2 x 2 mm Black Si Photodiode

FDBS22

Description

Thorlabs' FDBS22 photodiode is ideal for measuring both pulsed and CW light sources by converting optical power to electrical current. The detector is housed in a TO-46 package with an anode and cathode connection. The photodiode anode produces a current, which is a function of the incident light power and the wavelength. The responsivity $\Re(\lambda)$ can be read from the plot on the following page to estimate the amount of photocurrent. This can be converted to a voltage by placing a load resistor (R_L) from the photodiode anode to the circuit ground. Where P is the power, the output voltage is expressed as

$$V_o = P \times \Re \times R_L$$

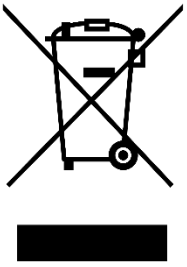
The bandwidth, f_{BW}, and the rise time response, t_R, are determined from the diode capacitance, C_J, and the load resistance, R_L, as shown below. The diode capacitance can be lowered by placing a bias voltage from the photodiode cathode to the circuit ground.

$$f_{BW} = \frac{1}{(2\pi)R_L C_J},\ t_R = \frac{0.35}{f_{BW}}$$

Specifications

Specifications[a]		
Wavelength Range	λ	240 - 1170 nm
Peak Wavelength	λ_P	1010 nm
Responsivity (1010 nm)	$\Re(\lambda_p)$	0.73 A/W (Typ.)
Active Area Size		2.0 mm x 2.0 mm
Rise/Fall Time (650 nm, R_L = 50 Ω, 10 V)	t_r/t_f	25 ns / 29 ns (Typ.)
NEP, Typical (1010 nm, 10 mV)		7.1×10^{-15} W/√Hz
Dark Current (10 V)	I_d	1 nA (Max)
Capacitance (10 V)	C_j	13 pF (Typ.)
Package		TO-46
Sensor Material		Black Silicon

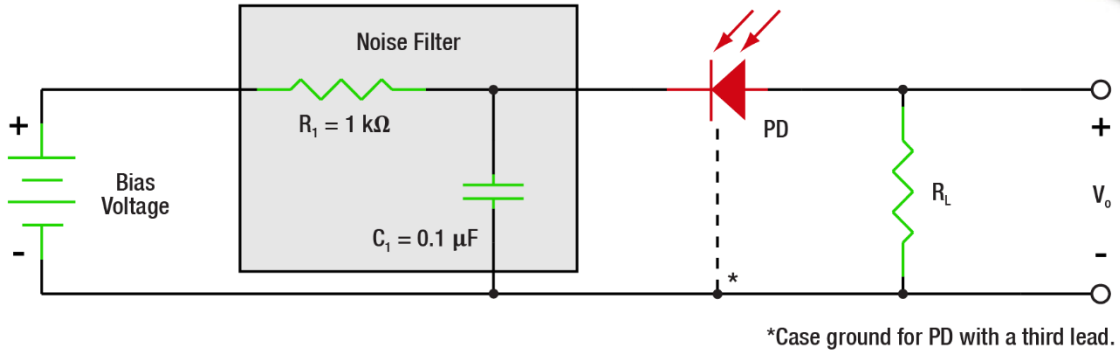
a. Unless otherwise noted, all measurements are performed at 25 °C ambient temperature.



Maximum Ratings	
Max Bias (Reverse) Voltage	20 V
Reverse Current	3 mA
Operating Temperature	-20 to 60 °C
Storage Temperature	-45 to 85 °C

CAUTION
Electrostatic sensitive device (ESD), do not handle except with an ESD wrist strap at a static-free workstation.

Recommended Circuit

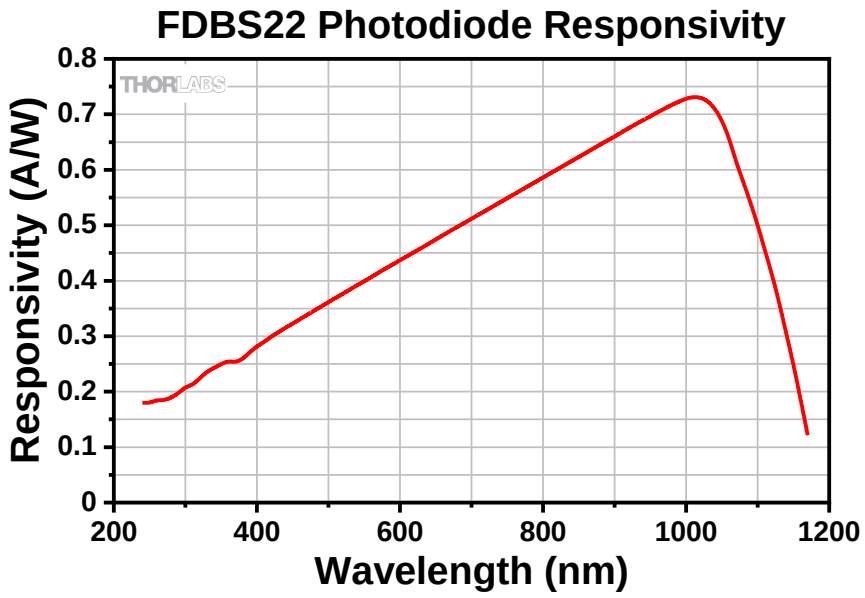


Typical Spectral Intensity Distribution

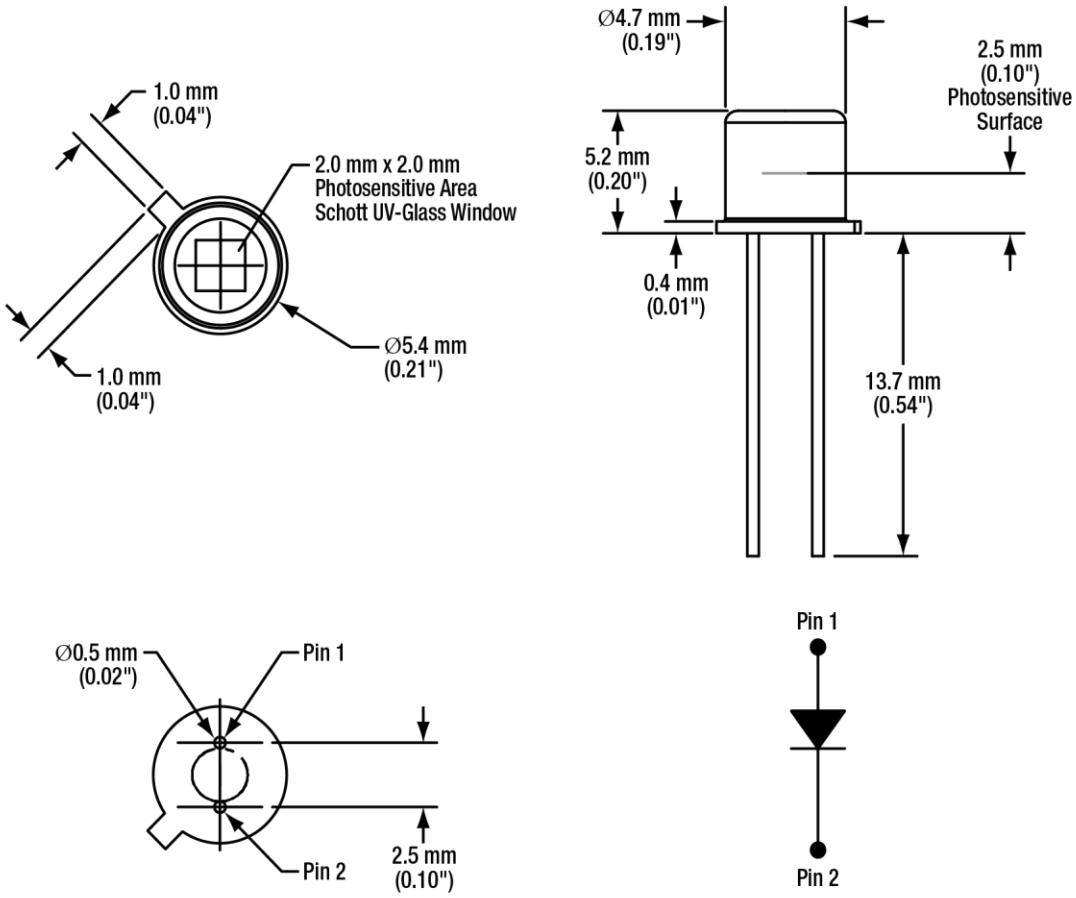
The responsivity of a photodiode is a measure of its sensitivity to light and is defined as the ratio of the photocurrent I_P to the incident light power P at a given wavelength:

$$R_\lambda = \frac{I_P}{P}$$

In other words, it is a measure of the effectiveness of the conversion of light power into electrical current. Responsivity varies from lot to lot and with the wavelength of the incident light, applied reverse bias, and temperature. It increases slightly with applied reverse bias due to improved charge collection efficiency in the photodiode. The change in temperature increases or decreases the width of the band gap and varies inversely with the temperature.



Drawing



Precautions and Warranty Information

Photodiodes are ESD (electrostatic discharge) sensitive devices and particularly sensitive to any value that exceeds the absolute maximum ratings. Any applied voltage in excess of the maximum specification will cause damage and possible complete failure. The user must use handling procedures that prevent any electrostatic discharges or other voltage surges when handling or using these devices.