

## Silicon PN Photodiode

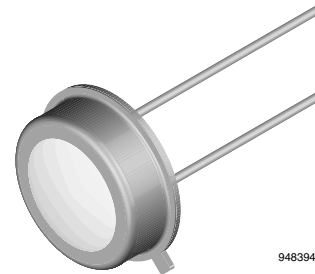
### Description

BPW21R is a planar Silicon PN photodiode in a hermetically sealed short TO-5 case, especially designed for high precision linear applications.

Due to its extremely high dark resistance, the short circuit photocurrent is linear over seven decades of illumination level.

On the other hand, there is a strictly logarithmic correlation between open circuit voltage and illumination over the same range.

The device is equipped with a flat glass window with built in color correction filter, giving an approximation to the spectral response of the human eye.



### Features

- Hermetically sealed TO-5 case
- Flat glass window with built-in color correction filter for visible radiation
- Cathode connected to case
- Wide viewing angle  $\varphi = \pm 50^\circ$
- Large radiant sensitive area ( $A = 7.5 \text{ mm}^2$ )
- Suitable for visible radiation
- High sensitivity
- Low dark current
- High shunt resistance
- Excellent linearity
- For photodiode and photovoltaic cell operation
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



### Applications

- Sensor in exposure and color measuring purposes

### Absolute Maximum Ratings

$T_{\text{amb}} = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                               | Test condition                         | Symbol            | Value         | Unit             |
|---|--|-------------------|---------------|------------------|
| Reverse Voltage                         |  | $V_R$             | 10            | V                |
| Power Dissipation                       | $T_{\text{amb}} \leq 50^\circ\text{C}$ | $P_V$             | 300           | mW               |
| Junction Temperature                    |  | $T_j$             | 125           | $^\circ\text{C}$ |
| Operating Temperature Range             |  | $T_{\text{amb}}$  | - 55 to + 125 | $^\circ\text{C}$ |
| Storage Temperature Range               |  | $T_{\text{stg}}$  | - 55 to + 125 | $^\circ\text{C}$ |
| Soldering Temperature                   | $t \leq 5 \text{ s}$                   | $T_{\text{sd}}$   | 260           | $^\circ\text{C}$ |
| Thermal Resistance Junction/<br>Ambient |  | $R_{\text{thJA}}$ | 250           | K/W              |

### Electrical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

| Parameter            | Test condition                                    | Symbol     | Min | Typ. | Max | Unit      |
|----------------------|---|------------|-----|------|-----|-----------|
| Forward Voltage      | $I_F = 50\text{ mA}$                              | $V_F$      |     | 1.0  | 1.3 | V         |
| Breakdown Voltage    | $I_R = 20\text{ }\mu\text{A}$ , $E = 0$           | $V_{(BR)}$ | 10  |      |     | V         |
| Reverse Dark Current | $V_R = 5\text{ V}$ , $E = 0$                      | $I_{ro}$   |     | 2    | 30  | nA        |
| Diode capacitance    | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$ | $C_D$      |     | 1.2  |     | nF        |
|                      | $V_R = 5\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$ | $C_D$      |     | 400  |     | pF        |
| Dark Resistance      | $V_R = 10\text{ mV}$                              | $R_D$      |     | 38   |     | $G\Omega$ |

### Optical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

| Parameter                      | Test condition  | Symbol          | Min | Typ.       | Max | Unit          |
|--------------------------------|---|-----------------|-----|------------|-----|---------------|
| Open Circuit Voltage           | $E_A = 1\text{ klx}$  | $V_o$           | 280 | 450        |     | mV            |
| Temp. Coefficient of $V_o$     | $E_A = 1\text{ klx}$  | $TK_{V_o}$      |     | - 2        |     | mV/K          |
| Short Circuit Current          | $E_A = 1\text{ klx}$  | $I_k$           | 4.5 | 9          |     | $\mu\text{A}$ |
| Temp. Coefficient of $I_k$     | $E_A = 1\text{ klx}$  | $TK_{I_k}$      |     | - 0.05     |     | %/K           |
| Reverse Light Current          | $E_A = 1\text{ klx}$ , $V_R = 5\text{ V}$                                 | $I_{ra}$        | 4.5 | 9          |     | $\mu\text{A}$ |
| Sensitivity                    | $V_R = 5\text{ V}$ , $E_A = 10^{-2}\text{ to }10^5\text{ lx}$             | $S$             |     | 9          |     | nA/lx         |
| Angle of Half Sensitivity      |   | $\phi$          |     | $\pm 50$   |     | deg           |
| Wavelength of Peak Sensitivity |   | $\lambda_p$     |     | 565        |     | nm            |
| Range of Spectral Bandwidth    |   | $\lambda_{0.5}$ |     | 420 to 675 |     | nm            |
| Rise Time                      | $V_R = 0\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $\lambda = 660\text{ nm}$ | $t_r$           |     | 3.1        |     | $\mu\text{s}$ |
| Fall Time                      | $V_R = 0\text{ V}$ , $R_L = 1\text{ k}\Omega$ , $\lambda = 660\text{ nm}$ | $t_f$           |     | 3.0        |     | $\mu\text{s}$ |

### Typical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

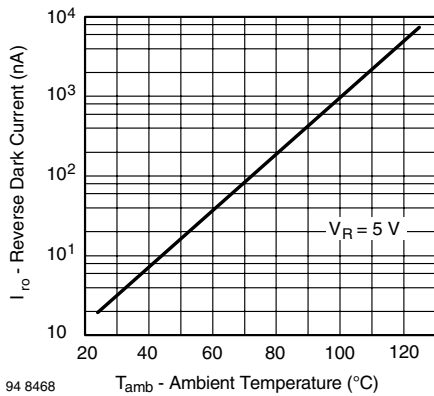


Figure 1. Reverse Dark Current vs. Ambient Temperature

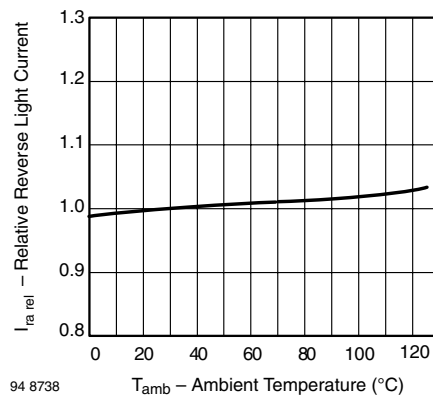
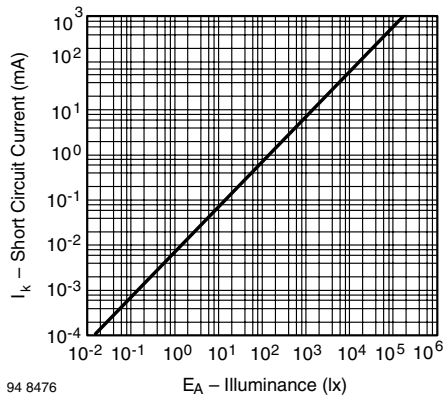
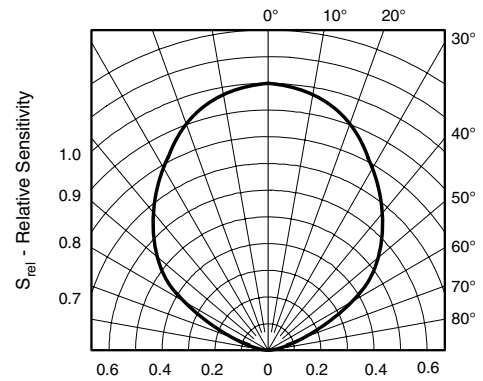


Figure 2. Relative Reverse Light Current vs. Ambient Temperature



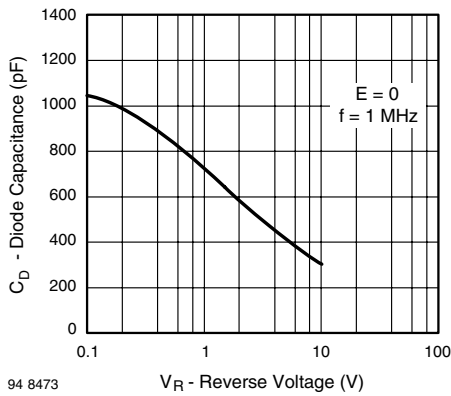
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Figure 3. Short Circuit Current vs. Illuminance



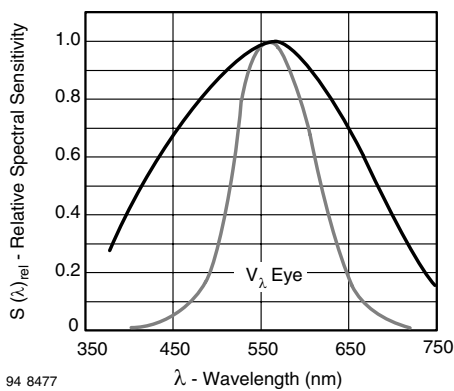
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Figure 6. Relative Radiant Sensitivity vs. Angular Displacement



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Figure 4. Diode Capacitance vs. Reverse Voltage



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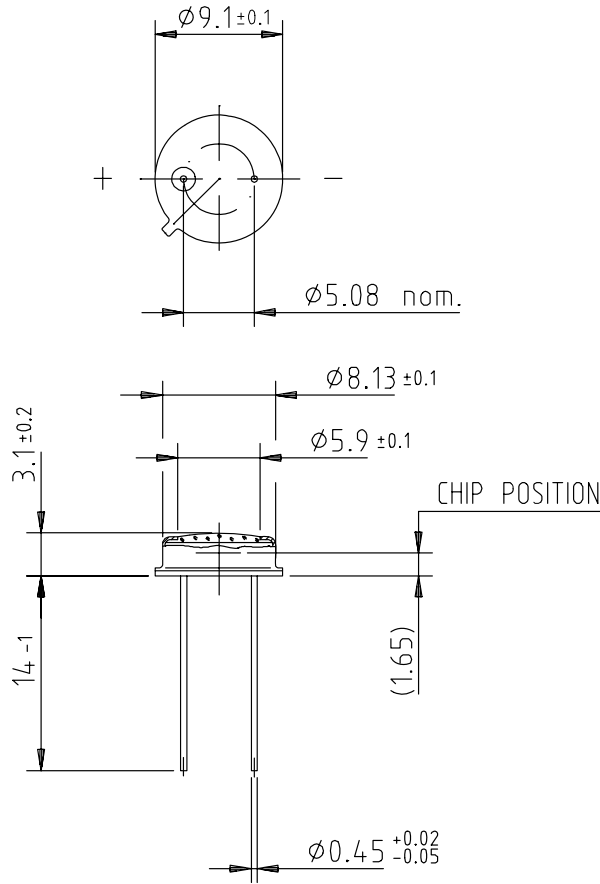
Figure 5. Relative Spectral Sensitivity vs. Wavelength

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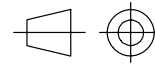
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## Package Dimensions in mm



96 12181



technical drawings  
according to DIN  
specifications

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2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

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3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany



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