</sub>	20	V
Emitter collector voltage		V <sub>ECO</sub>	7	V
Collector current		I <sub>C</sub>	20	mA
<b>SENSOR</b>				
Total power dissipation	T <sub>amb</sub> ≤ 25 °C	P <sub>tot</sub>	170	mW
Ambient temperature range		T <sub>amb</sub>	- 40 to + 85	°C
Storage temperature range		T <sub>stg</sub>	- 40 to + 100	°C
Soldering temperature	In accordance with fig. 11	T <sub>sd</sub>	260	°C

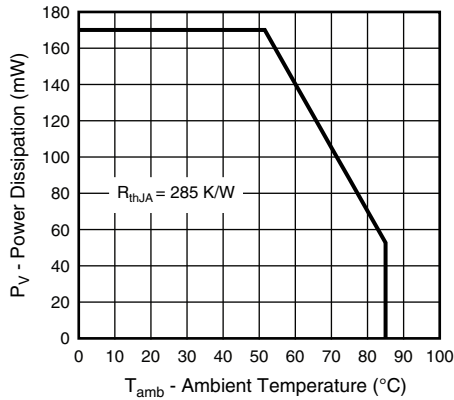
**ABSOLUTE MAXIMUM RATINGS**


Fig. 1 - Power Dissipation vs. Ambient Temperature

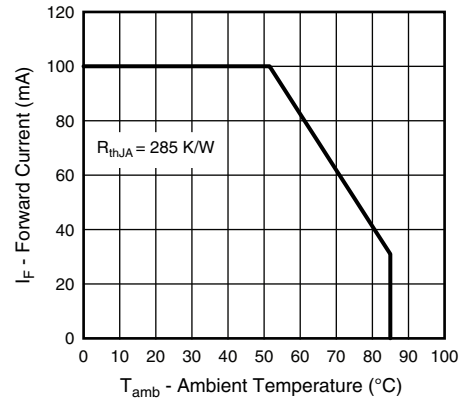


Fig. 2 - Forward Current vs. Ambient Temperature

<b>BASIC CHARACTERISTICS</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT (EMITTER)</b>						
Forward voltage	I <sub>F</sub> = 20 mA	V <sub>F</sub>		1.25	1.45	V
	I <sub>F</sub> = 100 mA			1.4	1.7	
Temperature coefficient of V <sub>F</sub>	I <sub>F</sub> = 20 mA	TKV <sub>F</sub>		- 1.0		mV/K
Peak wavelength	I <sub>F</sub> = 100 mA	λ <sub>P</sub>		940		nm
Reverse current	V <sub>R</sub> = 5 V	I <sub>R</sub>			10	μA
<b>OUTPUT (DETECTOR)</b>						
Collector emitter breakdown voltage	I <sub>C</sub> = 0.1 mA, E = 0	V <sub>(BR)CEO</sub>	20			V
Emitter collector voltage	I <sub>E</sub> = 100 μA, E = 0	V <sub>ECO</sub>	7			V
Collector emitter dark current	V <sub>CE</sub> = 20 V, E = 0	I <sub>CEO</sub>		1	30	nA
<b>SENSOR</b>						
Collector current	V <sub>CE</sub> = 5 V, I <sub>F</sub> = 20 mA, d = 1 mm	I <sub>C</sub>	0.4	1.5	3.0	mA
Current transfer ratio	I <sub>C</sub> /I <sub>F</sub> , d = 1 mm, V <sub>CE</sub> = 5 V	CTR		4		%
Rise time	I <sub>C</sub> = 0.8 mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 100 Ω	t <sub>r</sub>		10	70	μs
Fall time	I <sub>C</sub> = 0.8 mA, V <sub>CE</sub> = 5 V, R <sub>L</sub> = 100 Ω	t <sub>f</sub>		15	70	μs

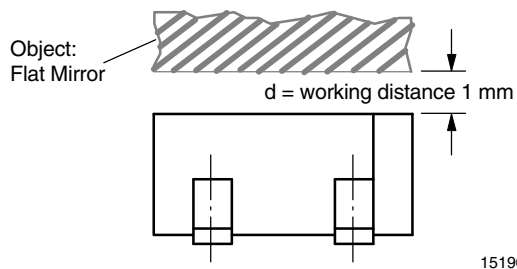


Fig. 3 - Test Circuit

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

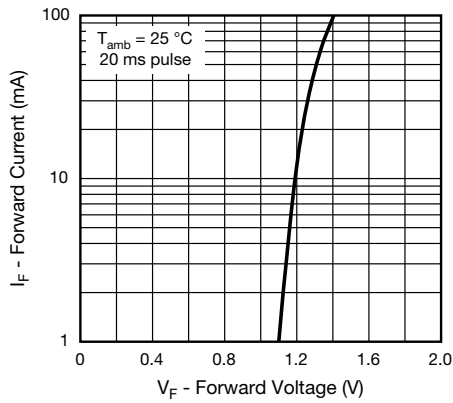


Fig. 4 - Forward Current vs. Forward Voltage

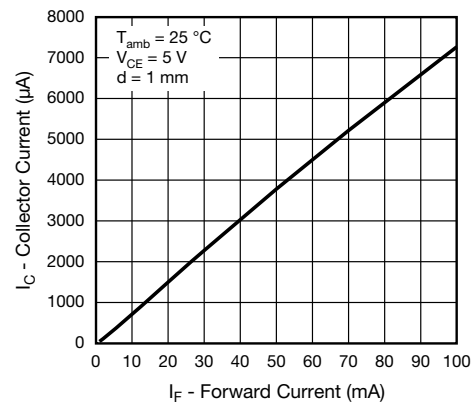


Fig. 7 - Collector Current vs. Forward Current

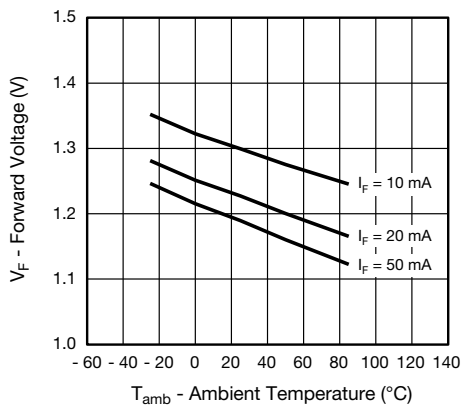


Fig. 5 - Forward Voltage vs. Ambient Temperature

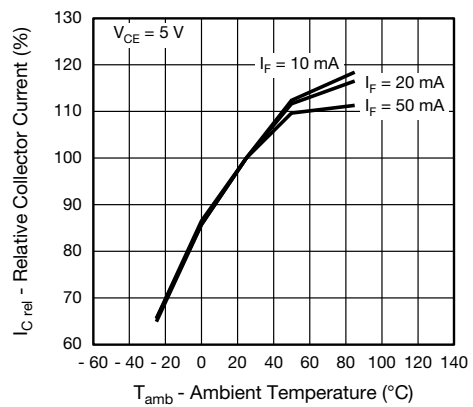


Fig. 8 - Relative Collector Current vs. Ambient Temperature

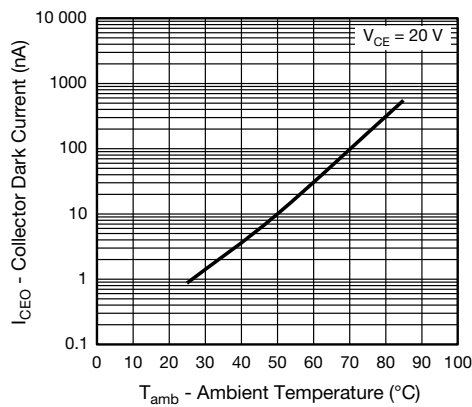


Fig. 6 - Collector Dark Current vs. Ambient Temperature

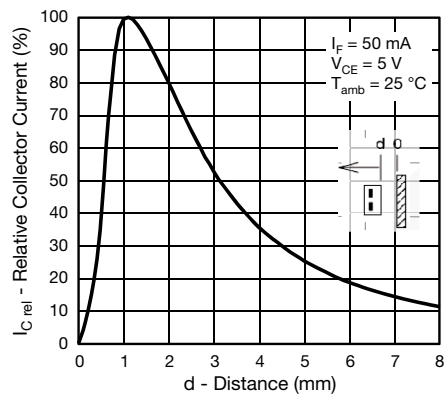


Fig. 9 - Relative Collector Current vs. Distance

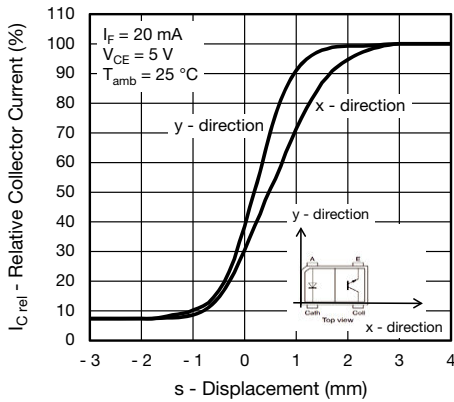


Fig. 10 - Relative Collector Current vs. Displacement

**REFLOW SOLDER PROFILE**

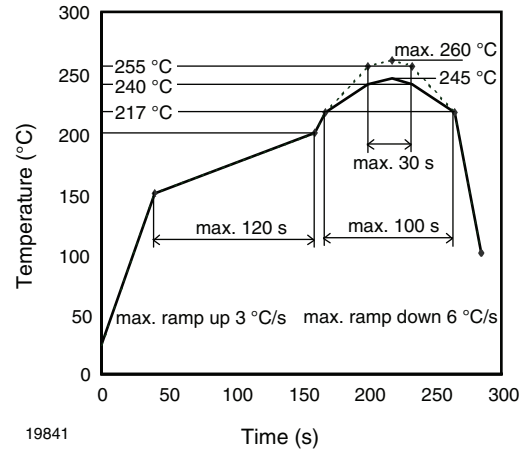


Fig. 11 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

**PRECAUTIONS FOR USE**

**1. Over-current-proof**

Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (Burn out will happen).

**2. Storage**

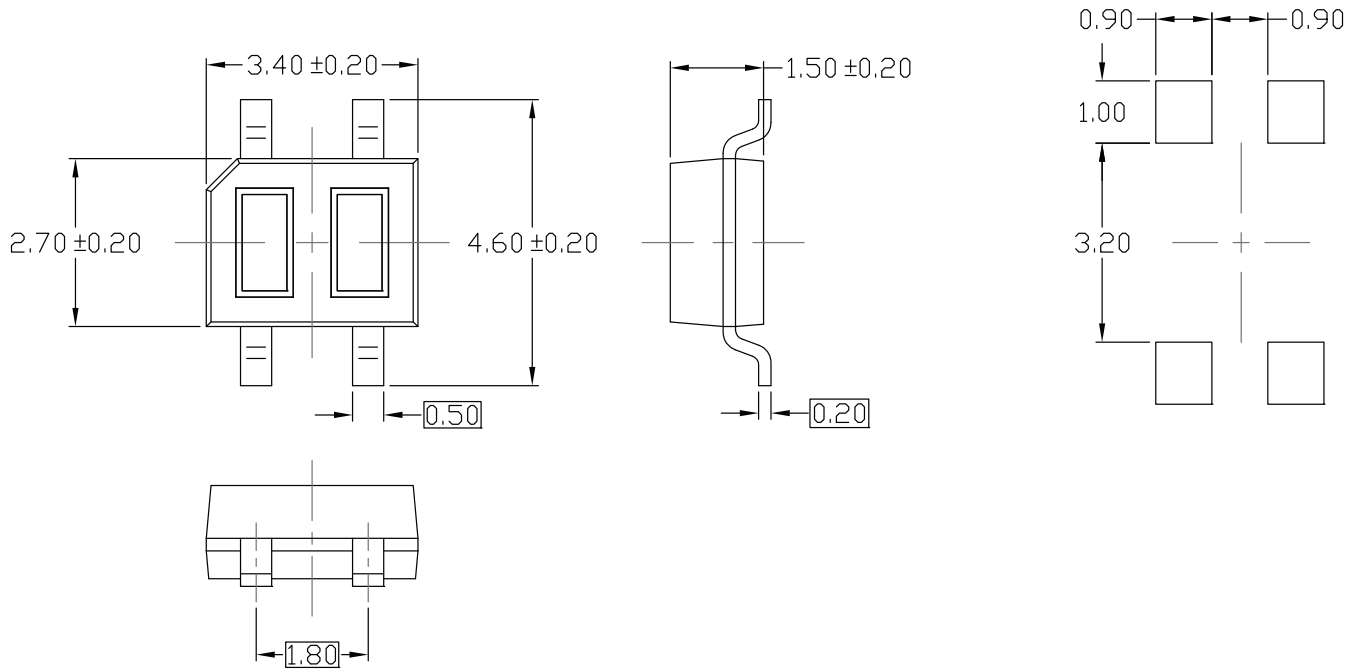
- 2.1. Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, RH 60
- 2.2. Floor life must not exceed 168 h, acc. to JEDEC level 3, J-STD-020.

Once the package is opened, the products should be used within 168 h. Otherwise, they should be kept in a damp proof box with desiccant.

Considering tape life, we suggest to use products within one year from production date.

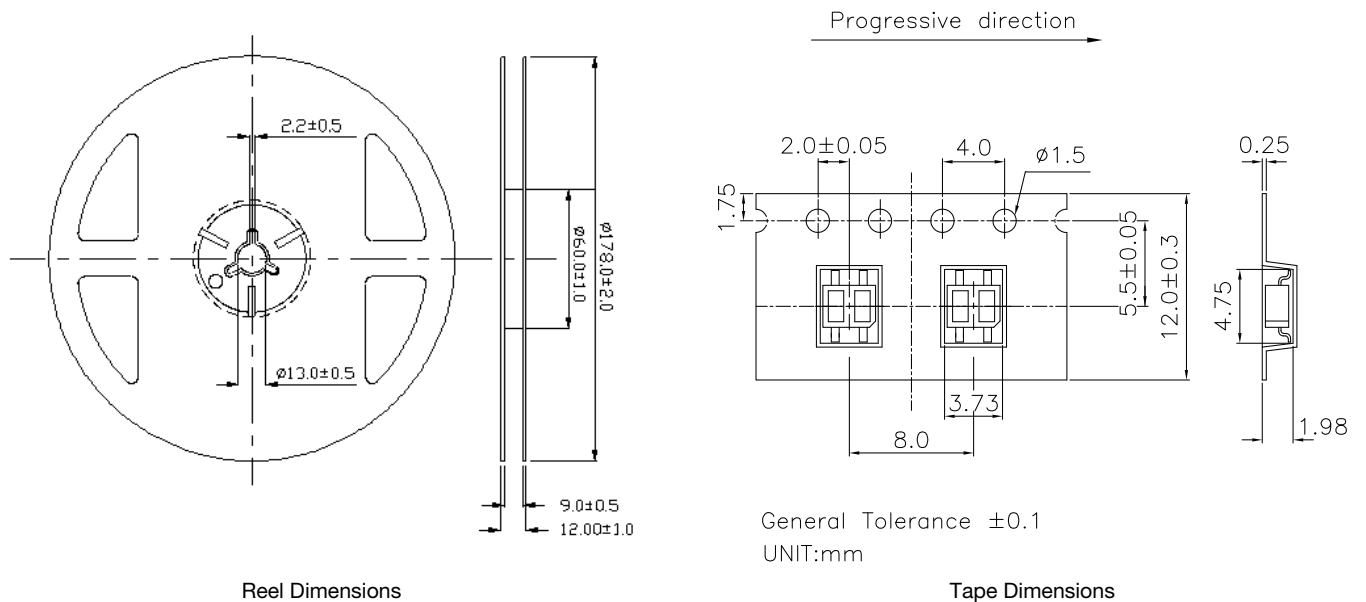
- 2.3 If opened more than 168 h in an atmosphere 5 °C to 30 °C, RH 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.
- 2.4 If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3.

**PACKAGE DIMENSIONS** in millimeters



**TAPE AND REEL DIMENSIONS** in millimeters: **TCNT2000**

1000 pcs/reel





## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**