SFH 2201

**TOPLED®**
Silicon PIN Photodiode with Enhanced Blue Sensitivity

**Applications**
- Electronic Equipment
- Industrial Automation (Machine Controls, Light Barriers, Vision Controls)

**Features:**
- Package: clear silicone
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Suitable for reflow soldering
- Small package (WxDxH): 4 mm x 5.1 mm x 0.85mm
- Solder control structure

**Ordering Information**

<table>
<thead>
<tr>
<th>Type</th>
<th>Photocurrent</th>
<th>Photocurrent</th>
<th>Ordering Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$E_x = 1000 \text{ lx}; \ white \ LED; \ V_r = 5 \text{ V}$</td>
<td>$E_x = 1000 \text{ lx}; \ white \ LED; \ V_r = 5 \text{ V}$</td>
<td></td>
</tr>
<tr>
<td>$I_p$</td>
<td>≥ 10 $\mu$A</td>
<td>13 $\mu$A</td>
<td>Q65112A3981</td>
</tr>
</tbody>
</table>

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# Maximum Ratings

$T_A = 25 \degree C$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>$T_{op}$</td>
<td>min. -40 °C, max. 85 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>min. -40 °C, max. 85 °C</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>$V_R$</td>
<td>max. 16 V</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>$P_{tot}$</td>
<td>max. 150 mW</td>
</tr>
<tr>
<td>ESD withstand voltage</td>
<td>$V_{ESD}$</td>
<td>max. 2 kV</td>
</tr>
<tr>
<td>acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Characteristics

\( T_A = 25 ^\circ C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spectral sensitivity</td>
<td>( S )</td>
<td>typ.</td>
</tr>
<tr>
<td>( V_R = 5 ) V; Std. Light A, ( T = 2856 ) K</td>
<td>( \lambda_{\text{max}} )</td>
<td>typ.</td>
</tr>
<tr>
<td>Wavelength of max sensitivity</td>
<td>( \lambda_{\text{10%}} )</td>
<td>typ.</td>
</tr>
<tr>
<td>Spectral range of sensitivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiant sensitive area</td>
<td>( A )</td>
<td>typ.</td>
</tr>
<tr>
<td>Dimensions of active chip area</td>
<td>( L \times W )</td>
<td>typ.</td>
</tr>
<tr>
<td>Half angle</td>
<td>( \phi )</td>
<td>typ.</td>
</tr>
<tr>
<td>Dark current</td>
<td>( I_R )</td>
<td>typ.</td>
</tr>
<tr>
<td>( V_R = 10 ) V</td>
<td>max.</td>
<td>25 nA</td>
</tr>
<tr>
<td>Spectral sensitivity of the chip</td>
<td>( \lambda = 400 ) nm</td>
<td>( S_{\lambda} )</td>
</tr>
<tr>
<td>Spectral sensitivity of the chip</td>
<td>( \lambda = 550 ) nm</td>
<td>( S_{\lambda} )</td>
</tr>
<tr>
<td>Open-circuit voltage</td>
<td>( E_v = 1000 ) lx; Std. Light A</td>
<td>( V_0 )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>typ.</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>( E_v = 1000 ) lx; Std. Light A</td>
<td>( I_{\text{SC}} )</td>
</tr>
<tr>
<td>Rise time</td>
<td>( V_R = 5 ) V; ( R_L = 50 ) ( \Omega ); ( \lambda = 850 ) nm; ( I_p = 800 ) ( \mu )A</td>
<td>( t_r )</td>
</tr>
<tr>
<td>Fall time</td>
<td>( V_R = 5 ) V; ( R_L = 50 ) ( \Omega ); ( \lambda = 850 ) nm; ( I_p = 800 ) ( \mu )A</td>
<td>( t_f )</td>
</tr>
<tr>
<td>Forward voltage</td>
<td>( I_F = 100 ) mA; ( E = 0 )</td>
<td>( V_F )</td>
</tr>
<tr>
<td>Capacitance</td>
<td>( V_R = 0 ) V; ( f = 1 ) MHz; ( E = 0 )</td>
<td>( C_0 )</td>
</tr>
<tr>
<td>Temperature coefficient of voltage</td>
<td>( T_{CV} )</td>
<td>typ.</td>
</tr>
<tr>
<td>Thermal resistance junction ambient real</td>
<td>( R_{\text{thJA}} )</td>
<td>max.</td>
</tr>
</tbody>
</table>
Relative Spectral Sensitivity 1), 2)
\[ S_{\text{rel}} = f (\lambda) \]

Directional Characteristics 1), 2)
\[ S_{\text{rel}} = f (\phi) \]
Dark Current 1), 2)
\[ I_R = f(V_R); \ E = 0 \]

![Graph showing dark current vs. voltage](image)

Capacitance 1), 2)
\[ C = f(V_R); \ f = 1 \text{ MHz}; \ E = 0; \]

![Graph showing capacitance vs. voltage](image)
Approximate Weight: 46.0 mg
Package marking: Cathode
Handling Indication: The package is casted with silicone. Mechanical stress at the silicone surface of the unit should be avoided. Pickup the device at the plastic frame.

**Recommended Solder Pad**

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E

**Reflow Soldering Profile**

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E
### Profile Feature

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pb-Free (SnAgCu) Assembly Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>Recommendation</td>
</tr>
</tbody>
</table>

- **Ramp-up rate to preheat**
  - 25 °C to 150 °C
  - 2 K/s to 3 K/s

- **Time**
  - \(t_s\): 60 s to 100 s to 120 s
  - \(T_{S_{\text{min}}} \) to \(T_{S_{\text{max}}}\)

- **Ramp-up rate to peak**
  - \(T_{S_{\text{max}}} \) to \(T_p\)
  - 2 K/s to 3 K/s

- **Liquidus temperature**
  - \(T_L\): 217 °C

- **Time above liquidus temperature**
  - \(t_L\): 80 s to 100 s

- **Peak temperature**
  - \(T_p\): 245 °C to 260 °C

- **Time within 5 °C of the specified peak temperature \(T_p\) - 5 K**
  - \(t_p\): 10 s to 20 s to 30 s

- **Ramp-down rate**
  - \(T_p\) to 100 °C
  - 3 K/s to 6 K/s

- **Time**
  - 25 °C to \(T_p\)
  - 480 s

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All temperatures refer to the center of the package, measured on the top of the component.

* slope calculation DT/Dt: Dt max. 5 s; fulfillment for the whole T-range

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### Taping 3)

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**Tape and Reel 4)***

![Diagram of tape and reel dimensions]

**Reel dimensions [mm]**

<table>
<thead>
<tr>
<th>A</th>
<th>W</th>
<th>N&lt;sub&gt;min&lt;/sub&gt;</th>
<th>W&lt;sub&gt;1&lt;/sub&gt;</th>
<th>W&lt;sub&gt;2&lt;/sub&gt; max</th>
<th>Pieces per PU</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 mm</td>
<td>12 + 0.3 / - 0.1</td>
<td>60</td>
<td>12.4 + 2</td>
<td>18.4</td>
<td>1500</td>
</tr>
</tbody>
</table>

Leader: min. 400 mm *
Trailer: min. 160 mm *
*) Dimensions acc. to IEC 60286-3; EIA 481-D

OHAY0324
Barcode-Product-Label (BPL)

Dry Packing Process and Materials

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.

Moisture-sensitive label or print
Barcode label
Humidity indicator
Barcode label
Desiccant

Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.
Transportation Packing and Materials

Dimensions of transportation box in mm

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>195 ± 5 mm</td>
<td>195 ± 5 mm</td>
<td>30 ± 5 mm</td>
</tr>
</tbody>
</table>
Notes

The evaluation of eye safety occurs according to the standard IEC 62471:2006 (photo biological safety of lamps and lamp systems). Within the risk grouping system of this IEC standard, the device specified in this data sheet falls into the class exempt group (exposure time 10000 s). Under real circumstances (for exposure time, conditions of the eye pupils, observation distance), it is assumed that no endangerment to the eye exists from these devices. As a matter of principle, however, it should be mentioned that intense light sources have a high secondary exposure potential due to their blinding effect. When looking at bright light sources (e.g. headlights), temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents, depending on the situation.

For further application related informations please visit www.osram-os.com/appnotes
Disclaimer

Language english will prevail in case of any discrepancies or deviations between the two language wordings.

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Glossary

1) **Typical Values**: Due to the special conditions of the manufacturing processes of semiconductor devices, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typ. data will be changed without any further notice.

2) **Testing temperature**: $T_A = 25^\circ$C

3) **Tolerance of Measure**: Unless otherwise noted in drawing, tolerances are specified with ±0.1 and dimensions are specified in mm.

4) **Tape and Reel**: All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.