## Vishay Semiconductors



# Silicon NPN Phototransistor, RoHS Compliant



#### **FEATURES**

Package type: leadedPackage form: TO-18

• Dimensions (in mm): Ø 4.7

High photo sensitivity

· High radiant sensitivity

· Suitable for visible and near infrared radiation

• Fast response times

• Angle of half sensitivity:  $\varphi = \pm 10^{\circ}$ 

· Base terminal connected

· Hermetically sealed package

 Lead (Pb)-free component in accordance with RoHS 2002/95/EC and WEEE 2002/96/EC



· Detector in electronic control and drive circuits

#### **DESCRIPTION**

BPW77 is a silicon NPN phototransistor with high radiant sensitivity in hermetically sealed TO-18 package with base terminal and glass lens. It is sensitive to visible and near infrared radiation.

PRODUCT SUMMARY						
COMPONENT	I <sub>ca</sub> (mA)	φ (deg)	λ <sub>0.1</sub> (nm)			
BPW77NA	7.5 to 15	± 10	450 to 1080			
BPW77NB	> 10	± 10	450 to 1080			

#### Note

Test condition see table "Basic Characteristics"

ORDERING INFORMATION						
ORDERING CODE	PACKAGING	REMARKS	PACKAGE FORM			
BPW77NA	Bulk	MOQ: 1000 pcs, 1000 pcs/bulk	TO-18			
BPW77NB	Bulk	MOQ: 1000 pcs, 1000 pcs/bulk	TO-18			

#### Note

MOQ: minimum order quantity

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT	
Collector base voltage		V <sub>CBO</sub>	80	V	
Collector emitter voltage		V <sub>CEO</sub>	70	V	
Emitter base voltage		V <sub>EBO</sub>	5	V	
Collector current		Ic	50	mA	
Collector peak current	$t_p/T = 0.5, t_p \le 10 \text{ ms}$	I <sub>CM</sub>	100	mA	
Total power dissipation	T <sub>amb</sub> ≤ 25 °C	P <sub>V</sub>	250	mW	
Junction temperature		Tj	125	°C	
Operating temperature range		T <sub>amb</sub>	- 40 to + 125	°C	
Storage temperature range		T <sub>stg</sub>	- 40 to + 125	°C	
Soldering temperature	t ≤ 5 s	T <sub>sd</sub>	260	°C	
Thermal resistance junction/ambient	Connected with Cu wire, 0.14 mm <sup>2</sup>	R <sub>thJA</sub>	400	K/W	
Thermal resistance junction/gase		R <sub>thJC</sub>	150	K/W	

#### Note

 $T_{amb}$  = 25 °C, unless otherwise specified









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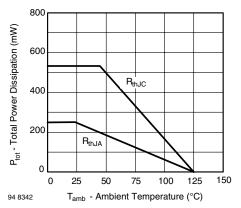


Fig. 1 - Power Dissipation Limit vs. Ambient Temperature

BASIC CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Collector emitter breakdown voltage	I <sub>C</sub> = 1 mA	V <sub>(BR)CEO</sub>	70			V
Collector emitter dark current	V <sub>CE</sub> = 20 V, E = 0	I <sub>CEO</sub>		1	100	nA
Collector emitter capacitance	$V_{CE} = 5 \text{ V}, f = 1 \text{ MHz}, E = 0$	C <sub>CEO</sub>		6		pF
Angle of half sensitivity		φ		± 10		deg
Wavelength of peak sensitivity		$\lambda_{p}$		850		nm
Range of spectral bandwidth		λ <sub>0.1</sub>		450 to 1080		nm
Collector emitter saturation voltage	$E_e = 1 \text{ mW/cm}^2, \lambda = 950 \text{ nm},$ $I_C = 1 \text{ mA}$	V <sub>CEsat</sub>		0.15	0.3	V
Turn-on time	$V_S = 5 \text{ V}, I_C = 5 \text{ mA}, R_L = 100 \Omega$	t <sub>on</sub>		6		μs
Turn-off time	$V_S = 5 \text{ V}, I_C = 5 \text{ mA}, R_L = 100 \Omega$	t <sub>off</sub>		5		μs
Cut-off frequency	$V_S = 5 \text{ V}, I_C = 5 \text{ mA}, R_L = 100 \Omega$	f <sub>c</sub>		110		kHz

#### Note

T<sub>amb</sub> = 25 °C, unless otherwise specified

TYPE DEDICATED CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Collector light current	$E_e = 1 \text{ mW/cm}^2, \lambda = 950 \text{ nm},$	BPW77NA	I <sub>ca</sub>	7.5		15	mA
	$V_{CE} = 5 V$	BPW77NB	I <sub>ca</sub>	10			mA

### **BASIC CHARACTERISTICS**

T<sub>amb</sub> = 25 °C, unless otherwise specified

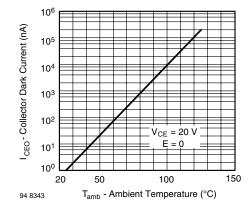


Fig. 2 - Collector Dark Current vs. Ambient Temperature

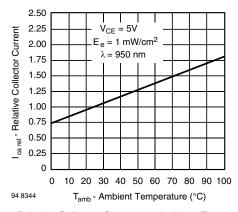


Fig. 3 - Relative Collector Current vs. Ambient Temperature

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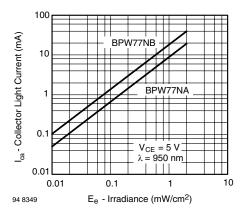


Fig. 4 - Collector Light Current vs. Irradiance

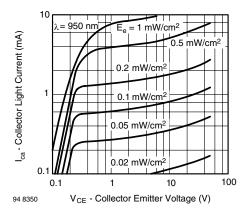


Fig. 5 - Collector Light Current vs. Collector Emitter Voltage

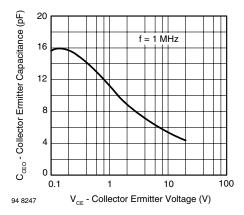


Fig. 6 - Collector Emitter Capacitance vs. Collector Emitter Voltage

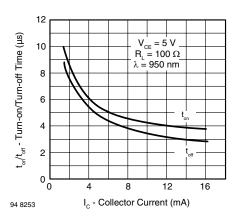


Fig. 7 - Turn-on/Turn-off Time vs. Collector Current

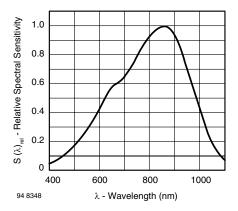


Fig. 8 - Relative Spectral Sensitivity vs. Wavelength

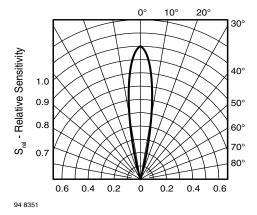
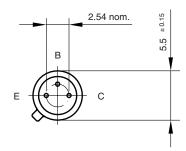


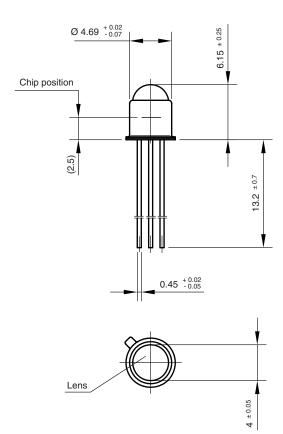
Fig. 9 - Relative Radiant Sensitivity vs. Angular Displacement



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### **PACKAGE DIMENSIONS** in millimeters







technical drawings according to DIN specifications

Drawing-No.: 6.503-5023.01-4

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