Mounted InGaAs Photodiode, Ø0.15 mm Active Area



SM05PD10A

Description

Thorlabs' SM05PD10A photodiode converts optical power to electrical current and is ideal for measuring both pulsed and CW light sources. The detector is mounted in a convenient externally SM05 (Ø0.535"-40) threaded tube for easy mounting and integration into an existing setup. The photodiode is a *Type A (Cathode Grounded)* arrangement; the anode produces a current, which is a function of the incident optical power (*P*) and the wavelength (*λ*). The responsivity $\mathcal{R}(\lambda)$ can be read from the responsivity curve 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

$$V_o = P \times \Re(\lambda) \times R_L$$

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.

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

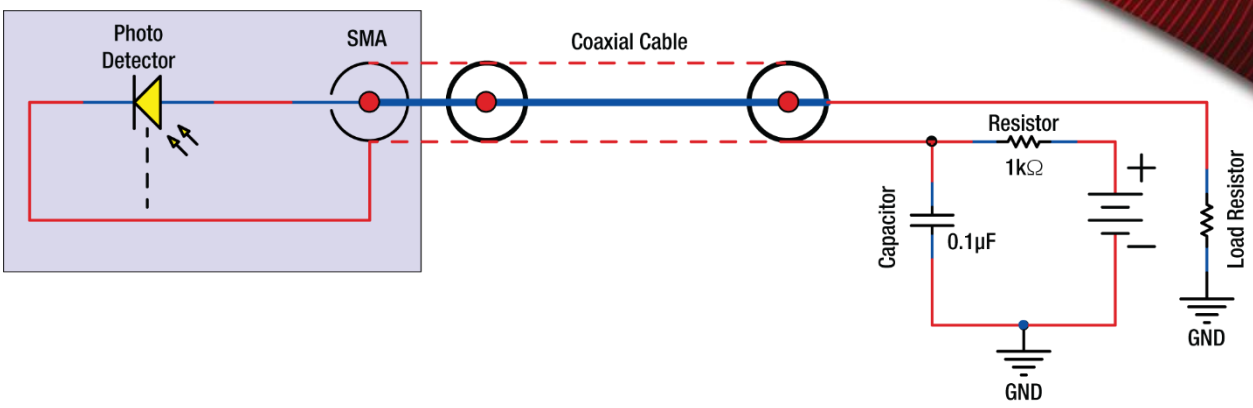
Specifications

Specifications[a]		
Wavelength Range	λ	800 - 1700 nm
Peak Wavelength	λ_P	1550 nm
Responsivity (1550 nm)	$\Re(\lambda_p)$	0.95 A/W (Typ.)
Active Area Size		Ø150 µm
Rise/Fall Time (1550 nm, R_L = 50 Ω, 5 V)	t_r/t_f	300 ps / 300 ps (Typ.)
NEP, Typical (1550 nm, 5 V)		1.30×10^{-14} W/√Hz
Dark Current (5 V)	I_d	0.5 nA (Typ.)
Capacitance (5 V)	C_j	1.5 pF (Typ.)
Package		SM05, External Thread
Sensor Material		InGaAs

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

Maximum Ratings	
Max Bias (Reverse) Voltage	20 V
Optical Input Power (1550nm)	10 mW
Operating Temperature	-40 to 85 °C
Storage Temperature	-45 to 100 °C

Recommended Circuit

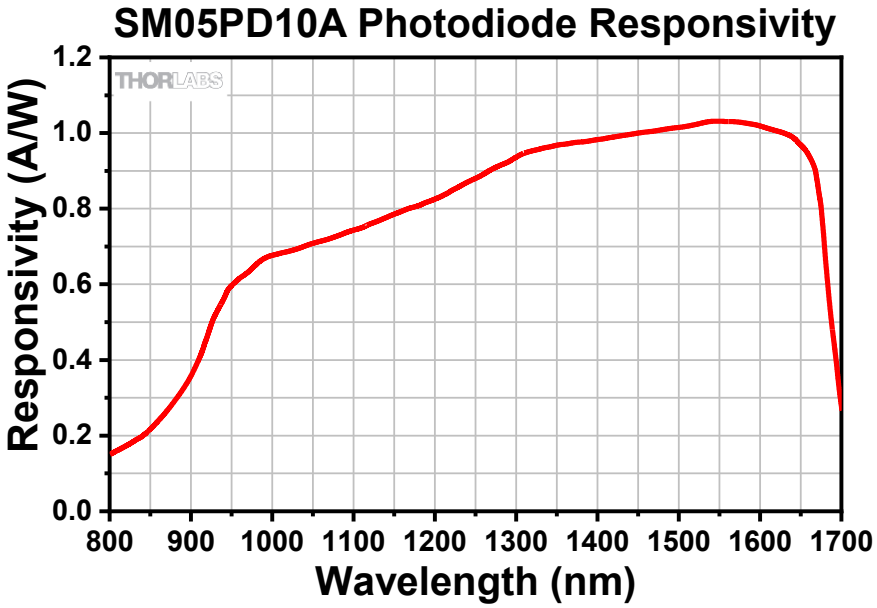


Responsivity Graph

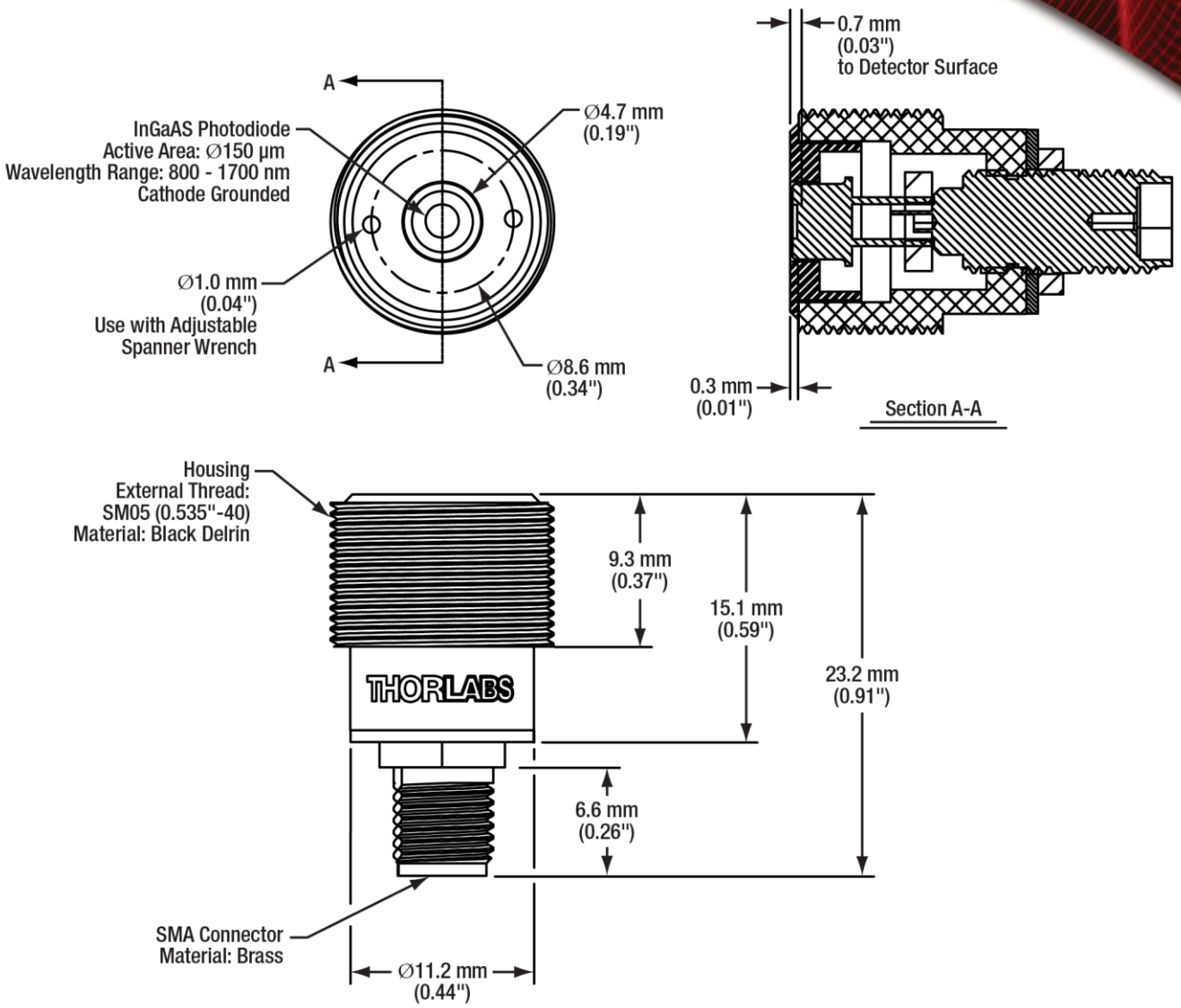
The responsivity of a photodiode is a measure of its sensitivity to light and is defined as the ratio of the photocurrent I_P to the incident optical power P at a given wavelength:

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

In other words, it is a measure of the effectiveness of the conversion of optical 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. A change in temperature can increase or decrease the size of the bandgap, with the size of the bandgap varying inversely with the change in 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.