Silicon NPN Phototransistor

DESCRIPTION
VEMT2023SLX01 is a silicon NPN epitaxial planar phototransistor in a miniature side looking, surface mount package (SMD) with dome lens and daylight blocking filter. Filter bandwidth is matched with 830 nm to 950 nm IR emitters.

FEATURES
- Package type: surface mount
- Package form: side view
- Dimensions (L x W x H in mm): 2.3 x 2.55 x 2.3
- AEC-Q101 qualified
- High radiant sensitivity
- Daylight blocking filter matched with 830 nm to 950 nm IR emitters
- Fast response times
- Angle of half sensitivity: \( \varphi = \pm 35^\circ \)
- Package matched with IR emitter series VSMB2943SLX01
- Floor life: 4 weeks, MSL 2a, acc. J-STD-020
- Lead (Pb)-free reflow soldering
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS
- Detector in automotive applications
- Photo interrupters
- Miniature switches
- Counters
- Encoders
- Position sensors

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>VEMT2023SLX01</td>
<td>2.7</td>
<td>\pm 35</td>
<td>790 to 970</td>
</tr>
</tbody>
</table>

Note
- Test condition 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>VEMT2023SLX01</td>
<td>Tape and reel</td>
<td>MOQ: 3000 pcs, 3000 pcs/reel</td>
<td>Side view</td>
</tr>
</tbody>
</table>

Note
- MOQ: minimum order quantity
## ABSOLUTE MAXIMUM RATINGS (T_{amb} = 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>Collector emitter voltage</td>
<td></td>
<td>V_{CEO}</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Emitter collector voltage</td>
<td></td>
<td>V_{EEO}</td>
<td>7</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>Power power dissipation</td>
<td>T_{amb} ≤ 75 °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>- 40 to + 100</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>Acc. reflow profile fig. 8</td>
<td>T_{sd}</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction/ambient</td>
<td>Acc. J-STD-051</td>
<td>R_{thJA}</td>
<td>250</td>
<td>K/W</td>
</tr>
</tbody>
</table>

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

Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

## BASIC CHARACTERISTICS (T_{amb} = 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 breakdown voltage</td>
<td>I_C = 0.1 mA</td>
<td>V_{CEO}</td>
<td>20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector dark current</td>
<td>V_{CE} = 5 V, E = 0</td>
<td>I_{CEO}</td>
<td>1</td>
<td>100</td>
<td>nA</td>
<td></td>
</tr>
<tr>
<td>Collector emitter capacitance</td>
<td>V_{CE} = 0 V, f = 1 MHz, E = 0</td>
<td>C_{CEO}</td>
<td>25</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector light current</td>
<td>E_e = 1 mW/cm², λ = 950 nm, V_{CE} = 5 V</td>
<td>I_{ca}</td>
<td>1.3</td>
<td>2.7</td>
<td>4.1</td>
<td>mA</td>
</tr>
<tr>
<td>Angle of half sensitivity</td>
<td></td>
<td>φ</td>
<td>± 35</td>
<td>deg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength of peak sensitivity</td>
<td></td>
<td>λ_p</td>
<td>860</td>
<td>nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of spectral bandwidth</td>
<td></td>
<td>λ_{0.5}</td>
<td>790 to 970</td>
<td>nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector emitter saturation voltage</td>
<td>I_C = 0.05 mA</td>
<td>V_{CEsat}</td>
<td>0.4</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of Ica</td>
<td>E_e = 1 mW/cm², λ = 950 nm, V_{CE} = 5 V</td>
<td>T_{Kica}</td>
<td>1.1</td>
<td>%/K</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BASIC CHARACTERISTICS  \( (T_{\text{amb}} = 25 \, ^{\circ}\text{C}, \text{unless otherwise specified})\)

**Fig. 2 - Collector Dark Current vs. Ambient Temperature**

![Collector Dark Current vs. Ambient Temperature](image1)

**Fig. 3 - Collector Light Current vs. Irradiance**

![Collector Light Current vs. Irradiance](image2)

**Fig. 4 - Rise/Fall Time vs. Collector Current**

![Rise/Fall Time vs. Collector Current](image3)

**Fig. 5 - Relative Spectral Sensitivity vs. Wavelength**

![Relative Spectral Sensitivity vs. Wavelength](image4)

**Fig. 6 - Relative Radiant Sensitivity vs. Angular Displacement**

![Relative Radiant Sensitivity vs. Angular Displacement](image5)

**Fig. 7 - Relative Collector Current vs. Ambient Temperature**

![Relative Collector Current vs. Ambient Temperature](image6)
**DRYPACK**

Devices are packed in moisture barrier bags (MBB) to prevent the products from moisture absorption during transportation and storage. Each bag contains a desiccant.

**FLOOR LIFE**

Floor life (time between soldering and removing from MBB) must not exceed the time indicated on MBB label:

- Floor life: 4 weeks
- Conditions: $T_{amb} < 30 \, ^\circ C$, RH < 60 %
- Moisture sensitivity level 2a, acc. to J-STD-020.

**DRYING**

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or label.

- Devices taped on reel dry using recommended conditions 192 h at $40 \, ^\circ C (\pm 5 \, ^\circ C)$, RH < 5 %.

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**PACKAGE DIMENSIONS VEMT2023SLX01** in millimeters

![Package Dimensions Diagram]

- Collector
- Emitter
- Solder pad proposal acc. IPC '7351

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**REFLOW SOLDER PROFILE**

![Reflow Profile Graph]

**Fig. 8 - Lead (Pb)-free Reflow Solder Profile acc. J-STD-020**
**Tape and Reel Dimensions VEMT2023SLX01** in millimeters

**Reel**

Unreel direction

Tape position coming out from reel
3000 pcs / reel

Label posted here

**Leader and tailer tape:**

Empty (160 mm min.)

Parts mounted

Direction of pulling out

Empty (400 mm min.)

**Terminal position in tape**

<table>
<thead>
<tr>
<th>Device</th>
<th>Lead I</th>
<th>Lead II</th>
</tr>
</thead>
<tbody>
<tr>
<td>VSMB2943SLX01</td>
<td>Cathode</td>
<td>Anode</td>
</tr>
<tr>
<td>VSMF2893SLX01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSMB2948SL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEMD2023SLX01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEMD2523SLX01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEMT2023SLX01</td>
<td>Collector</td>
<td>Emitter</td>
</tr>
<tr>
<td>VEMT2523SLX01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VSMY2853SL</td>
<td>Anode</td>
<td>Cathode</td>
</tr>
</tbody>
</table>

Drawing refers to following types: see table

Reel dimensions and tape

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Issue: 2; 19.02.13
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