Silicon PIN Photodiode

**DESCRIPTION**
VBP104FAS and VBP104FASR are high speed and high sensitive PIN photodiodes. It is a surface mount device (SMD) including the chip with a 4.4 mm² sensitive area and a daylight blocking filter matched with IR emitters operating at wavelength 870 nm or 950 nm.

**FEATURES**
- Package type: surface mount
- Package form: GW, RGW
- Dimensions (L x W x H in mm): 6.4 x 3.9 x 1.2
- Radiant sensitive area (in mm²): 4.4
- High radiant sensitivity
- Daylight blocking filter matched with 870 nm to 950 nm emitters
- Fast response times
- Angle of half sensitivity: \( \varphi = \pm 65° \)
- Floor life: 168 h, MSL 3, acc. J-STD-020
- Lead (Pb)-free reflow soldering

**APPLICATIONS**
- High speed detector for infrared radiation
- Infrared remote control and free air data transmission systems, e.g. in combination with TSFFxxxx series IR emitters

**PRODUCT SUMMARY**

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>( I_{ra} ) (( \mu )A)</th>
<th>( \varphi ) (deg)</th>
<th>( \lambda_{0.5} ) (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBP104FAS</td>
<td>35</td>
<td>( \pm 65 )</td>
<td>780 to 1050</td>
</tr>
<tr>
<td>VBP104FASR</td>
<td>35</td>
<td>( \pm 65 )</td>
<td>780 to 1050</td>
</tr>
</tbody>
</table>

Note
- Test conditions see table “Basic Characteristics”

**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>Reverse voltage</td>
<td></td>
<td>( V_R )</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>( T_{amb} \leq 25 ) °C</td>
<td>( P_V )</td>
<td>215</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>( \varphi ) = \pm 65°</td>
<td>( T_{amb} )</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td></td>
<td>( T_{stg} )</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature range</td>
<td>Acc. reflow solder profile fig. 8</td>
<td>( T_{sd} )</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction/ambient</td>
<td></td>
<td>( R_{thJA} )</td>
<td>350</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>Forward voltage</td>
<td>I&lt;sub&gt;F&lt;/sub&gt; = 50 mA</td>
<td>V&lt;sub&gt;F&lt;/sub&gt;</td>
<td>1 V</td>
<td>1.3 V</td>
<td>60 V</td>
<td>V</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>I&lt;sub&gt;R&lt;/sub&gt; = 100 μA, E = 0</td>
<td>V&lt;sub&gt;(BR)&lt;/sub&gt;</td>
<td>2 nA</td>
<td>30 nA</td>
<td>60 V</td>
<td>nA</td>
</tr>
<tr>
<td>Reverse dark current</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V, E = 0</td>
<td>I&lt;sub&gt;r0&lt;/sub&gt;</td>
<td>2 nA</td>
<td>30 nA</td>
<td>60 V</td>
<td>nA</td>
</tr>
<tr>
<td>Diode capacitance</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 0 V, f = 1 MHz, E = 0</td>
<td>C&lt;sub&gt;D&lt;/sub&gt;</td>
<td>48 pF</td>
<td>48 pF</td>
<td>60 V</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 3 V, f = 1 MHz, E = 0</td>
<td>C&lt;sub&gt;D&lt;/sub&gt;</td>
<td>17 pF</td>
<td>40 pF</td>
<td>60 V</td>
<td>pF</td>
</tr>
<tr>
<td>Open circuit voltage</td>
<td>E&lt;sub&gt;e&lt;/sub&gt; = 1 mW/cm², λ = 950 nm</td>
<td>V&lt;sub&gt;o&lt;/sub&gt;</td>
<td>350 mV</td>
<td>350 mV</td>
<td>60 V</td>
<td>mV</td>
</tr>
<tr>
<td>Temperature coefficient of V&lt;sub&gt;o&lt;/sub&gt;</td>
<td>E&lt;sub&gt;e&lt;/sub&gt; = 1 mW/cm², λ = 950 nm</td>
<td>TK&lt;sub&gt;Vo&lt;/sub&gt;</td>
<td>-2.6 mV/K</td>
<td>-2.6 mV/K</td>
<td>60 V</td>
<td>mV/K</td>
</tr>
<tr>
<td>Short circuit current</td>
<td>E&lt;sub&gt;e&lt;/sub&gt; = 1 mW/cm², λ = 950 nm</td>
<td>I&lt;sub&gt;k&lt;/sub&gt;</td>
<td>32 μA</td>
<td>32 μA</td>
<td>60 V</td>
<td>μA</td>
</tr>
<tr>
<td>Temperature coefficient of I&lt;sub&gt;k&lt;/sub&gt;</td>
<td>E&lt;sub&gt;e&lt;/sub&gt; = 1 mW/cm², λ = 950 nm</td>
<td>TK&lt;sub&gt;Ik&lt;/sub&gt;</td>
<td>0.1 %/K</td>
<td>0.1 %/K</td>
<td>60 V</td>
<td>%/K</td>
</tr>
<tr>
<td>Reverse light current</td>
<td>E&lt;sub&gt;e&lt;/sub&gt; = 1 mW/cm², λ = 950 nm, V&lt;sub&gt;R&lt;/sub&gt; = 5 V</td>
<td>I&lt;sub&gt;ra&lt;/sub&gt;</td>
<td>25 µA</td>
<td>35 µA</td>
<td>60 V</td>
<td>µA</td>
</tr>
<tr>
<td>Angle of half sensitivity</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V</td>
<td>φ</td>
<td>± 65 deg</td>
<td>± 65 deg</td>
<td>60 V</td>
<td>deg</td>
</tr>
<tr>
<td>Wavelength of peak sensitivity</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V</td>
<td>λ&lt;sub&gt;0,5&lt;/sub&gt;</td>
<td>950 nm</td>
<td>950 nm</td>
<td>60 V</td>
<td>nm</td>
</tr>
<tr>
<td>Range of spectral bandwidth</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V</td>
<td>λ</td>
<td>780 to 1050 nm</td>
<td>780 to 1050 nm</td>
<td>60 V</td>
<td>nm</td>
</tr>
<tr>
<td>Noise equivalent power</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V</td>
<td>NEP</td>
<td>4 x 10&lt;sup&gt;-14&lt;/sup&gt; W/√Hz</td>
<td>4 x 10&lt;sup&gt;-14&lt;/sup&gt; W/√Hz</td>
<td>60 V</td>
<td>W/√Hz</td>
</tr>
<tr>
<td>Rise time</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V, R&lt;sub&gt;L&lt;/sub&gt; = 1 kΩ, λ = 820 nm</td>
<td>t&lt;sub&gt;r&lt;/sub&gt;</td>
<td>100 ns</td>
<td>100 ns</td>
<td>60 V</td>
<td>ns</td>
</tr>
<tr>
<td>Fall time</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 10 V, R&lt;sub&gt;L&lt;/sub&gt; = 1 kΩ, λ = 820 nm</td>
<td>t&lt;sub&gt;f&lt;/sub&gt;</td>
<td>100 ns</td>
<td>100 ns</td>
<td>60 V</td>
<td>ns</td>
</tr>
</tbody>
</table>

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**Fig. 1 - Reverse Dark Current vs. Ambient Temperature**

**Fig. 2 - Relative Reverse Light Current vs. Ambient Temperature**

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

**Fig. 4 - Reverse Light Current vs. Reverse Voltage**
Fig. 5 - Diode Capacitance vs. Reverse Voltage

Fig. 6 - Relative Spectral Sensitivity vs. Wavelength

Fig. 7 - Relative Radiant Sensitivity vs. Angular Displacement
PACKAGE DIMENSIONS FOR VBP104FASR in millimeters

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Recommended solder pad

technical drawings according to DIN specifications

For technical questions, contact: detectortechsupport@vishay.com

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TAPPING DIMENSIONS FOR VBP104FAS in millimeters

TAPPING DIMENSIONS FOR VBP104FASR in millimeters
SOLDER PROFILE

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

Time between soldering and removing from MBB must not exceed the time indicated in J-STD-020:
- Moisture sensitivity: level 3
- Floor life: 168 h
- Conditions: $T_{amb} < 30 \, ^\circ C$, RH < 60 %

DRYING

In case of moisture absorption devices should be baked before soldering. Conditions see J-STD-020 or recommended conditions:
- 192 h at 40 °C (+ 5 °C), RH < 5 %
- or
- 96 h at 60 °C (+ 5 °C), RH < 5 %.
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