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 (1) (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>

Note
(1) Conditions like in table basic characteristics/coupler

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>

Note
(1) MOQ: minimum order quantity

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>$T_{amb} \leq 25\ ^\circ C$</td>
<td>$P_{tot}$</td>
<td>250</td>
<td>mW</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>$T_{amb}$</td>
<td>-25 to +85</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>$T_{stg}$</td>
<td>-40 to +100</td>
<td>°C</td>
<td></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>$I_{FSM}$</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$T_{amb} \leq 25\ ^\circ C$</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 (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>Power dissipation</td>
<td>$T_{\text{amb}} \leq 25 , ^\circ\text{C}$</td>
<td>$P_V$</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>$T_J$</td>
<td>100</td>
<td>°C</td>
</tr>
</tbody>
</table>

**Note**

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

### ABSOLUTE MAXIMUM RATINGS

![Graph: Power Dissipation Limit vs. Ambient Temperature](image)

Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

### BASIC CHARACTERISTICS (1)

<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>$V_{\text{CE}} = 10 , \text{V}, I_F = 20 , \text{mA}$</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 voltage</td>
<td>$I_F = 20 , \text{mA}, I_C = 0.2 , \text{mA}$</td>
<td>$V_{\text{CEsat}}$</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>0.6</td>
<td>1.25</td>
<td>1.5</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>$V_{\text{CEO}}$</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>$V_{\text{ECC}}$</td>
<td>7</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Collector dark current</td>
<td>$V_{\text{CE}} = 25 , \text{V}, I_F = 0 , \text{A}, E = 0 , \text{lx}$</td>
<td>$I_{\text{CEO}}$</td>
<td>10</td>
<td>100</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

### SWITCHING CHARACTERISTICS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn-on time</td>
<td></td>
<td>$t_{\text{on}}$</td>
<td>15</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Turn-off time</td>
<td></td>
<td>$t_{\text{off}}$</td>
<td>10</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
</tbody>
</table>

**Note**

(1) $T_{\text{amb}} = 25 \, ^\circ\text{C}$, unless otherwise specified
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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. 3 - Switching Times

Fig. 7 - Collector Current vs. Forward Current
TCST5250

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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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PACKAGE DIMENSIONS in millimeters

Not indicated tolerances ±0.2

Recommended installation holes for reference only (component side)

Drawing-No.: 6.550-5198.01-4
Issue 3: 06.06.00
15192

For technical questions, contact: sensorstechsupport@vishay.com
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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

K 720 P
TCST 5250

K 721 P

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 Diagram](image)

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

Fig. 2

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

Drawing refers to following types: TCRT 5000

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

Fig. 3

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

With stopper pins
Tolerance: ±0.5mm
Length: 575±1mm
Fig. 8

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

Drawing-No.: 9700-5222.01-4
Issue: 2, 19.11.04
20257
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