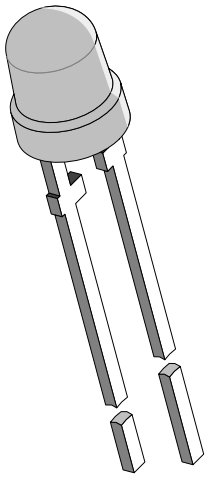
# Silicon NPN Phototransistor

## Description

BPW85 is a high speed and high sensitive silicon NPN epitaxial planar phototransistor in a standard T–1 (ø 3 mm) plastic package. Due to its waterclear epoxy the device is sensitive to visible and near infrared radiation.
The viewing angle of ± 25° makes it insensible to ambient straylight.




## Features

- Fast response times
- High photo sensitivity
- Standard T–1 (ø 3 mm ) clear plastic package
- Axial terminals
- Angle of half sensitivity φ = ± 25°
- Suitable for visible and near infrared radiation
- Selected into sensitivity groups

## Applications

Detector in electronic control and drive circuits

## Absolute Maximum Ratings

$T_{amb}$ = 25°C

| Parameter | Test Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector Emitter Voltage | | $V_{CEO}$ | 70 | V |
| Emitter Collector Voltage | | $V_{ECO}$ | 5 | V |
| Collector Current | | $I_C$ | 50 | mA |
| Peak Collector Current | $t_p/T$ = 0.5, $t_p$ ≦ 10 ms | $I_{CM}$ | 100 | mA |
| Total Power Dissipation | $T_{amb}$ ≦ 55 °C | $P_{tot}$ | 100 | mW |
| Junction Temperature | | $T_j$ | 100 | °C |
| Storage Temperature Range | | $T_{stg}$ | –55...+100 | °C |
| Soldering Temperature | t ≦ 3 s, 2 mm from case | $T_{sd}$ | 260 | °C |
| Thermal Resistance Junction/Ambient | | $R_{thJA}$ | 450 | K/W |

## Basic Characteristics

$T_{amb}$ = 25°C

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Collector Emitter Breakdown Voltage | $I_C$ = 1 mA | $V_{(BR)CEO}$ | 70 | | | V |
| Collector Dark Current | $V_{CE}$ = 20 V, E = 0 | $I_{CEO}$ | | 1 | 200 | nA |
| Collector Emitter Capacitance | $V_{CE}$ = 5 V, f = 1 MHz, E = 0 | $C_{CEO}$ | | 3 | | pF |
| Angle of Half Sensitivity | | $\varphi$ | | ±25 | | deg |
| Wavelength of Peak Sensitivity | | $\lambda_p$ | | 850 | | nm |
| Range of Spectral Bandwidth | | $\lambda_{0.5}$ | | 620...980 | | nm |
| Collector Emitter Saturation Voltage | $E_e$ = 1 mW/cm$^2$, $\lambda$ = 950 nm, $I_C$ = 0.1 mA | $V_{CEsat}$ | | | 0.3 | V |
| Turn–On Time | $V_S$ = 5 V, $I_C$ = 5 mA, $R_L$ = 100 Ω | $t_{on}$ | | 2.0 | | µs |
| Turn–Off Time | $V_S$ = 5 V, $I_C$ = 5 mA, $R_L$ = 100 Ω | $t_{off}$ | | 2.3 | | µs |
| Cut–Off Frequency | $V_S$ = 5 V, $I_C$ = 5 mA, $R_L$ = 100 Ω | $f_c$ | | 180 | | kHz |

## Type Dedicated Characteristics

$T_{amb}$ = 25°C

| Parameter | Test Conditions | Type | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Collector Light Current | $E_e$=1mW/cm$^2$, $\lambda$=950nm, $V_{CE}$=5V | BPW85A | $I_{ca}$ | 0.8 | 1.5 | 2.5 | mA |
| | | BPW85B | $I_{ca}$ | 1.5 | 2.5 | 4.0 | mA |
| | | BPW85C | $I_{ca}$ | 3.0 | 5.0 | 8.0 | mA |

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

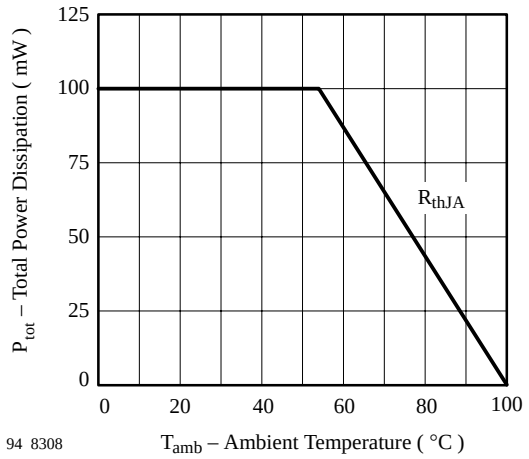



Figure 1. Total Power Dissipation vs. Ambient Temperature

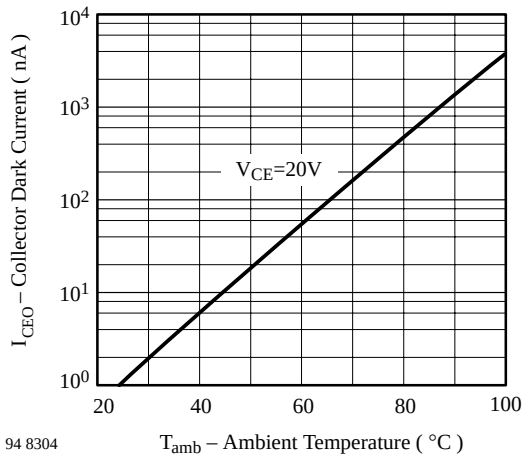



Figure 2. Collector Dark Current vs. Ambient Temperature

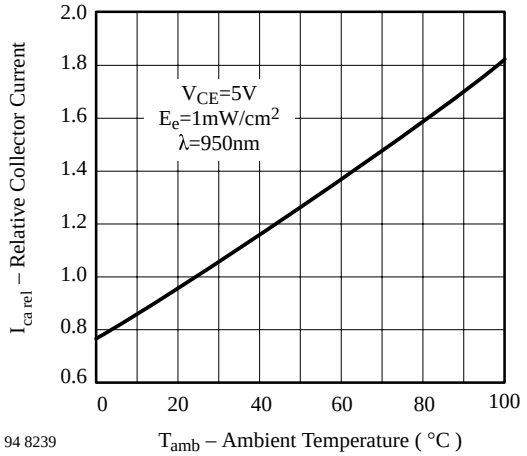



Figure 3. Relative Collector Current vs. Ambient Temperature

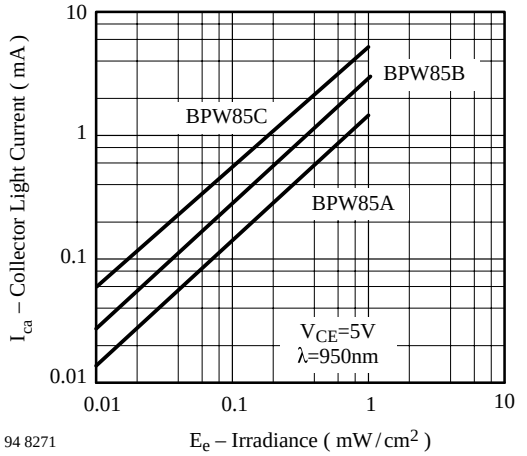



Figure 4. Collector Light Current vs. Irradiance

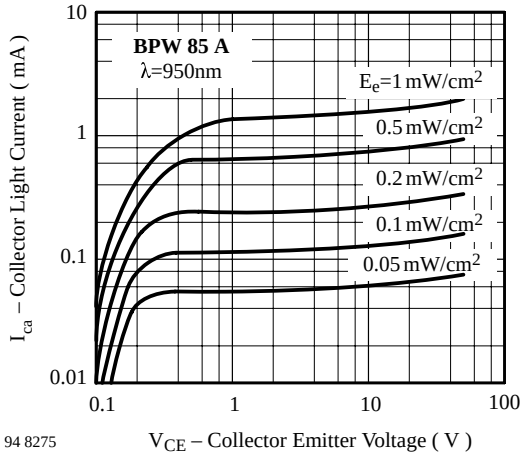



Figure 5. Collector Light Current vs. Collector Emitter Voltage

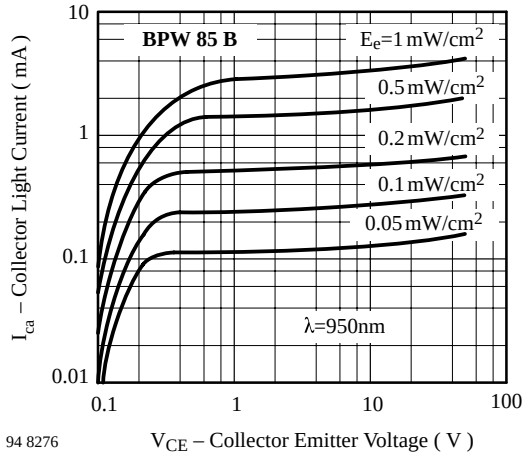



Figure 6. Collector Light Current vs. Collector Emitter Voltage

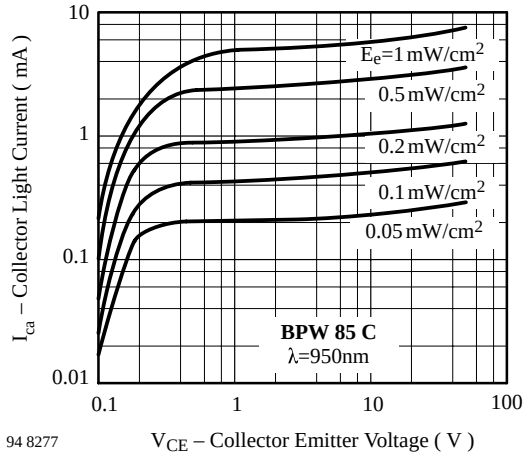



Figure 7. Collector Light Current vs. Collector Emitter Voltage

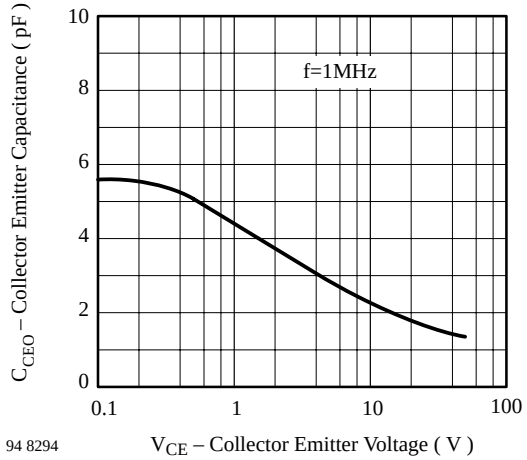



Figure 8. Collector Emitter Capacitance vs. Collector Emitter Voltage

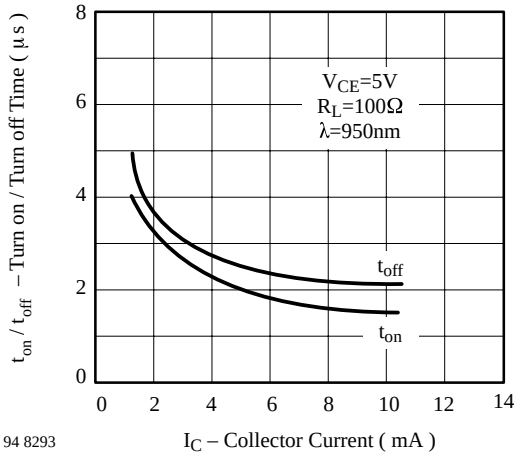



Figure 9. Turn On/Turn Off Time vs. Collector Current

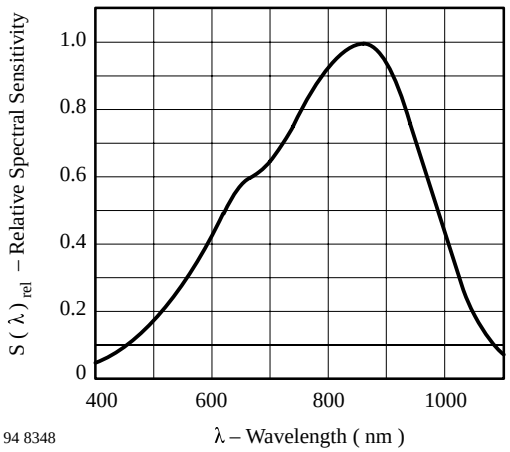



Figure 10. Relative Spectral Sensitivity vs. Wavelength

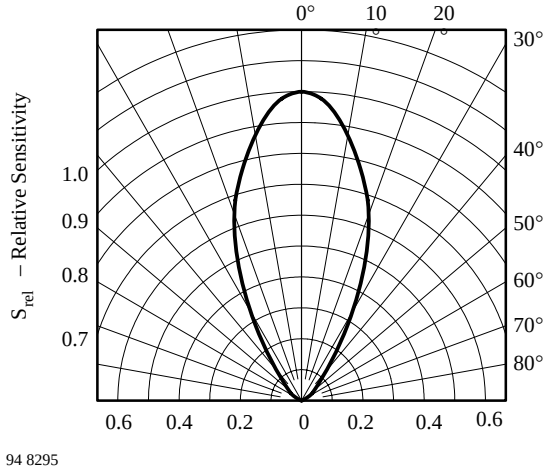
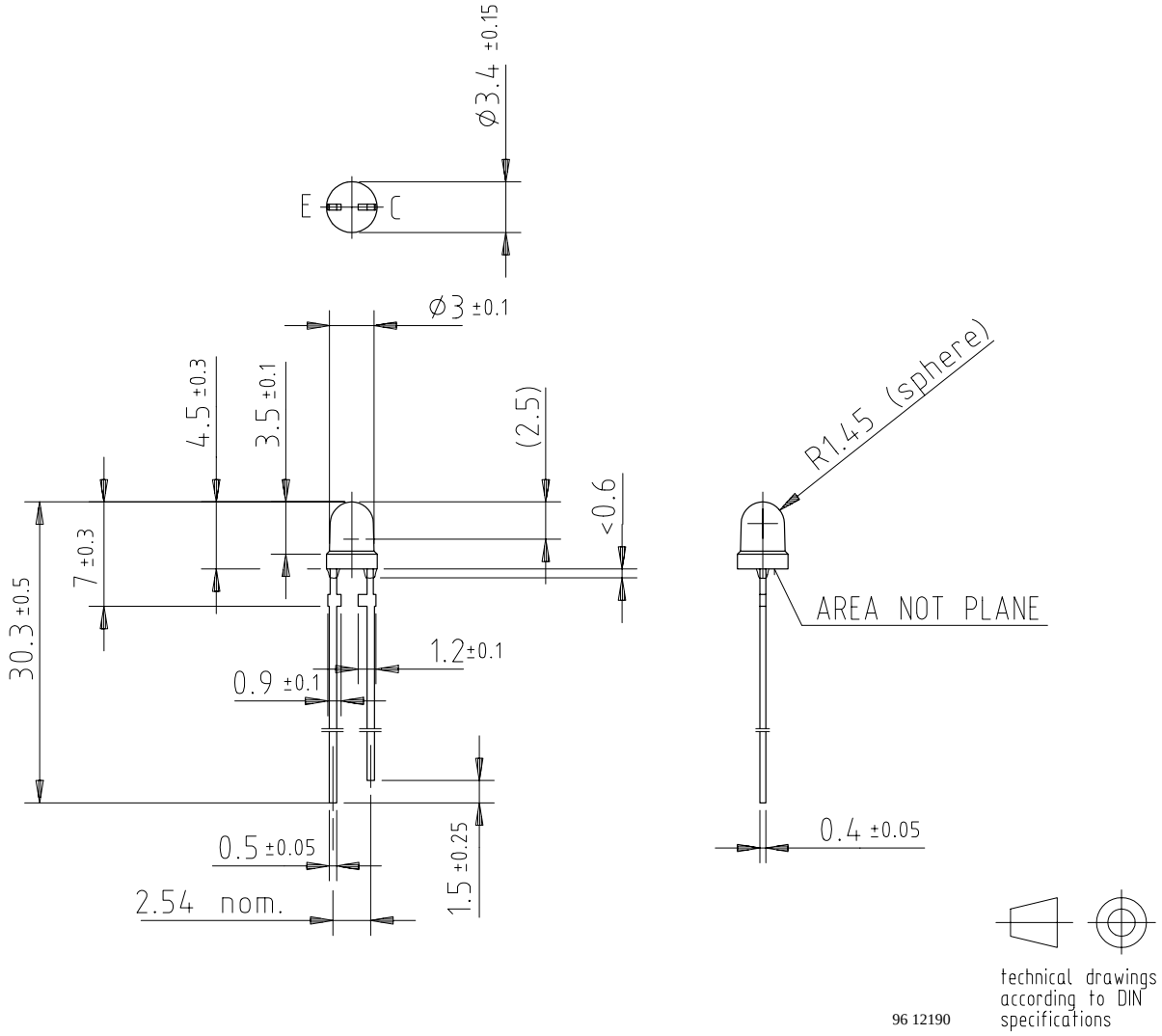



Figure 11. Relative Radiant Sensitivity vs. Angular Displacement

## 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.

**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-Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay-Semiconductors 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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