Transmissive Optical Sensor with Phototransistor Output

**DESCRIPTION**
The TCST5250 is a transmissive sensor that includes an infrared emitter and a phototransistor, located face-to-face on the optical axes in a leaded package which blocks visible light.

**FEATURES**
- Package type: leaded
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 14.3 x 6 x 9.5
- Gap (in mm): 2.7
- Aperture (in mm): 0.5
- Typical output current under test: I_C = 1.5 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

**APPLICATIONS**
- Optical switch
- Shaft encoder

**PRODUCT SUMMARY**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>GAP WIDTH (mm)</th>
<th>APERTURE WIDTH (mm)</th>
<th>TYPICAL OUTPUT CURRENT UNDER TEST (mA)</th>
<th>DAYLIGHT BLOCKING FILTER INTEGRATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCST5250</td>
<td>2.7</td>
<td>0.5</td>
<td>1.5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>ORDERING CODE</th>
<th>PACKAGING</th>
<th>VOLUME (1)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCST5250</td>
<td>Tube</td>
<td>MOQ: 4860 pcs, 30 pcs/tube</td>
<td>-</td>
</tr>
</tbody>
</table>

**ABSOLUTE MAXIMUM RATINGS (1)**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUPLER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>P_{tot}</td>
<td>250</td>
<td>mW</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>T_amb - 25 to + 85 °C</td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T_{stg} - 40 to + 100 °C</td>
<td></td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>Distance to package 1.6 mm, t ≤ 5 s</td>
<td>T_{sd}</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>INPUT (EMITTER)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>V_R</td>
<td>6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Forward current</td>
<td>I_F</td>
<td>60</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Forward surge current</td>
<td>I_{FSM} ≤ 10 µs</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>P_V</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_J</td>
<td>100</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>OUTPUT (DETECTOR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector emitter voltage</td>
<td>V_{CEO}</td>
<td>70</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Emitter collector voltage</td>
<td>V_{ECO}</td>
<td>7</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>100</td>
<td>mA</td>
<td></td>
</tr>
</tbody>
</table>
TCST5250
Vishay Semiconductors Transmissive Optical Sensor with Phototransistor Output

**ABSOLUTE MAXIMUM RATINGs**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT (DETECTOR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ \text{C}$</td>
<td>$P_V$</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>$T_I$</td>
<td>100</td>
<td>°C</td>
</tr>
</tbody>
</table>

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

**BASIC CHARACTERISTICS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>COUPLER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector current</td>
<td>$V_{CE} = 10 , \text{V, } I_F = 20 , \text{mA}$</td>
<td>$I_C$</td>
<td>0.5</td>
<td>1.5</td>
<td>15</td>
<td>mA</td>
</tr>
<tr>
<td>Collector emitter saturation</td>
<td>$I_F = 20 , \text{mA, } I_C = 0.2 , \text{mA}$</td>
<td>$V_{CE_{Sat}}$</td>
<td>0.4</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>INPUT (EMITTER)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td></td>
<td>$I_F$</td>
<td>1.25</td>
<td>1.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>$V_R = 0 , \text{V, } f = 1 , \text{MHz}$</td>
<td>$C_J$</td>
<td>50</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>OUTPUT (DETECTOR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector emitter voltage</td>
<td>$I_C = 1 , \text{mA}$</td>
<td>$V_{CEO}$</td>
<td>70</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Emitter collector voltage</td>
<td>$I_E = 10 , \mu\text{A}$</td>
<td>$V_{EEO}$</td>
<td>7</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Collector dark current</td>
<td>$V_{CE} = 25 , \text{V, } I_F = 0 , \text{A, } E = 0 , \text{lx}$</td>
<td>$I_{CEO}$</td>
<td>10</td>
<td>100</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

**SWITCHING CHARACTERISTICS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on time</td>
<td>$I_C = 1 , \text{mA, } V_{CE} = 5 , \text{V, } R_L = 100 , \Omega$ (see figure 2)</td>
<td>$t_{on}$</td>
<td>15</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Turn-off time</td>
<td>$I_C = 1 , \text{mA, } V_{CE} = 5 , \text{V, } R_L = 100 , \Omega$ (see figure 2)</td>
<td>$t_{off}$</td>
<td>10</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
</tbody>
</table>

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

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Transmissive Optical Sensor with Phototransistor Output

Vishay Semiconductors

TCST5250

Fig. 2 - Test Circuit for $t_{on}$ and $t_{off}$

**BASIC CHARACTERISTICS**

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

**Fig. 4 - Forward Current vs. Forward Voltage**

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

**Fig. 6 - Collector Dark Current vs. Ambient Temperature**

**Fig. 7 - Collector Current vs. Forward Current**
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Fig. 8 - Collector Current vs. Collector Emitter Voltage

Fig. 9 - Current Transfer Ratio vs. Forward Current

Fig. 10 - Turn-on/Turn-off Time vs. Collector Current

Fig. 11 - Relative Collector Current vs. Displacement
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Vishay Semiconductors  Transmissive Optical Sensor with Phototransistor Output

**TUBE DIMENSIONS** in millimeters

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

With stopper pins
Tolerance: ±0.5mm
Length: 450±1mm
All dimensions in mm
# Packaging and Ordering Information

## Notes

(1) MOQ: minimum order quantity  
(2) Please refer to datasheets

## TUBE SPECIFICATION FIGURES

![Tube Specification Figure](image)

**Drawing-No:** 9.700-5097.01-4  
**Issue:** 1, 25.02.00  
**Length:** 575±1mm

**With rubber stopper**  
**Tolerance:** ±0.5mm  
**Fig. 1**
Packaging and Ordering Information
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Fig. 2

Drawing-No.: 9.700-5139.01-4
Issue: 1; 10.05.00
Drawing refers to following types:  TCRT 5000

Fig. 3

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

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

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

15210
15201
Packaging and Ordering Information

Fig. 4

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

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

Fig. 5

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

Drawing-No.: 9.700-5140.01-4
Issue: 1, 25.02.00
Fig. 6

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

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

Fig. 7

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

Drawing-No.: 9.700-5245.01-4
Issue: 1, 25.02.00
Packaging and Ordering Information

Packaging and Ordering Information Vishay Semiconductors

Fig. 8

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

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

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