

Reflective Optical Sensor with Transistor Output



19156_2



Top view

19156_1

FEATURES

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 10.2 x 5.8 x 7
- Peak operating distance: 2.5 mm
- Operating range within > 20 % relative collector current: 0.2 mm to 15 mm
- Typical output current under test: $I_C = 1$ mA
- Daylight blocking filter
- Emitter wavelength: 950 nm
- Lead (Pb)-free soldering released
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

DESCRIPTION

The TCRT5000 and TCRT5000L are reflective sensors which include an infrared emitter and phototransistor in a leaded package which blocks visible light. The package includes two mounting clips. TCRT5000L is the long lead version.

APPLICATIONS

- Position sensor for shaft encoder
- Detection of reflective material such as paper, IBM cards, magnetic tapes etc.
- Limit switch for mechanical motions in VCR
- General purpose - wherever the space is limited

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 |
|-------------|-------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|-------------------------------------|
| TCRT5000 | 2.5 | 0.2 to 15 | 1 | Yes |
| TCRT5000L | 2.5 | 0.2 to 15 | 1 | Yes |

Notes

(1) CTR: current transfere ratio, I_{out}/I_{in}

(2) Conditions like in table basic characteristics/sensors

ORDERING INFORMATION

| ORDERING CODE | PACKAGING | VOLUME ⁽¹⁾ | REMARKS |
|---------------|-----------|----------------------------|--------------------|
| TCRT5000 | Tube | MOQ: 4500 pcs, 50 pcs/tube | 3.5 mm lead length |
| TCRT5000L | Tube | MOQ: 2400 pcs, 48 pcs/tube | 15 mm lead length |

Note

(1) MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|------------------------|---------------------------|-----------|-------|------------|
| INPUT (EMITTER) | | | | |
| Reverse voltage | | V_R | 5 | V |
| Forward current | | I_F | 60 | mA |
| Forward surge current | $t_p \leq 10 \mu s$ | I_{FSM} | 3 | A |
| Power dissipation | $T_{amb} \leq 25^\circ C$ | P_V | 100 | mW |
| Junction temperature | | T_j | 100 | $^\circ C$ |

| ABSOLUTE MAXIMUM RATINGS (1) | | | | |
|------------------------------|-----------------------------------------|-----------|---------------|------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| OUTPUT (DETECTOR) | | | | |
| Collector emitter voltage | | V_{CEO} | 70 | V |
| Emitter collector voltage | | V_{ECO} | 5 | V |
| Collector current | | I_C | 100 | mA |
| Power dissipation | $T_{amb} \leq 55\text{ }^\circ\text{C}$ | P_V | 100 | mW |
| Junction temperature | | T_j | 100 | $^\circ\text{C}$ |
| SENSOR | | | | |
| Total power dissipation | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | P_{tot} | 200 | mW |
| Ambient temperature range | | T_{amb} | - 25 to + 85 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | - 25 to + 100 | $^\circ\text{C}$ |
| Soldering temperature | 2 mm from case, $t \leq 10\text{ s}$ | T_{sd} | 260 | $^\circ\text{C}$ |

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 |
| INPUT (EMITTER) | | | | | | |
| Forward voltage | $I_F = 60\text{ mA}$ | V_F | | 1.25 | 1.5 | V |
| Junction capacitance | $V_R = 0\text{ V}$, $f = 1\text{ MHz}$ | C_j | | 17 | | pF |
| Radiant intensity | $I_F = 60\text{ mA}$, $t_p = 20\text{ ms}$ | I_e | | | 21 | mW/sr |
| Peak wavelength | $I_F = 100\text{ mA}$ | λ_P | 940 | | | nm |
| Virtual source diameter | Method: 63 % encircled energy | d | | 2.1 | | mm |
| OUTPUT (DETECTOR) | | | | | | |
| Collector emitter voltage | $I_C = 1\text{ mA}$ | V_{CEO} | 70 | | | V |
| Emitter collector voltage | $I_e = 100\text{ }\mu\text{A}$ | V_{ECO} | 7 | | | V |
| Collector dark current | $V_{CE} = 20\text{ V}$, $I_F = 0\text{ A}$, $E = 0\text{ lx}$ | I_{CEO} | | 10 | 200 | nA |
| SENSOR | | | | | | |
| Collector current | $V_{CE} = 5\text{ V}$, $I_F = 10\text{ mA}$, $D = 12\text{ mm}$ | $I_C^{(2)(3)}$ | 0.5 | 1 | 2.1 | mA |
| Collector emitter saturation voltage | $I_F = 10\text{ mA}$, $I_C = 0.1\text{ mA}$, $D = 12\text{ mm}$ | $V_{CEsat}^{(2)(3)}$ | | | 0.4 | V |

Note

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

(2) See figure 3

(3) Test surface: mirror (Mfr. Spindler a. Hoyer, Part No. 340005)



Fig. 2 - Test Circuit

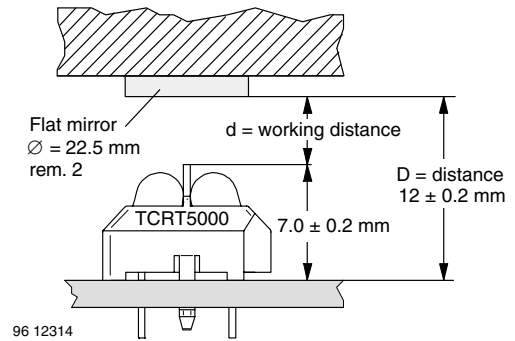


Fig. 3 - Test Circuit

BASIC CHARACTERISTICS

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



Fig. 4 - Forward Current vs. Forward Voltage



Fig. 6 - Collector Current vs. Forward Current



Fig. 5 - Relative Current Transfer Ratio vs. Ambient Temperature



Fig. 7 - Collector Emitter Saturation Voltage vs. Collector Current

TCRT5000, TCRT5000L



Vishay Semiconductors

Reflective Optical Sensor with Transistor Output



Fig. 8 - Current Transfer Ratio vs. Forward Current



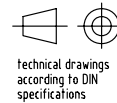
Fig. 9 - Relative Collector Current vs. Distance

PACKAGE DIMENSIONS in millimeters, TCRT5000

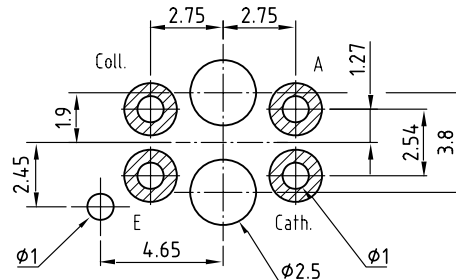


* Tolerances related to reference plain

weight: ca. 0.23g



Footprint Top View



Drawing-No.: 6.550-5096.01-4

Issue: 4; 11.04.02

96 12073



TCRT5000, TCRT5000L

Reflective Optical Sensor with Transistor Output

Vishay Semiconductors

PACKAGE DIMENSIONS in millimeters, TCRT5000L



weight: ca. 0.23g

Drawing-No.: 6.550-5146.01-4
Issue: 4; 11.04.02
95 11267

* Tolerances related to reference plain "A"

** Tolerances related on lead end



Footprint Top View



TCRT5000, TCRT5000L



Vishay Semiconductors

Reflective Optical Sensor with Transistor Output

TUBE DIMENSIONS in millimeters, TCRT5000



With rubber stopper
Tolerance: $\pm 0.5\text{mm}$
Length: $575 \pm 1\text{mm}$

Drawing-No.: 9.700-5139.01-4
Issue: 1; 10.05.00
20298

TUBE DIMENSIONS in millimeters, TCRT5000L



With stopper pins
Tolerance: $\pm 0.5\text{mm}$
Length: $575 \pm 1\text{mm}$

Drawing-No.: 9.700-5178.01-4
Issue: 1; 25.02.00
20298

Packaging and Ordering Information

| PART NUMBER | MOQ ⁽¹⁾ | PCS PER TUBE | TUBE SPEC. (FIGURE) | CONSTITUENTS (FORMS) |
|---------------|--------------------|--------------|---------------------|----------------------|
| CNY70 | 4000 | 80 | 1 | 28 |
| TCPT1300X01 | 2000 | Reel | (2) | 29 |
| TCRT1000 | 1000 | Bulk | - | 26 |
| TCRT1010 | 1000 | Bulk | - | 26 |
| TCRT5000 | 4500 | 50 | 2 | 27 |
| TCRT5000L | 2400 | 48 | 3 | 27 |
| TCST1030 | 5200 | 65 | 5 | 24 |
| TCST1030L | 2600 | 65 | 6 | 24 |
| TCST1103 | 1020 | 85 | 4 | 24 |
| TCST1202 | 1020 | 85 | 4 | 24 |
| TCST1230 | 4800 | 60 | 7 | 24 |
| TCST1300 | 1020 | 85 | 4 | 24 |
| TCST2103 | 1020 | 85 | 4 | 24 |
| TCST2202 | 1020 | 85 | 4 | 24 |
| TCST2300 | 1020 | 85 | 4 | 24 |
| TCST5250 | 4860 | 30 | 8 | 24 |
| TCUT1300X01 | 2000 | Reel | (2) | 29 |
| TCZT8020-PAER | 2500 | Bulk | - | 22 |

Notes

(1) MOQ: minimum order quantity

(2) Please refer to datasheets

TUBE SPECIFICATION FIGURES



With rubber stopper

Tolerance: $\pm 0.5\text{mm}$

Length: $575 \pm 1\text{mm}$

Drawing-No.: 9.700-5097.01-4

Issue: 1; 25.02.00

15198

Fig. 1

Packaging and Ordering Information

Vishay Semiconductors Packaging and Ordering Information



Drawing-No.: 9.700-5139.01-4
Issue: 1; 10.05.00

Drawing refers to following types: TCRT 5000

15210

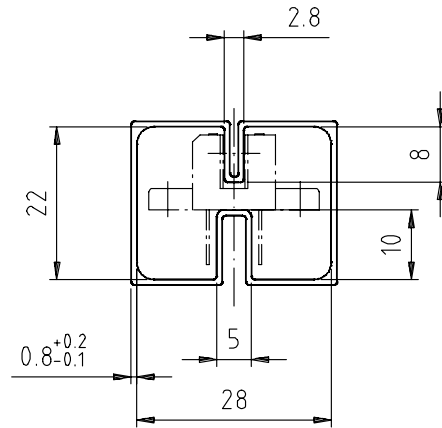
Fig. 2



Drawing-No.: 9.700-5178.01-4
Issue: 1; 25.02.00

15201

Fig. 3

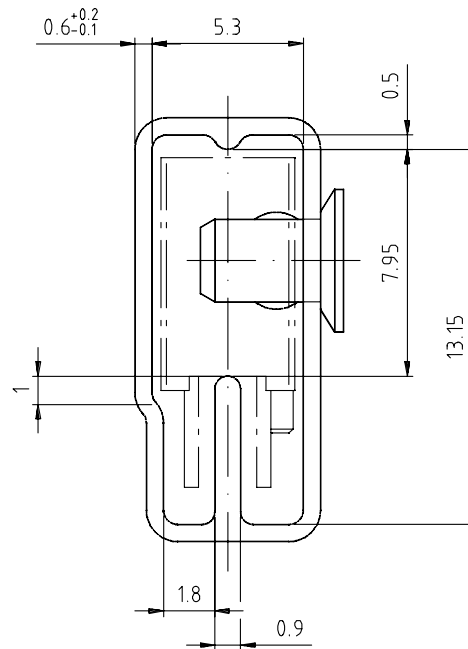


With rubber stopper
Tolerance: ±0.5mm
Length: 575±1mm

Drawing-No.: 9.700-5100.01-4
Issue: 1; 25.02.00

15199

Fig. 4



With stopper pins
Tolerance: ±0.5mm
Length: 575±1mm

Drawing-No.: 9.700-5140.01-4
Issue: 1; 25.02.00

15202

Fig. 5



Drawing-No.: 9.700-5205.01-4
Issue: 1; 25.02.00

15196

Fig. 6



Drawing-No.: 9.700-5245.01-4
Issue: 1; 25.02.00

15195

Fig. 7



Drawing-No.: 9.700-5222.01-4
 Issue: 2, 19.11.04
 20257

With stopper pins
 Tolerance: ± 0.5 mm
 Length: 450 ± 1 mm
 All dimensions in mm

Fig. 8



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.