

## Silicon PIN Photodiode

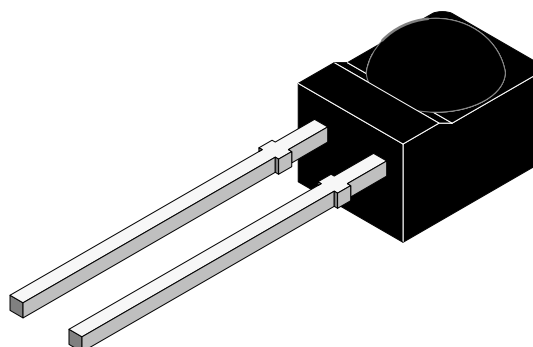
### Description

BPV23NF(L) is a high speed and high sensitive PIN photodiode in a plastic package with a spherical side view lens.

The epoxy package itself is an IR filter, spectrally matched to GaAs on GaAs and GaAlAs on GaAlAs IR emitters ( $\lambda_p = 950 \text{ nm}$ ,  $s_{rel}(\lambda = 875 \text{ nm}) > 90 \%$ ).

Lens radius and chip position are perfectly matched to the chip size, giving high sensitivity without compromising the viewing angle.

In comparison with flat packages the spherical lens package achieves a sensitivity improvement of 80%.



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### Features

- Large radiant sensitive area ( $A = 5.7 \text{ mm}^2$ )
- Wide viewing angle  $\varphi = \pm 60^\circ$
- Improved sensitivity
- Fast response times
- Low junction capacitance
- Plastic package with universal IR filter
- Option "L": long lead package optional available with suffix "L"; e.g.: BPV23FL

### Applications

Infrared remote control and free air transmission systems in combination with IR emitter diodes (TSU.-, TSI.-, or TSH.-Series). High sensitivity detector for high data rate transmission systems. The IR filter matches perfectly to the high speed infrared emitters in the 830 nm to 880 nm wavelength range.

### Absolute Maximum Ratings

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

| Parameter                           | Test Conditions                 | Symbol     | Value        | Unit             |
|-------------------------------------|---------------------------------|------------|--------------|------------------|
| Reverse Voltage                     |                                 | $V_R$      | 60           | V                |
| Power Dissipation                   | $T_{amb} \leq 25^\circ\text{C}$ | $P_V$      | 215          | mW               |
| Junction Temperature                |                                 | $T_j$      | 100          | $^\circ\text{C}$ |
| Operating Temperature Range         |                                 | $T_{amb}$  | $-55...+100$ | $^\circ\text{C}$ |
| Storage Temperature Range           |                                 | $T_{stg}$  | $-55...+100$ | $^\circ\text{C}$ |
| Soldering Temperature               | $t \leq 5 \text{ s}$            | $T_{sd}$   | 260          | $^\circ\text{C}$ |
| Thermal Resistance Junction/Ambient |                                 | $R_{thJA}$ | 350          | K/W              |

## Basic Characteristics

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

| Parameter                      | Test Conditions                                                               | Symbol          | Min | Typ                 | Max | Unit                                   |
|--------------------------------|-------------------------------------------------------------------------------|-----------------|-----|---------------------|-----|----------------------------------------|
| Forward Voltage                | $I_F = 50\text{ mA}$                                                          | $V_F$           |     | 1                   | 1.3 | V                                      |
| Breakdown Voltage              | $I_R = 100\text{ }\mu\text{A}$ , $E = 0$                                      | $V_{(BR)}$      | 60  |                     |     | V                                      |
| Reverse Dark Current           | $V_R = 10\text{ V}$ , $E = 0$                                                 | $I_{ro}$        |     | 2                   | 30  | nA                                     |
| Diode Capacitance              | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ , $E = 0$                             | $C_D$           |     | 48                  |     | pF                                     |
| Serial Resistance              | $V_R = 12\text{ V}$ , $f = 1\text{ MHz}$                                      | $R_S$           |     | 900                 |     | $\Omega$                               |
| Open Circuit Voltage           | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $V_o$           |     | 390                 |     | mV                                     |
| Temp. Coefficient of $V_o$     | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $TK_{V_o}$      |     | -2.6                |     | mV/K                                   |
| Short Circuit Current          | $E_e = 1\text{ mW/cm}^2$ , $\lambda = 950\text{ nm}$                          | $I_k$           |     | 65                  |     | $\mu\text{A}$                          |
| Reverse Light Current          | $E_e = 1\text{ mW/cm}^2$ ,<br>$\lambda = 870\text{ nm}$ , $V_R = 5\text{ V}$  | $I_{ra}$        | 45  | 65                  |     | $\mu\text{A}$                          |
| Temp. Coefficient of $I_{ra}$  | $E_e = 1\text{ mW/cm}^2$ ,<br>$\lambda = 950\text{ nm}$ , $V_R = 10\text{ V}$ | $TK_{I_{ra}}$   |     | 0.1                 |     | %/K                                    |
| Absolute Spectral Sensitivity  | $V_R = 5\text{ V}$ , $\lambda = 870\text{ nm}$                                | $s(\lambda)$    |     | 0.57                |     | A/W                                    |
|                                | $V_R = 5\text{ V}$ , $\lambda = 950\text{ nm}$                                | $s(\lambda)$    |     | 0.60                |     | A/W                                    |
| Angle of Half Sensitivity      |                                                                               | $\phi$          |     | $\pm 60$            |     | deg                                    |
| Wavelength of Peak Sensitivity |                                                                               | $\lambda_p$     |     | 940                 |     | nm                                     |
| Range of Spectral Bandwidth    |                                                                               | $\lambda_{0.5}$ |     | 790...1050          |     | nm                                     |
| Quantum Efficiency             | $\lambda = 950\text{ nm}$                                                     | $\eta$          |     | 90                  |     | %                                      |
| Noise Equivalent Power         | $V_R = 10\text{ V}$ , $\lambda = 950\text{ nm}$                               | NEP             |     | $4 \times 10^{-14}$ |     | W/ $\sqrt{\text{Hz}}$                  |
| Detectivity                    | $V_R = 10\text{ V}$ , $\lambda = 950\text{ nm}$                               | $D^*$           |     | $5 \times 10^{12}$  |     | $\text{cm}^2\sqrt{\text{Hz}}/\text{W}$ |
| Rise Time                      | $V_R = 10\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 820\text{ nm}$ | $t_r$           |     | 70                  |     | ns                                     |
| Fall Time                      | $V_R = 10\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 820\text{ nm}$ | $t_f$           |     | 70                  |     | ns                                     |
| Cut-Off Frequency              | $V_R = 12\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 870\text{ nm}$ | $f_c$           |     | 4                   |     | MHz                                    |
|                                | $V_R = 12\text{ V}$ , $R_L = 1\text{ k}\Omega$ ,<br>$\lambda = 950\text{ nm}$ | $f_c$           |     | 1                   |     | MHz                                    |

## Typical Characteristics ( $T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified)

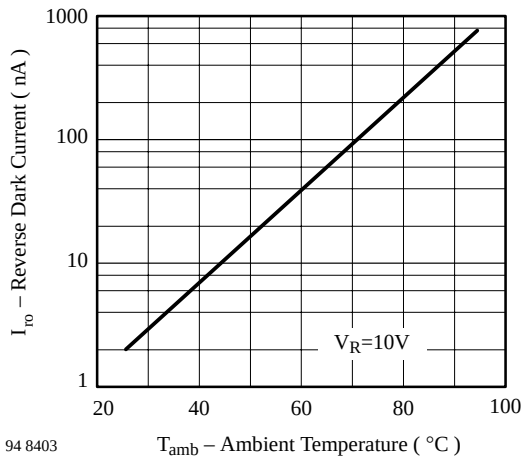


Figure 1. Reverse Dark Current vs. Ambient Temperature

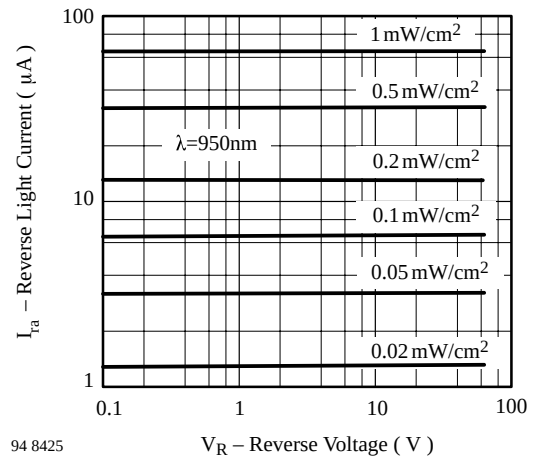


Figure 4. Reverse Light Current vs. Reverse Voltage

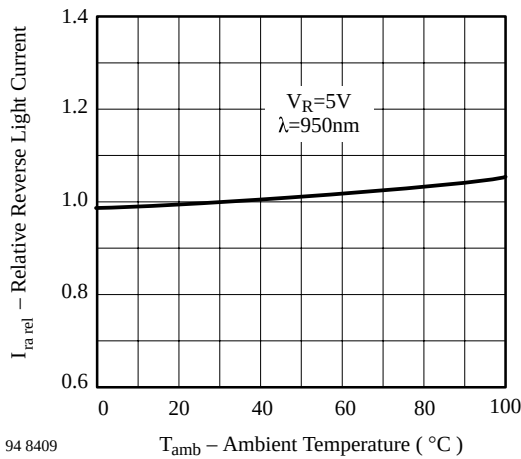


Figure 2. Relative Reverse Light Current vs. Ambient Temperature

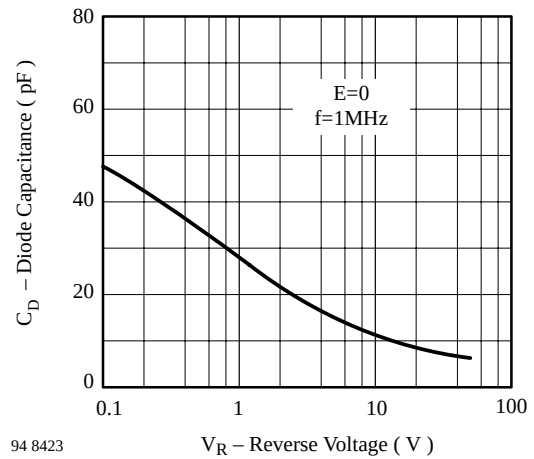


Figure 5. Diode Capacitance vs. Reverse Voltage

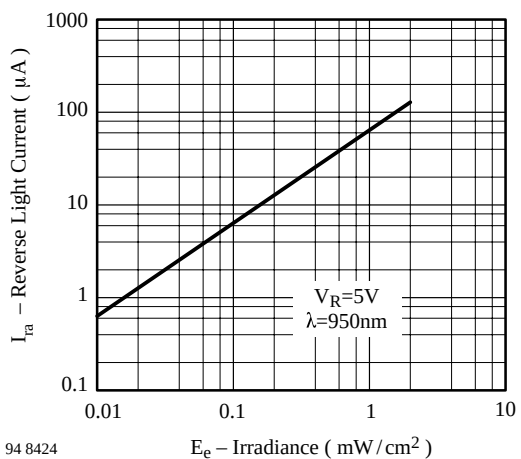


Figure 3. Reverse Light Current vs. Irradiance

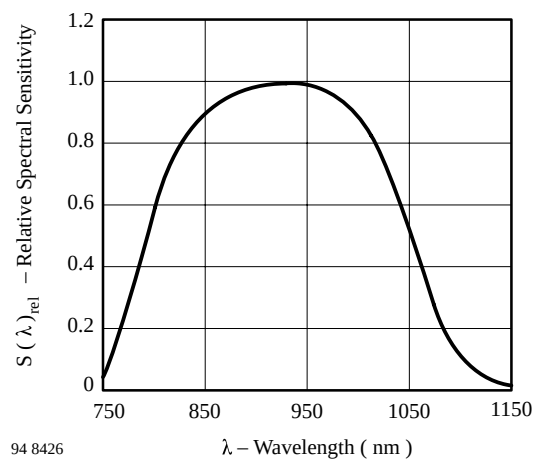
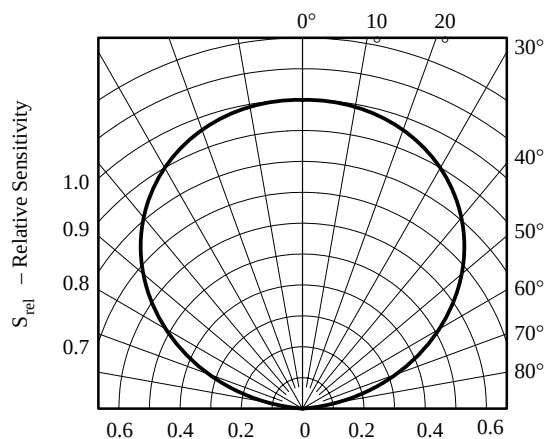


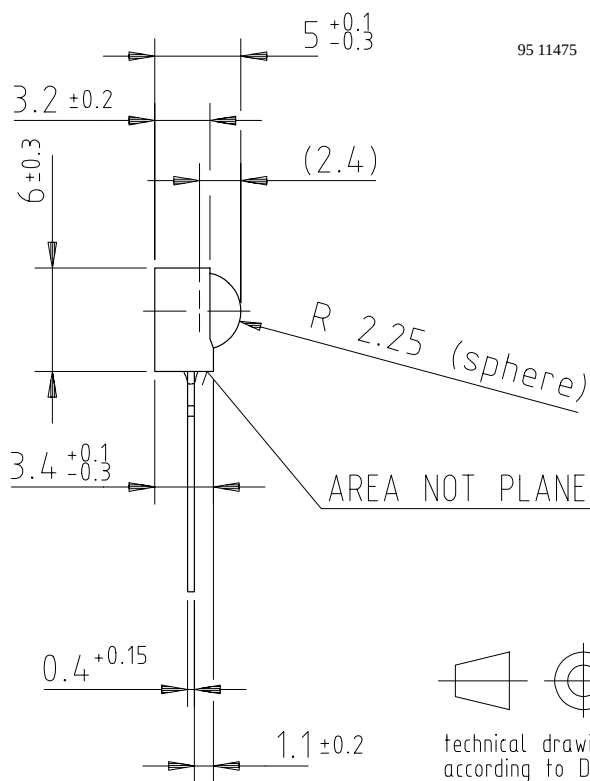
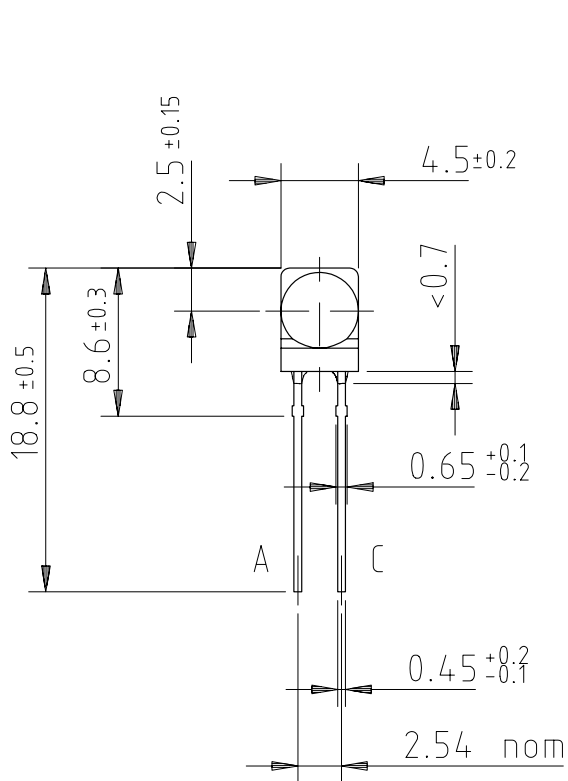
Figure 6. Relative Spectral Sensitivity vs. Wavelength



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Figure 7. Relative Radiant Sensitivity vs. Angular Displacement

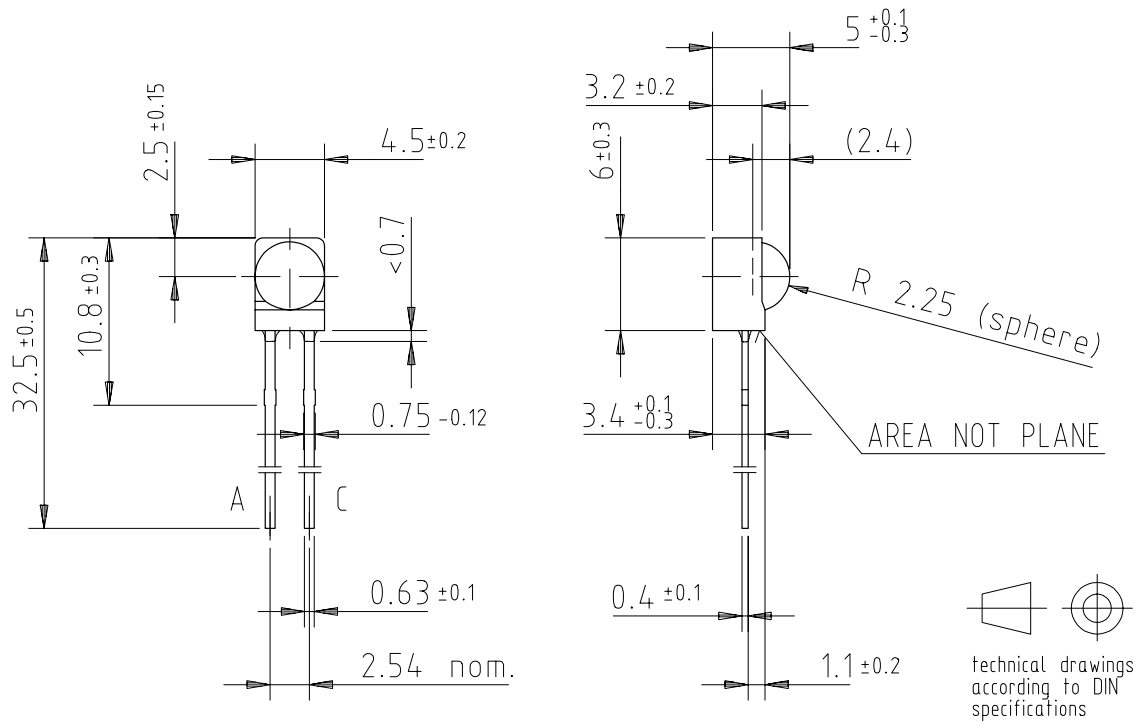
## Dimensions BPV23NF in mm



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technical drawings  
according to DIN  
specifications

**Dimensions BPV23NFL in mm**



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### Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.
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.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**Vishay Semiconductor GmbH** has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
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.

**We reserve the right to make changes to improve technical design and may do so without further notice.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay-Telefunken products for any unintended or unauthorized application, the buyer shall indemnify Vishay-Telefunken against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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