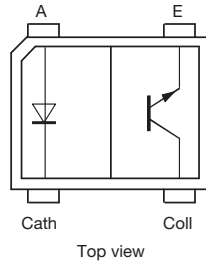


Reflective Optical Sensor with Transistor Output



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



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 _{rel} (1) (mm) | DISTANCE RANGE FOR RELATIVE I _{out} > 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_{out}/I_{in}

(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_{amb} = 25 °C, unless otherwise specified)

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

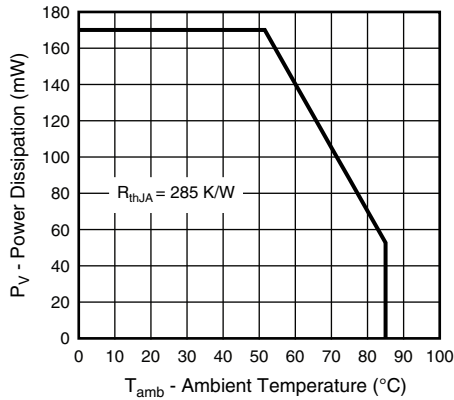
ABSOLUTE MAXIMUM RATINGS


Fig. 1 - Power Dissipation vs. Ambient Temperature

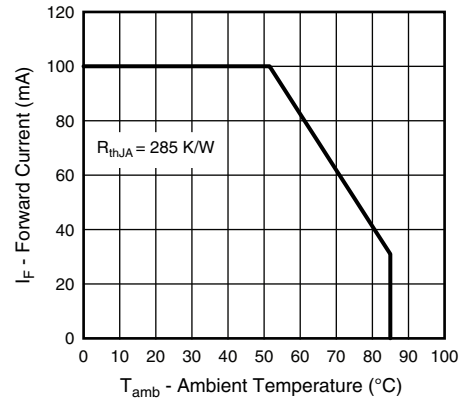


Fig. 2 - Forward Current vs. Ambient Temperature

| BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | |
|---|---|---------------|------|-------|------|---------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| INPUT (EMITTER) | | | | | | |
| Forward voltage | $I_F = 20\text{ mA}$ | V_F | | 1.25 | 1.45 | V |
| | $I_F = 100\text{ mA}$ | | | 1.4 | 1.7 | |
| Temperature coefficient of V_F | $I_F = 20\text{ mA}$ | TKV_F | | - 1.0 | | mV/K |
| Peak wavelength | $I_F = 100\text{ mA}$ | λ_P | | 940 | | nm |
| Reverse current | $V_R = 5\text{ V}$ | I_R | | | 10 | μA |
| OUTPUT (DETECTOR) | | | | | | |
| Collector emitter breakdown voltage | $I_C = 0.1\text{ mA}$, $E = 0$ | $V_{(BR)CEO}$ | 20 | | | V |
| Emitter collector voltage | $I_E = 100\text{ }\mu\text{A}$, $E = 0$ | V_{ECO} | 7 | | | V |
| Collector emitter dark current | $V_{CE} = 20\text{ V}$, $E = 0$ | I_{CEO} | | 1 | 30 | nA |
| SENSOR | | | | | | |
| Collector current | $V_{CE} = 5\text{ V}$, $I_F = 20\text{ mA}$, $d = 1\text{ mm}$ | I_C | 0.4 | 1.5 | 3.0 | mA |
| Current transfer ratio | I_C/I_F , $d = 1\text{ mm}$, $V_{CE} = 5\text{ V}$ | CTR | | 4 | | % |
| Rise time | $I_C = 0.8\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 100\text{ }\Omega$ | t_r | | 10 | 70 | μs |
| Fall time | $I_C = 0.8\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 100\text{ }\Omega$ | t_f | | 15 | 70 | μs |

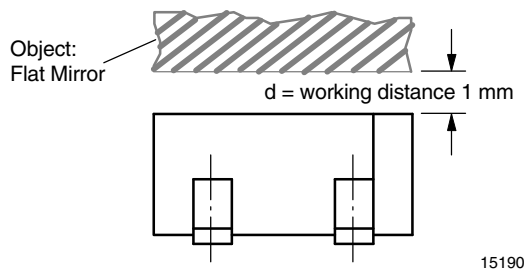


Fig. 3 - Test Circuit

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

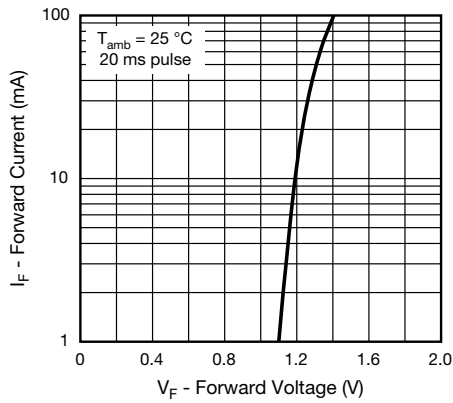


Fig. 4 - Forward Current vs. Forward Voltage

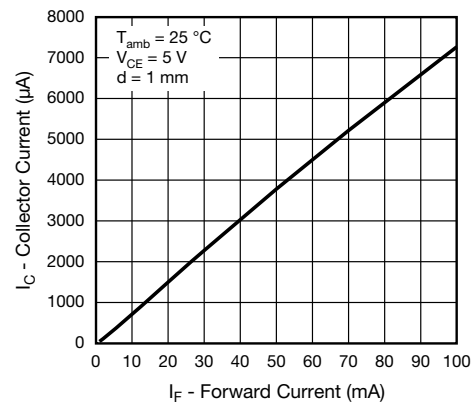


Fig. 7 - Collector Current vs. Forward Current

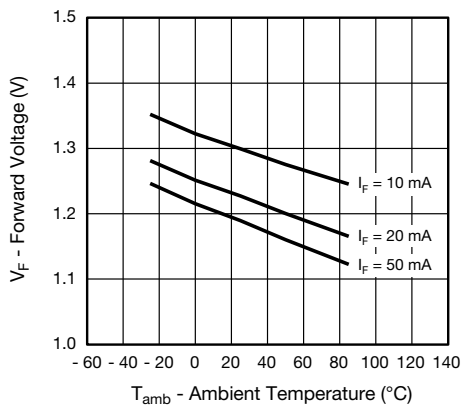


Fig. 5 - Forward Voltage vs. Ambient Temperature

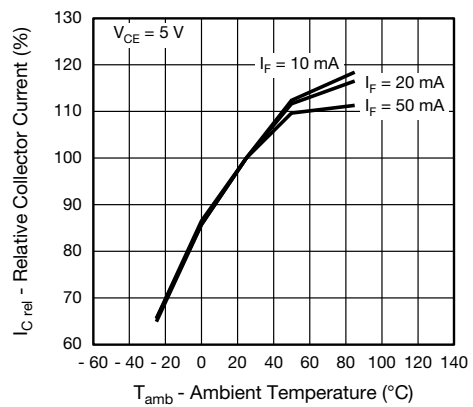


Fig. 8 - Relative Collector Current vs. Ambient Temperature

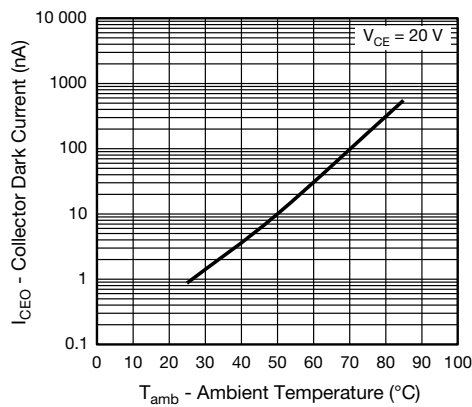


Fig. 6 - Collector Dark Current vs. Ambient Temperature

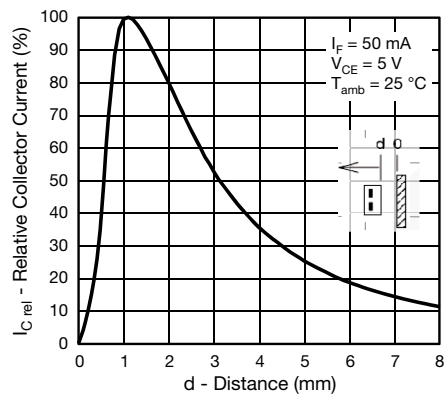


Fig. 9 - Relative Collector Current vs. Distance

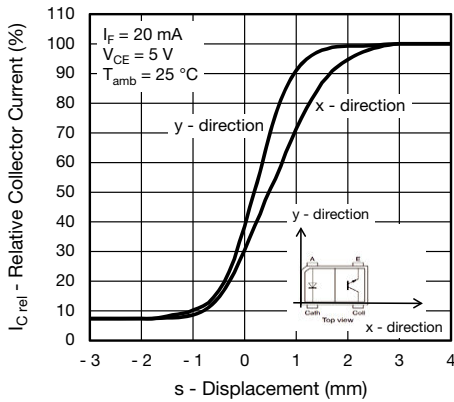


Fig. 10 - Relative Collector Current vs. Displacement

REFLOW SOLDER PROFILE

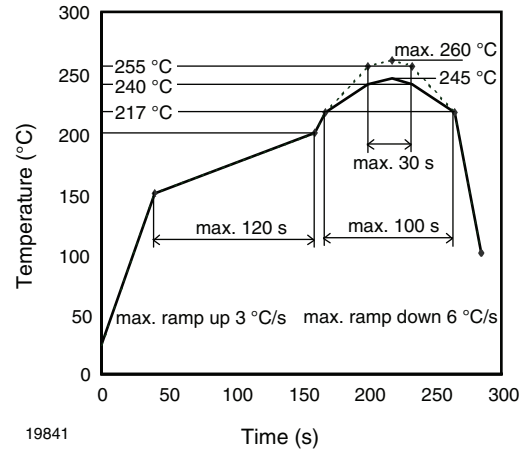


Fig. 11 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

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

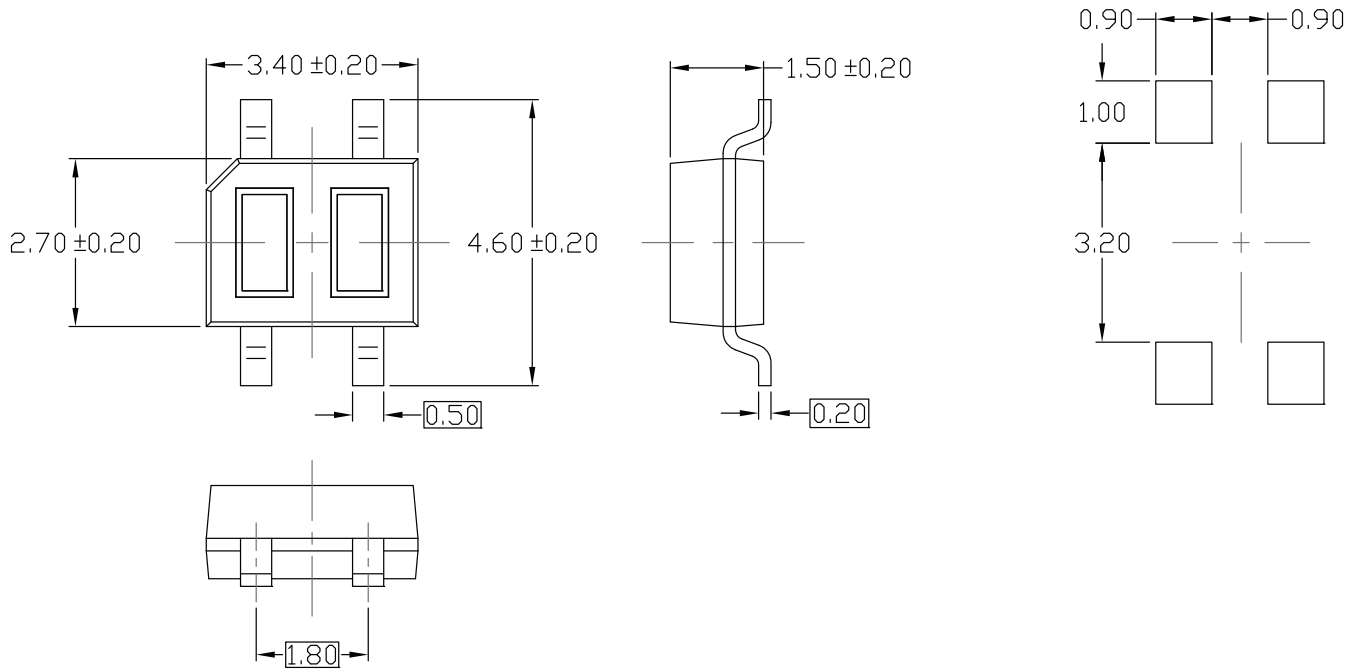
- 2.1. Storage temperature and rel. humidity conditions are: 5 °C to 30 °C, RH 60
- 2.2. Floor life must not exceed 168 h, acc. to JEDEC level 3, J-STD-020.

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.

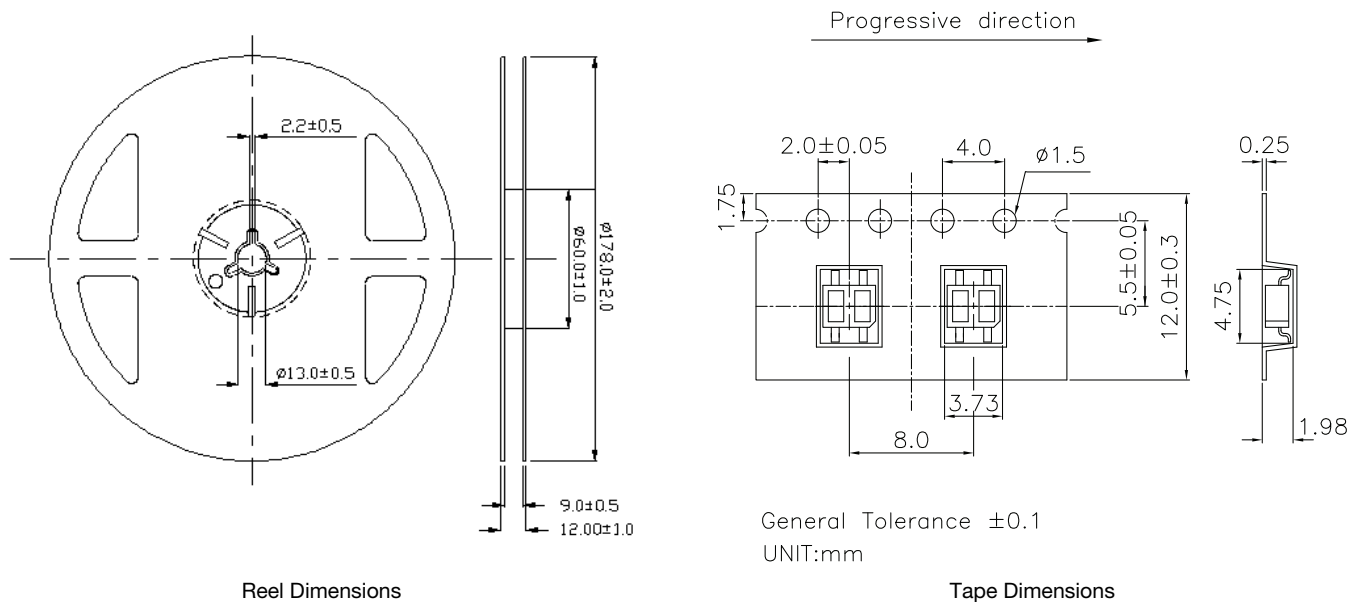
- 2.3 If opened more than 168 h in an atmosphere 5 °C to 30 °C, RH 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.
- 2.4 If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3.

PACKAGE DIMENSIONS in millimeters



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

1000 pcs/reel





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