

Reflective Optical Sensor with Transistor Output



FEATURES

- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 7 x 4 x 2.5
- Peak operating distance: 1 mm
- Operating range within > 20 % relative collector current: 0.2 mm to 4 mm
- Typical output current under test: $I_C = 0.5$ mA
- Daylight blocking filter
- Emitter wavelength: 950 nm
- Lead (Pb)-free soldering released
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

DESCRIPTION

The TCRT1000 and TCRT1010 are reflective sensors which include an infrared emitter and phototransistor in a leaded package which blocks visible light.

APPLICATIONS

- Optoelectronic scanning and switching devices i.e., index sensing, coded disk scanning etc. (optoelectronic encoder assemblies for transmissive sensing).

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 |
|-------------|---|---|--|-------------------------------------|
| TCRT1000 | 1 | 0.2 to 4 | 0.5 | Yes |
| TCRT1010 | 1 | 0.2 to 4 | 0.5 | Yes |

Notes

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

(2) Conditions like in table basic characteristics/sensor

ORDERING INFORMATION

| ORDERING CODE | PACKAGING | VOLUME (1) | REMARKS |
|---------------|-----------|------------------------------|----------------|
| TCRT1000 | Bulk | MOQ: 1000 pcs, 1000 pcs/bulk | Straight leads |
| TCRT1010 | Bulk | MOQ: 1000 pcs, 1000 pcs/bulk | Bent leads |

Note

(1) MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25$ °C, unless otherwise specified)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---------------------------|--|-----------|---------------|------|
| SENSOR | | | | |
| Total power dissipation | $T_{amb} \leq 25$ °C | P_{tot} | 200 | mW |
| Ambient temperature range | | T_{amb} | - 40 to + 85 | °C |
| Storage temperature range | | T_{stg} | - 40 to + 100 | °C |
| Soldering temperature | 2 mm distance to package, $t \leq 5$ s | T_{sd} | 260 | °C |
| INPUT (EMITTER) | | | | |
| Reverse voltage | | V_R | 5 | V |
| Forward current | | I_F | 50 | mA |
| Forward surge current | $t_p \leq 10$ μ s | I_{FSM} | 3 | A |
| Power dissipation | $T_{amb} \leq 25$ °C | P_V | 100 | mW |
| Junction temperature | | T_J | 100 | °C |



| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|---|---|-----------|-------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| OUTPUT (DETECTOR) | | | | |
| Collector emitter voltage | | V_{CEO} | 32 | V |
| Emitter collector voltage | | V_{ECO} | 5 | V |
| Collector current | | I_C | 50 | mA |
| Power dissipation | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | P_V | 100 | mW |
| Junction temperature | | T_j | 100 | $^{\circ}\text{C}$ |

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



Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

| BASIC CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | | | |
|--|---|-------------------|------|------|------|---------------|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| SENSOR | | | | | | |
| Collector current | $V_{CE} = 5\text{ V}$, $I_F = 20\text{ mA}$, $d = 1\text{ mm}$ (figure 2) | $I_C^{(1)}$ | 0.3 | 0.5 | | mA |
| Cross talk current | $V_{CE} = 5\text{ V}$, $I_F = 20\text{ mA}$, (figure 1) | $I_{CX}^{(2)}$ | | | 1 | μA |
| Collector emitter saturation voltage | $I_F = 20\text{ mA}$, $I_C = 0.1\text{ mA}$, $d = 1\text{ mm}$ (figure 2) | $V_{CEsat}^{(1)}$ | | | 0.3 | V |
| INPUT (EMITTER) | | | | | | |
| Forward voltage | $I_F = 50\text{ mA}$ | V_F | | 1.25 | 1.6 | V |
| Radiant intensity | $I_F = 50\text{ mA}$, $t_p = 20\text{ ms}$ | I_e | | | 7.5 | mW/sr |
| Peak wavelength | $I_F = 100\text{ mA}$ | λ_P | 940 | | | nm |
| Virtual source diameter | Method: 63 % encircled energy | d | | 1.2 | | mm |
| OUTPUT (DETECTOR) | | | | | | |
| Collector emitter voltage | $I_C = 1\text{ mA}$ | V_{CEO} | 32 | | | V |
| Emitter collector voltage | $I_E = 100\text{ }\mu\text{A}$ | V_{ECO} | 5 | | | V |
| Collector dark current | $V_{CE} = 20\text{ V}$, $I_F = 0\text{ A}$, $E = 0\text{ lx}$ | I_{CEO} | | | 200 | nA |

Notes

- (1) Measured with the "Kodak neutral test card", white side with 90 % diffuse reflectance
- (2) Measured without reflecting medium

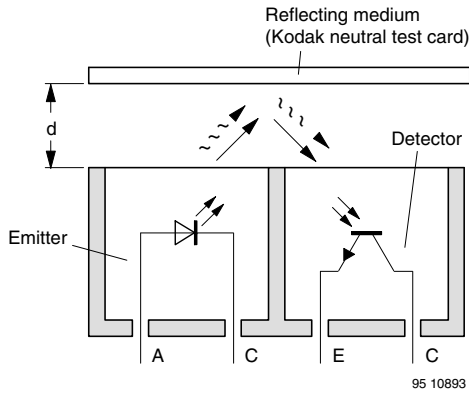


Fig. 2 - Test Condition

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

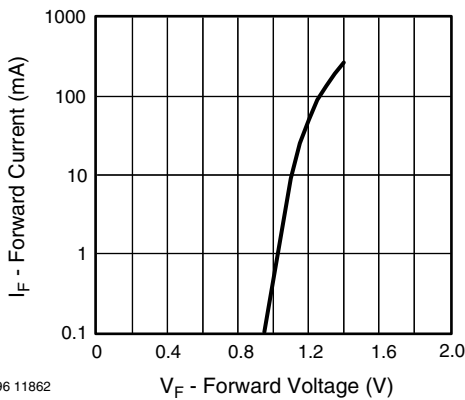


Fig. 3 - Forward Current vs. Forward Voltage

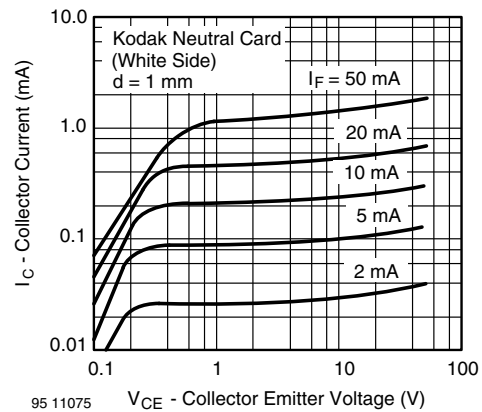


Fig. 5 - Collector Current vs. Collector Emitter Voltage

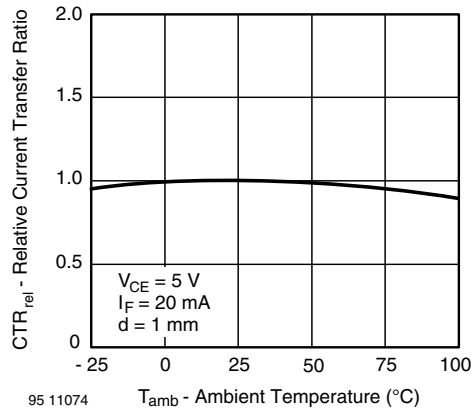


Fig. 4 - Relative Current Transfer Ratio vs. Ambient Temperature

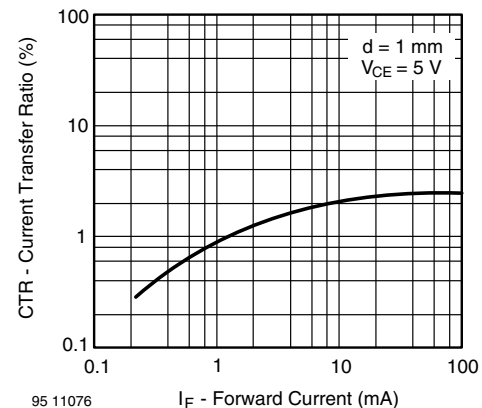


Fig. 6 - Current Transfer Ratio vs. Forward Current



Fig. 7 - Collector Current vs. Distance



Fig. 8 - Relative Collector Current vs. Displacement

PACKAGE DIMENSIONS in millimeters



Packaging and Ordering Information

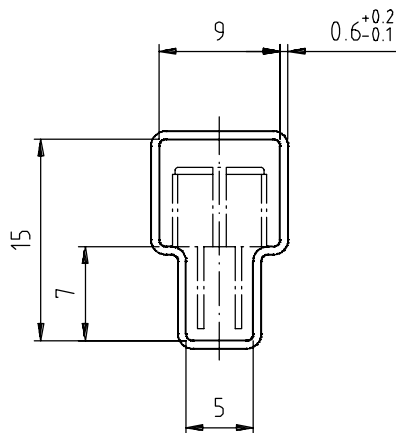
| PART NUMBER | MOQ ⁽¹⁾ | PCS PER TUBE | TUBE SPEC. (FIGURE) | CONSTITUENTS (FORMS) |
|---------------|--------------------|--------------|---------------------|----------------------|
| CNY70 | 4000 | 80 | 1 | 28 |
| TCPT1300X01 | 2000 | Reel | (2) | 29 |
| TCRT1000 | 1000 | Bulk | - | 26 |
| TCRT1010 | 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: ±0.5mm

Length: 575±1mm

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



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

15201

Fig. 3

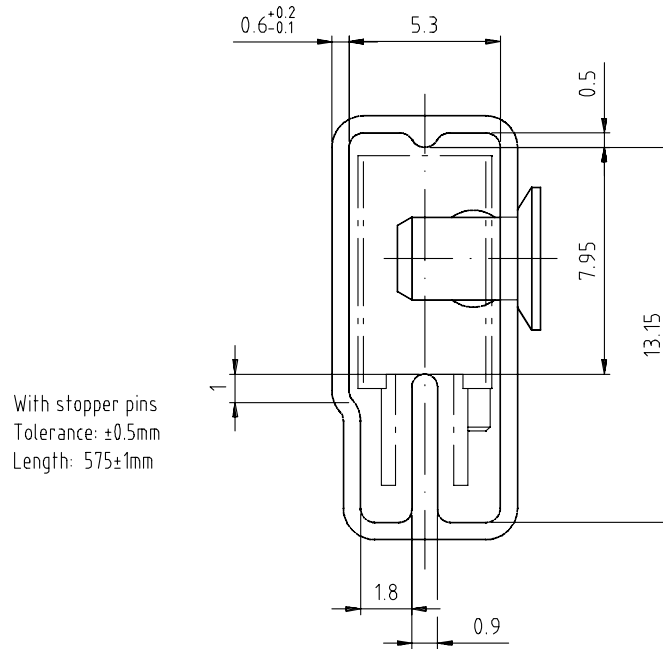


With rubber stopper
Tolerance: ±0.5mm
Length: 575±1mm

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: $\pm 0.5\text{mm}$
 Length: $450 \pm 1\text{mm}$
 All dimensions in mm

Fig. 8



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