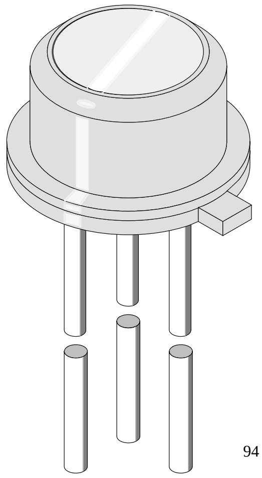
# Silicon PIN Photodiode

## Description

BPW97 is an extra high speed PIN photodiode in a hermetically sealed TO–18 package.
Unlike most similar devices, the cathode terminal is isolated from case and connected to a third terminal, giving the user all the means to improve shielding of his system.
Due to its high precision flat glass window and its accurate chip alignment, this device is recommended for ambitious applications in the optical data transmission domain.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## Features

- Extra fast response times at low operating voltages
- Exact central chip alignment
- Chip insulated
- Shielded construction
- Hermetically sealed TO–18 case
- Flat optical window
- Wide angle of half sensitivity $\varphi = \pm 55^\circ$
- Radiant sensitive area $A=0.25mm^2$
- Suitable for visible and near infrared radiation
- Suitable for coupling with 50 µm gradient index fiber

## Applications

Wide band detector for demodulation of fast signals, e.g. of lasers and GaAs emitters.
Detector for optical communication, e.g. for optical fiber transmission systems with only 5 V power supply.

## Absolute Maximum Ratings

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

| Parameter | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Reverse Voltage | | $V_R$ | 60 | V |
| Power Dissipation | $T_{amb} \leqq 25\ ^\circ C$ | $P_V$ | 285 | mW |
| Junction Temperature | | $T_j$ | 125 | °C |
| Storage Temperature Range | | $T_{stg}$ | –55...+125 | °C |
| Soldering Temperature | $t \leqq 5$ s | $T_{sd}$ | 260 | °C |
| Thermal Resistance Junction/Ambient | | $R_{thJA}$ | 350 | K/W |

## Basic Characteristics

$T_{amb}$ = 25°C

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | $I_F$ = 50 mA | $V_F$ | | 0.9 | 1.2 | V |
| Breakdown Voltage | $I_R$ = 100 μA, E = 0 | $V_{(BR)}$ | 60 | | | V |
| Reverse Dark Current | $V_R$ = 50 V, E = 0 | $I_{ro}$ | | 1 | 5 | nA |
| Diode Capacitance | $V_R$ = 50 V, f = 1 MHz, E = 0 | $C_D$ | | 1.7 | | pF |
| Dark Resistance | $V_R$ = 10m V, E = 0, f = 0 | $R_D$ | | 5 | | GΩ |
| Serial Resistance | $V_R$ = 50 V, f = 1 MHz | $R_S$ | | 180 | | Ω |
| Reverse Light Current | $E_e$ = 1 mW/cm$^2$, λ = 870 nm, $V_R$ = 50 V | $I_{ra}$ | 1.0 | 1.3 | | μA |
| | $E_e$ = 1 mW/cm$^2$, λ = 950 nm, $V_R$ = 50 V | $I_{ra}$ | | 0.9 | | μA |
| Temp. Coefficient of $I_{ra}$ | $V_R$ = 50 V, λ = 870 nm | $TK_{Ira}$ | | 0.2 | | %/K |
| Absolute Spectral Sensitivity | $V_R$ = 5 V, λ = 870 nm | s(λ) | | 0.50 | | A/W |
| | $V_R$ = 5 V, λ = 950 nm | s(λ) | | 0.35 | | A/W |
| Angle of Half Sensitivity | | φ | | ±55 | | deg |
| Wavelength of Peak Sensitivity | | $\lambda_p$ | | 810 | | nm |
| Range of Spectral Bandwidth | | $\lambda_{0.5}$ | | 560...960 | | nm |
| Quantum Efficiency | λ = 850 nm | η | | 80 | | % |
| Noise Equivalent Power | $V_R$ = 50 V, λ = 870 nm | NEP | | $3.6 \times 10^{-14}$ | | W/√ Hz |
| Detectivity | $V_R$ = 50 V, λ = 870 nm | $D^*$ | | $1.4 \times 10^{12}$ | | cm√Hz/W |
| Rise Time | $V_R$ = 3.8 V, $R_L$ = 50 Ω, λ = 780 nm | $t_r$ | | 1.2 | | ns |
| Fall Time | $V_R$ = 3.8 V, $R_L$ = 50 Ω, λ = 780 nm | $t_f$ | | 1.2 | | ns |
| Rise Time | $V_R$ = 50 V, $R_L$ = 50 Ω, λ = 820 nm | $t_r$ | | 0.6 | | ns |
| Fall Time | $V_R$ = 50 V, $R_L$ = 50 Ω, λ = 820 nm | $t_f$ | | 0.6 | | ns |
| Cut–Off Frequency | λ = 820 nm | $f_c$ | | 1 | | GHz |

## Typical Characteristics (T$_{amb}$ = 25°C unless otherwise specified)

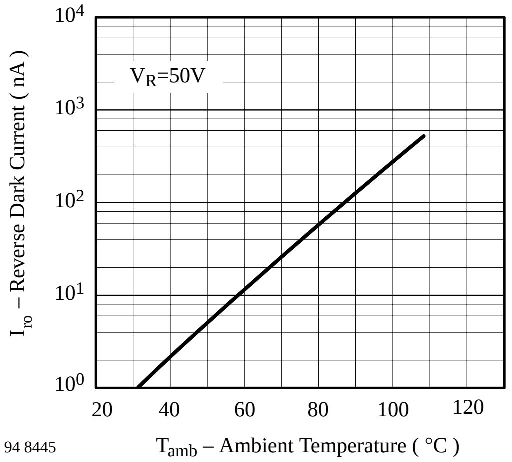



Figure 1. Reverse Dark Current vs. Ambient Temperature

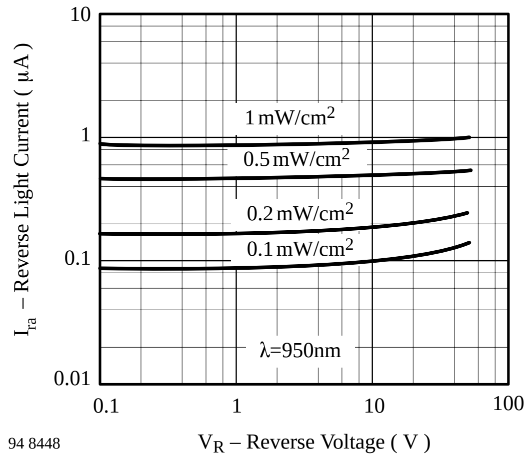



Figure 4. Reverse Light Current vs. Reverse Voltage

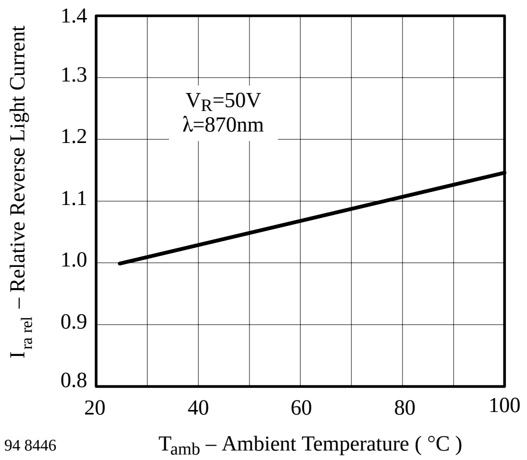



Figure 2. Relative Reverse Light Current vs. Ambient Temperature

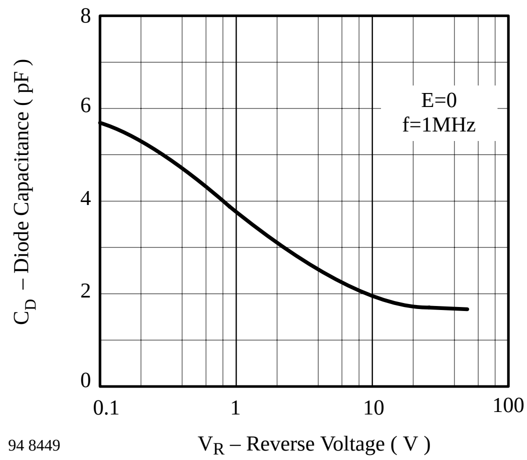



Figure 5. Diode Capacitance vs. Reverse Voltage

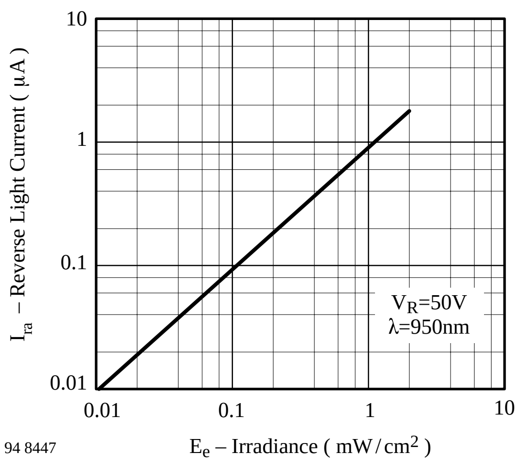



Figure 3. Reverse Light Current vs. Irradiance

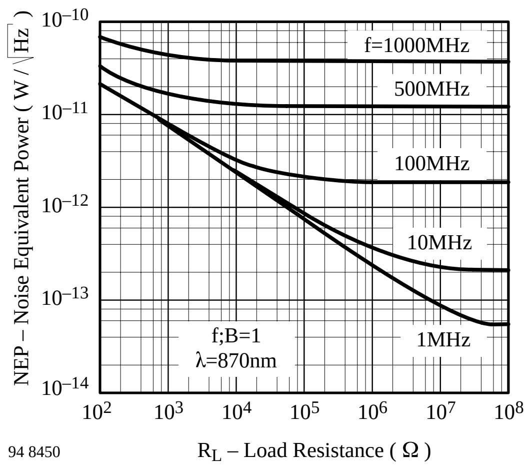



Figure 6. Noise Equivalent Power vs. Load Resistance

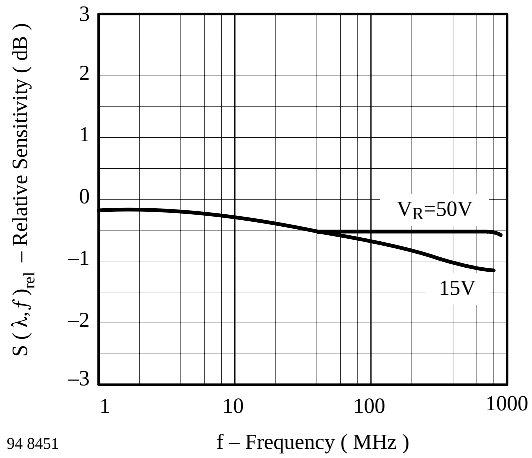



Figure 7. Relative Sensitivity vs. Frequency

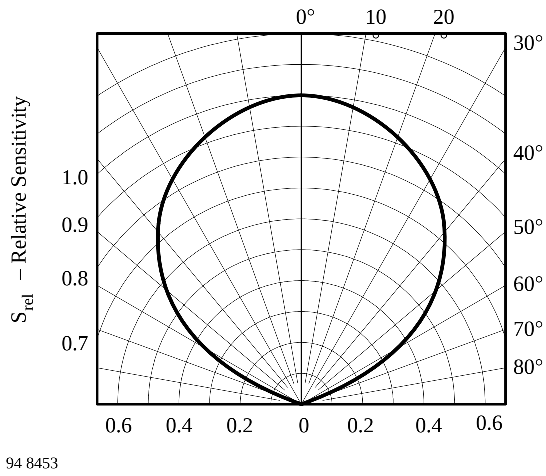



Figure 9. Relative Radiant Sensitivity vs. Angular Displacement

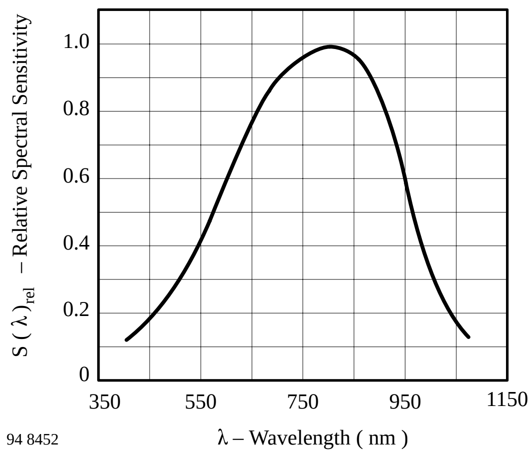
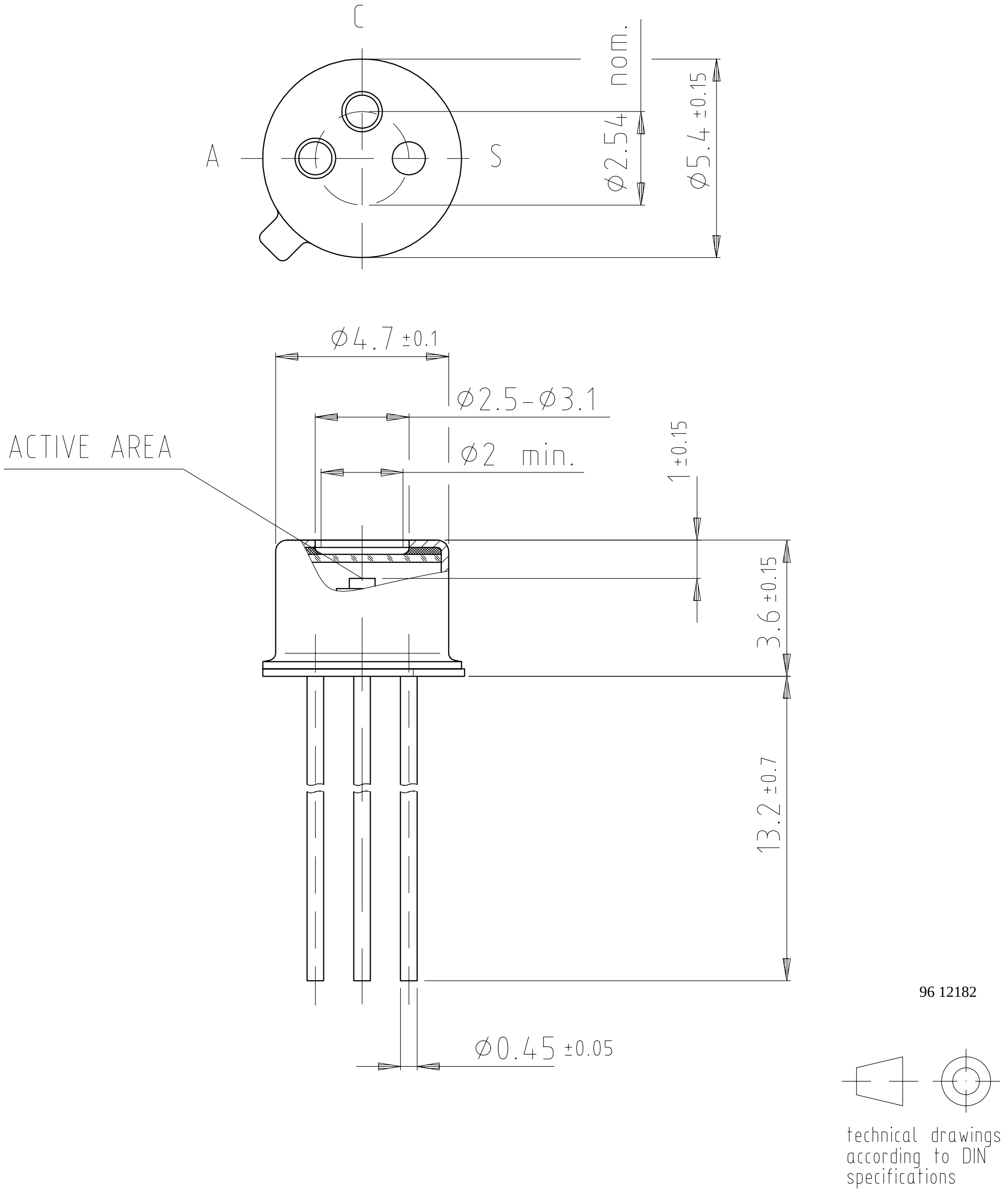



Figure 8. Relative Spectral Sensitivity vs. Wavelength

## Dimensions in mm



## 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.



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