Silicon NPN Phototransistor, RoHS Compliant

DESCRIPTION
TEMT1000 series are silicon NPN phototransistors with high radiant sensitivity in black, surface mount, plastic packages with lens and daylight blocking filter. Filter bandwidth is matched with 870 nm to 950 nm IR emitters.

FEATURES
- Package type: surface mount
- Package form: GW, RGW, yoke, axial
- Dimensions (L x W x H in mm): 2.5 x 2 x 2.7
- High radiant sensitivity
- Daylight blocking filter matched with 870 nm to 950 nm IR emitters
- Fast response times
- Angle of half sensitivity: $\varphi = \pm 15^\circ$
- Package matches with IR emitter series TSML1000
- Floor life: 168 h, MSL 3, acc. J-STD-020
- Compliant to RoHS Directive 2002/95/EC and in accordance with WEEE 2002/96/EC

APPLICATIONS
- Detector in electronic control and drive circuits
- IR detector for daylight application
- Photo interrupters
- Counter
- Encoder

PRODUCT SUMMARY

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>$I_{ca}$ (mA)</th>
<th>$\varphi$ (deg)</th>
<th>$\lambda_{0.5}$ (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMT1000</td>
<td>7</td>
<td>$\pm 15$</td>
<td>730 to 1000</td>
</tr>
<tr>
<td>TEMT1020</td>
<td>7</td>
<td>$\pm 15$</td>
<td>730 to 1000</td>
</tr>
<tr>
<td>TEMT1030</td>
<td>7</td>
<td>$\pm 15$</td>
<td>730 to 1000</td>
</tr>
<tr>
<td>TEMT1040</td>
<td>7</td>
<td>$\pm 15$</td>
<td>730 to 1000</td>
</tr>
</tbody>
</table>

Note
- Test conditions see table “Basic Characteristics”

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>ORDERING CODE</th>
<th>PACKAGING</th>
<th>REMARKS</th>
<th>PACKAGE FORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMT1000</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Reverse gullwing</td>
</tr>
<tr>
<td>TEMT1020</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Gullwing</td>
</tr>
<tr>
<td>TEMT1030</td>
<td>Tape and reel</td>
<td>MOQ: 1000 pcs, 1000 pcs/reel</td>
<td>Yoke</td>
</tr>
<tr>
<td>TEMT1040</td>
<td>Bulk</td>
<td>MOQ: 1000 pcs, 1000 pcs/bulk</td>
<td>Axial leads</td>
</tr>
</tbody>
</table>

Note
- MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25 ^\circ C$, 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>Emitter collector voltage</td>
<td></td>
<td>$V_{ECO}$</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td></td>
<td>$I_C$</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Collector peak current</td>
<td>$t_p/T = 0.5, t_p \leq 10$ ms</td>
<td>$I_{CM}$</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$T_{amb} \leq 55 ^\circ C$</td>
<td>$P_V$</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>$T_J$</td>
<td>100</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>$T_{amb}$</td>
<td></td>
<td>- 40 to + 85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>$T_{stg}$</td>
<td></td>
<td>- 40 to + 100</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>$t \leq 5$ s</td>
<td>$T_s$</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction/ambient</td>
<td>Soldered on PCB with pad dimensions: 4 mm x 4 mm</td>
<td>$R_{th JA}$</td>
<td>400</td>
<td>K/W</td>
</tr>
</tbody>
</table>
### 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 emitter voltage</td>
<td>I&lt;sub&gt;C&lt;/sub&gt; = 1 mA</td>
<td>V&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>70</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Collector emitter dark current</td>
<td>V&lt;sub&gt;CE&lt;/sub&gt; = 20 V, E = 0</td>
<td>I&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>1</td>
<td>200</td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>Collector emitter capacitance</td>
<td>V&lt;sub&gt;CE&lt;/sub&gt; = 5 V, f = 1 MHz, E = 0</td>
<td>C&lt;sub&gt;CEO&lt;/sub&gt;</td>
<td>3</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Angle of half sensitivity</td>
<td>ϕ</td>
<td>± 15</td>
<td>deg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength of peak sensitivity</td>
<td>λ&lt;sub&gt;p&lt;/sub&gt;</td>
<td>880</td>
<td>nm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of spectral bandwidth</td>
<td>λ&lt;sub&gt;λ&lt;/sub&gt;</td>
<td>730 to 1000</td>
<td>nm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector emitter saturation voltage</td>
<td>E&lt;sub&gt;a&lt;/sub&gt; = 1 mW/cm², λ = 950 nm, I&lt;sub&gt;C&lt;/sub&gt; = 0.1 mA</td>
<td>V&lt;sub&gt;CESat&lt;/sub&gt;</td>
<td>0.3</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Turn-on time</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 5 V, I&lt;sub&gt;C&lt;/sub&gt; = 5 mA, R&lt;sub&gt;L&lt;/sub&gt; = 100 Ω</td>
<td>t&lt;sub&gt;on&lt;/sub&gt;</td>
<td>2.0</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td>Turn-off time</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 5 V, I&lt;sub&gt;C&lt;/sub&gt; = 5 mA, R&lt;sub&gt;L&lt;/sub&gt; = 100 Ω</td>
<td>t&lt;sub&gt;off&lt;/sub&gt;</td>
<td>2.3</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td>Cut-off frequency</td>
<td>V&lt;sub&gt;S&lt;/sub&gt; = 5 V, I&lt;sub&gt;C&lt;/sub&gt; = 5 mA, R&lt;sub&gt;L&lt;/sub&gt; = 100 Ω</td>
<td>f&lt;sub&gt;c&lt;/sub&gt;</td>
<td>180</td>
<td></td>
<td></td>
<td>kHz</td>
</tr>
<tr>
<td>Collector light current</td>
<td>E&lt;sub&gt;a&lt;/sub&gt; = 1 mW/cm², λ = 950 nm, V&lt;sub&gt;CE&lt;/sub&gt; = 5 V</td>
<td>I&lt;sub&gt;ca&lt;/sub&gt;</td>
<td>2</td>
<td>7.0</td>
<td></td>
<td>mA</td>
</tr>
</tbody>
</table>

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

![Graph of collector dark current vs. ambient temperature](image1)

![Graph of relative collector current vs. ambient temperature](image2)

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For technical questions, contact: detectortechsupport@vishay.com

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**Fig. 4 - Collector Light Current vs. Irradiance**

**Fig. 5 - Collector Emitter Capacitance vs. Collector Emitter Voltage**

**Fig. 6 - Turn-on/Turn-off Time vs. Collector Current**

**Fig. 7 - Relative Spectral Sensitivity vs. Wavelength**

**Fig. 8 - Relative Radiant Sensitivity vs. Angular Displacement**
PRECAUTIONS FOR USE

1. Over-current-proof
Customer must apply resistors for protection, otherwise slight voltage shift will cause big current change (burn out will happen).

2. Storage
• Storage temperature and rel. humidity conditions are: 5 °C to 35 °C, R.H. 60 %.
• Floor life must not exceed 168 h, acc. to JEDEC level 3, J-STD-020.
   Once the package is opened, the products should be used within a week. Otherwise, they should be kept in a damp proof box with desiccant.
   Considering tape life, we suggest to use products within one year from production date.
• If opened more than one week in an atmosphere 5 °C to 35 °C, R.H. 60 %, devices should be treated at 60 °C ± 5 °C for 15 h.
• If humidity indicator in the package shows pink color (normal blue), then devices should be treated with the same conditions as 2.3.

REFLOW SOLDER PROFILE

Fig. 9 - Lead Tin (SnPb) Reflow Solder Profile

Fig. 10 - Lead (Pb)-Free Reflow Solder Profile acc. J-STD-020

PACKAGE DIMENSIONS in millimeters: TEMT1000

Solder pad proposal

Technical drawing according to IPC specification
**PACKAGE DIMENSIONS** in millimeters: **TEMT1020**

![TEMT1020 Package Diagram]

Drawing-No.: 6.544-5325.01-4  
Issue: 5; 19.01.06

**PACKAGE DIMENSIONS** in millimeters: **TEMT1030**

![TEMT1030 Package Diagram]

Drawing-No.: 6.544-5329.02-4  
Issue: 3; 08.05.03
PACKAGE DIMENSIONS in millimeters: TEMT1040

REEL DIMENSIONS in millimeters
TAPING DIMENSIONS in millimeters: **TEMT1000**

![Diagram of TEMT1000 taping dimensions]

- Top tape: 0.3 mm
- Collector: Ø 1.55 ± 0.05 mm
- Push pin through hole: 2 ± 0.05 mm
- Feed direction: 4 ± 0.1 mm
- Quantity per reel: 1000 pcs or 5000 pcs

Drawing-No.: 9.700-5271.01-4
Issue: 1; 22.11.02

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TAPING DIMENSIONS in millimeters: **TEMT1020**

![Diagram of TEMT1020 taping dimensions]

- Top tape: 0.3 mm
- Collector: Ø 1.55 ± 0.05 mm
- Push pin through hole: 2 ± 0.05 mm
- Feed direction: 4 ± 0.1 mm
- Quantity per reel: 1000 pcs or 5000 pcs

Drawing-No.: 9.700-5272.01-4
Issue: 1; 22.11.02
**Taping Dimensions** in millimeters: TEMT1030

**Drawing-No.:** 9.700-5273.01-4
**Issue:** 1, 22.11.02

- Top tape: 3.05 ± 0.05
- Push pin through hole: 0.3 Ø 1.55 ± 0.05
- Collector: 4 ± 0.1
- Feed direction: 2 ± 0.05
- 1.75 ± 0.1
- 5.5 ± 0.05
- 12 ± 0.3
- Quantity per reel: 1000 pcs or 5000 pcs
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