**DESCRIPTION**

The TCPT1350X01 is a compact transmissive sensor that includes an infrared emitter and a phototransistor detector, located face-to-face in a surface mount package. TCPT1350X01 is especially designed to meet high operating temperature requirements and is released for operating temperature ranges from -40 °C to +125 °C.

**FEATURES**

- Package type: surface mount
- Detector type: phototransistor
- Dimensions (L x W x H in mm): 5.5 x 4 x 4
- AEC-Q101 qualified
- Gap (in mm): 3
- Aperture (in mm): 0.3
- Typical output current under test: I_C = 1.6 mA
- Emitter wavelength: 950 nm
- Released for high operating temperatures up to 125 °C
- Moisture sensitivity level (MSL): 1
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

**APPLICATIONS**

- Automotive optical sensors
- Accurate position sensor for encoder
- Detection of motion speed

**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>TCPT1350X01</td>
<td>3</td>
<td>0.3</td>
<td>1.6</td>
<td>No</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>TCPT1350X01</td>
<td>Tape and reel</td>
<td>MOQ: 2000 pcs, 2000 pcs/reel</td>
<td>Drypack, MSL 1</td>
</tr>
</tbody>
</table>

**Note**

- Conditions like in table basic characteristics/coupler
- MOQ: minimum order quantity
# ABSOLUTE MAXIMUM RATINGS

(T<sub>amb</sub> = 25 °C, unless otherwise specified)

<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&lt;sub&gt;amb&lt;/sub&gt; ≤ 125 °C</td>
<td>P&lt;sub&gt;tot&lt;/sub&gt;</td>
<td>37.5</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>T&lt;sub&gt;J&lt;/sub&gt;</td>
<td>140</td>
<td>°C</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>T&lt;sub&gt;amb&lt;/sub&gt;</td>
<td>- 40 to + 125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T&lt;sub&gt;stg&lt;/sub&gt;</td>
<td>- 40 to + 125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>In accordance with fig. 16</td>
<td>T&lt;sub&gt;sd&lt;/sub&gt;</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></td>
<td>V&lt;sub&gt;R&lt;/sub&gt;</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Forward current</td>
<td>T&lt;sub&gt;amb&lt;/sub&gt; ≤ 125 °C</td>
<td>I&lt;sub&gt;F&lt;/sub&gt;</td>
<td>25</td>
<td>mA</td>
</tr>
<tr>
<td>Forward surge current</td>
<td>t&lt;sub&gt;p&lt;/sub&gt; ≤ 10 μs</td>
<td>I&lt;sub&gt;FSM&lt;/sub&gt;</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>T&lt;sub&gt;amb&lt;/sub&gt; ≤ 125 °C</td>
<td>P&lt;sub&gt;V&lt;/sub&gt;</td>
<td>37.5</td>
<td>mW</td>
</tr>
<tr>
<td>OUTPUT (DETECTOR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector emitter voltage</td>
<td></td>
<td>V&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Emitter collector voltage</td>
<td></td>
<td>V&lt;sub&gt;EKO&lt;/sub&gt;</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td></td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>Collector dark current</td>
<td>T&lt;sub&gt;amb&lt;/sub&gt; = 85 °C, V&lt;sub&gt;CE&lt;/sub&gt; = 5 V</td>
<td>I&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>3.3</td>
<td>μA</td>
</tr>
</tbody>
</table>

![Fig. 1 - Power Dissipation Limit vs. Ambient Temperature](image1.png)

![Fig. 2 - Forward Current Limit vs. Ambient Temperature](image2.png)
**BASIC CHARACTERISTICS** (T<sub>amb</sub> = 25 °C, unless otherwise specified)

<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>Collector current</td>
<td>V&lt;sub&gt;CE&lt;/sub&gt; = 5 V, I&lt;sub&gt;F&lt;/sub&gt; = 15 mA</td>
<td>I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>0.7</td>
<td>1.6</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Collector emitter saturation</td>
<td></td>
<td>V&lt;sub&gt;CESat&lt;/sub&gt;</td>
<td></td>
<td>0.4</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>voltage</td>
<td>I&lt;sub&gt;F&lt;/sub&gt; = 15 mA, I&lt;sub&gt;E&lt;/sub&gt; = 0.2 mA</td>
<td>V&lt;sub&gt;F&lt;/sub&gt;</td>
<td>1</td>
<td>1.2</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Junction capacitance</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 0 V, f = 1 MHz</td>
<td>C&lt;sub&gt;j&lt;/sub&gt;</td>
<td></td>
<td>25</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Collector emitter voltage I&lt;sub&gt;C&lt;/sub&gt;</td>
<td>I&lt;sub&gt;C&lt;/sub&gt; = 1 mA</td>
<td>V&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>20</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Emitter collector voltage</td>
<td>I&lt;sub&gt;E&lt;/sub&gt; = 100 μA</td>
<td>V&lt;sub&gt;EEO&lt;/sub&gt;</td>
<td>7</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Collector dark current</td>
<td>V&lt;sub&gt;CE&lt;/sub&gt; = 25 V, I&lt;sub&gt;F&lt;/sub&gt; = 0 A, E = 0 lx</td>
<td>I&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>1</td>
<td>100</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

**SWITCHING CHARACTERISTICS**

- **Rise time**
  - Channel I: I<sub>C</sub> = 0.7 mA, V<sub>CE</sub> = 5 V, R<sub>L</sub> = 100 Ω (see figure 3)
  - t<sub>r</sub> = 9 µs

- **Fall time**
  - Channel I: I<sub>C</sub> = 0.7 mA, V<sub>CE</sub> = 5 V, R<sub>L</sub> = 100 Ω (see figure 3)
  - t<sub>f</sub> = 16 µs

**Fig. 3 - Test Circuit for t<sub>r</sub> and t<sub>f</sub>**

**Fig. 4 - Switching Times**

**BASIC CHARACTERISTICS** (T<sub>amb</sub> = 25 °C, unless otherwise specified)

- **Fig. 5 - Forward Current vs. Forward Voltage**
- **Fig. 6 - Forward Voltage vs. Ambient Temperature**
Fig. 7 - Collector Current vs. Forward Current

Fig. 8 - Collector Current vs. Collector Emitter Voltage

Fig. 9 - Collector Emitter Saturation Voltage vs. Ambient Temperature

Fig. 10 - Collector Current vs. Ambient Temperature

Fig. 11 - Collector Dark Current vs. Ambient Temperature

Fig. 12 - Relative Collector Current vs. Horizontal Displacement
Fig. 13 - Relative Collector Current vs. Vertical Displacement

Fig. 14 - Rise/Fall Time vs. Collector Current

Fig. 15 - Application example

Fig. 16 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020

FLOOR LIFE
No time limit.
Moisture sensitivity level (MSL) 1, acc. JEDEC, J-STD-020.
PACKAGE DIMENSIONS in millimeters

![Package Dimensions Diagram](image)

Pin connection
Top view

Proposed solderpad design

Marking area

Drawing-No.: 6541-5062.01-4
Issue: 6; 14.05.07

10591
PACKAGE DIMENSIONS in millimeters
Volume/reel = 2000 pcs

Unreel direction
Tape position coming out from reel
Not indicated tolerances ±0.1

Parts mounted
Empty Leader 4.0mm min.
100mm min. with cover tape

Leader and trailer tape:
Empty Trailer 200mm min.
Direction of pulling out

X 2:1

Drawing-No.: 5.800-5092.02-4
Issue 1: 14.05.07

For technical questions, contact: sensorstechsupport@vishay.com
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### Packaging and Ordering Information

#### Notes
1. MOQ: minimum order quantity
2. Please refer to datasheets

#### TUBE SPECIFICATION FIGURES

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

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

Drawing-No: 9700-5097.01-4
Issue: 1, 25.02.00

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

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

Fig. 6

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

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

Fig. 7
Packaging and Ordering Information

Fig. 8

Drawing-No.: 9.700-5222.01-4
Issue: 2; 19.11.04
202/57

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