FGA21

Description

The Thorlabs FGA21 photodiode is ideal for measuring both pulsed and CW fiber light sources, by converting the optical power to an electrical current. The detector is in a TO-5 package with an anode, cathode, and case 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 to expect. This can be converted to a voltage by placing a load resistor (R_L) from the photodiode anode to the circuit ground. The output voltage is derived 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.

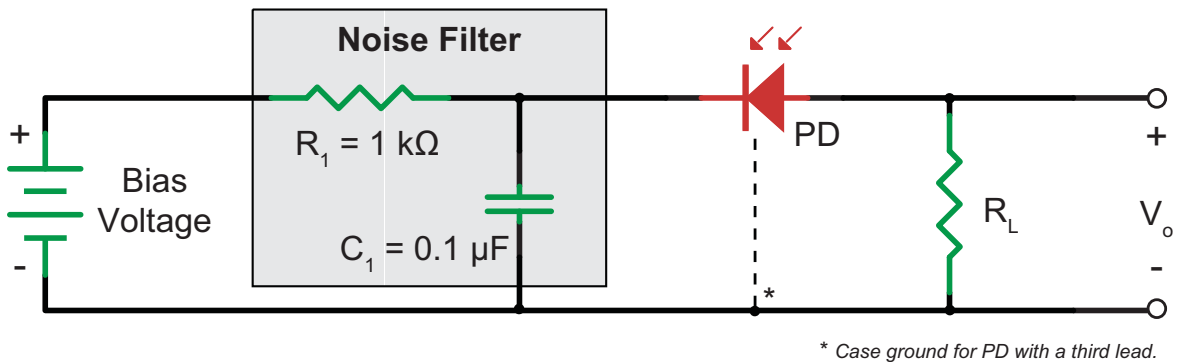$$f_{BW} = \frac{1}{(2\pi)R_L C_J}, \ t_R = \frac{0.35}{f_{BW}}$$

Specifications

Specification		Value
Wavelength Range	λ	800 - 1800 nm
Peak Wavelength	λ_P	1500 nm
Responsivity	$\Re(\lambda)$	1.0 A/W
Active Area Diameter		3.1 mm^2
Rise/Fall Time (R_L=50 Ω, 0 V)	t_r/t_f	66 ns / 66 ns
NEP, Typical (1550 nm)	W/√Hz	3.0 x 10^{-14}
Dark Current (1 V)	I_d	50 nA (Typ.) 200 nA (Max.)
Capacitance (3 V)	C_j	100 pF (Typ.) 150 pF (Max.)
Package		TO-5
Sensor Material		InGaAs

Maximum Rating	
Max Bias (Reverse) Voltage	3 V
Reverse Current	10 mA
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 125 °C

Recommended Circuit

Noise Filter

$R_1 = 1\ \text{k}\Omega$

$C_1 = 0.1\ \mu\text{F}$

Bias Voltage

+

-

PD

R_L

V_o

+

-

*
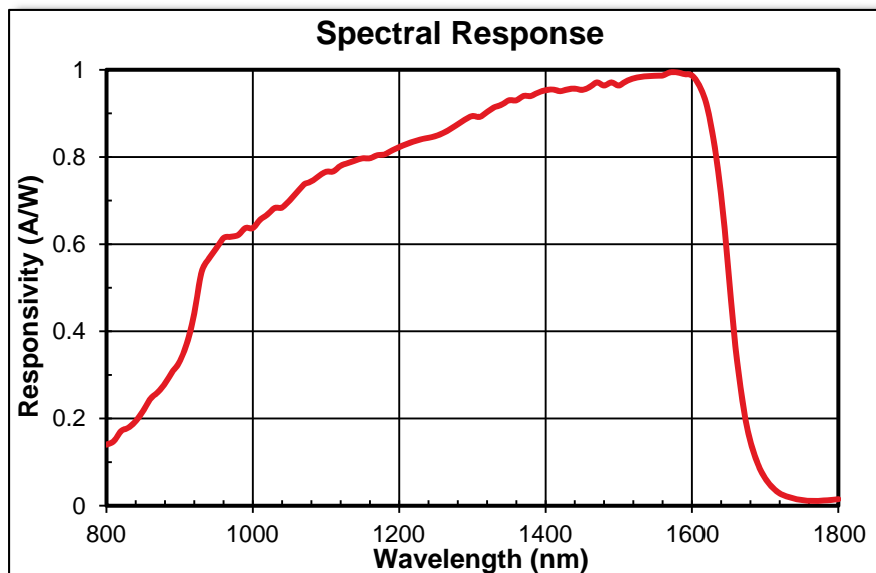
Case ground for PD with a third lead.
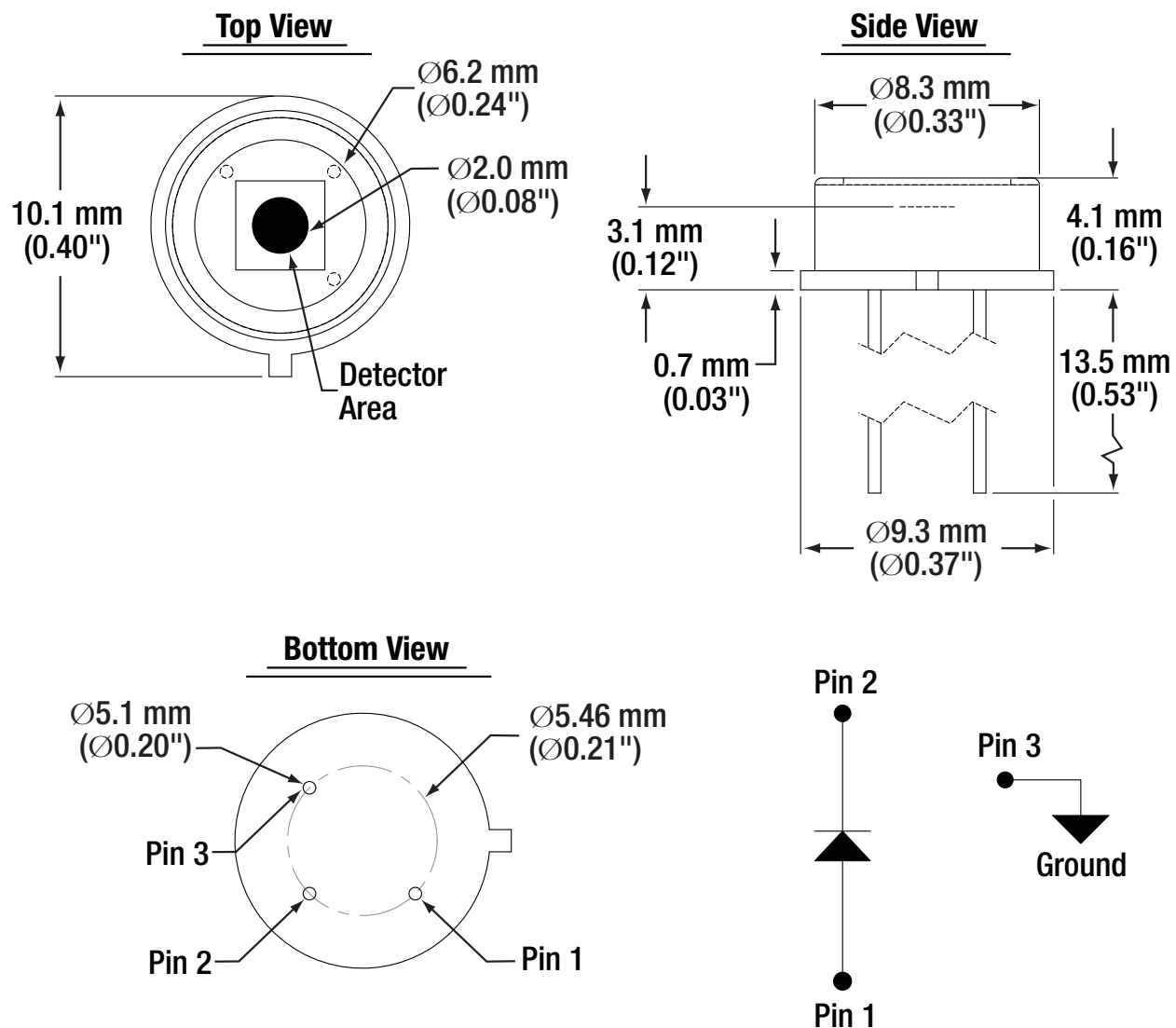
Responsivity Graph

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.

Spectral Response

Responsivity (A/W) vs Wavelength (nm)

Drawing

Top View

Ø6.2 mm
(Ø0.24")

Ø2.0 mm
(Ø0.08")

10.1 mm
(0.40")

Detector
Area

Side View

Ø8.3 mm
(Ø0.33")

3.1 mm
(0.12")

4.1 mm
(0.16")

0.7 mm
(0.03")

13.5 mm
(0.53")

Ø9.3 mm
(Ø0.37")

Bottom View

Ø5.1 mm
(Ø0.20")

Ø5.46 mm
(Ø0.21")

Pin 3

Pin 2

Pin 1

Pin 2

Pin 3

Pin 1

Ground

Precautions and Warranty Information

These products are ESD (electro static discharge) sensitive and as a result are not covered under warranty. In order to ensure the proper functioning of a photodiode care must be given to maintain the highest standards of compliance to the maximum electrical specifications when handling such devices. The photodiodes are particularly sensitive to any value that exceeds the absolute maximum ratings of the product. Any applied voltage in excess of the maximum specification will cause damage and possible complete failure to the product. The user must use handling procedures that prevent any electro static discharges or other voltage surges when handling or using these devices.

Thorlabs, Inc. Life Support and Military Use Application Policy is stated below:

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2. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

3. The Thorlabs products described in this document are not intended nor warranted for usage in Military Applications.