



## Description

The Thorlabs SM1PD2A photodiode is ideal for measuring both pulsed and CW fiber light sources, by converting the optical power to an electrical current. The detector is mounted in a convenient SM1 (Ø1.035"-40) externally threaded tube for easy mounting and integration in to existing set up. The photodiode is a *Type A (Cathode Grounded)* arrangement, and the pin codes for the specific package can be found in the drawing below. The photodiode anode produces a current, which is a function of the incident light power ( $P$ ) and the wavelength ( $\lambda$ ). The responsivity,  $\mathfrak{R}(\lambda)$ , can be read from the curve Responsivity Curve (provided below) to estimate the amount of photocurrent to expect. This current 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:

$$V_o = P \times \mathfrak{R}(\lambda) \times R_L$$

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.  $\Omega$

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

## Specifications



Specification		Value
Wavelength Range	$\lambda$	200 - 1100 nm
Peak Wavelength	$\lambda_p$	970 nm
Responsivity	$\mathfrak{R}(\lambda)$	0.50
Active Area		10 x 10 mm Behind Ø9 mm Clear Aperture
Rise/Fall Time ( $R_L=50 \Omega$ , 5 V)	$t_r/t_f$	450 ns / 45 ns
NEP, Typical (900 nm, 5 V)	W//Hz	$5.5 \times 10^{-14}$
Dark Current (5 V)	$I_d$	1.0 $\mu$ A
Capacitance (0 V)	$C_j$	1.75 nF
Package		SM1, External Thread
Sensor Material		Si

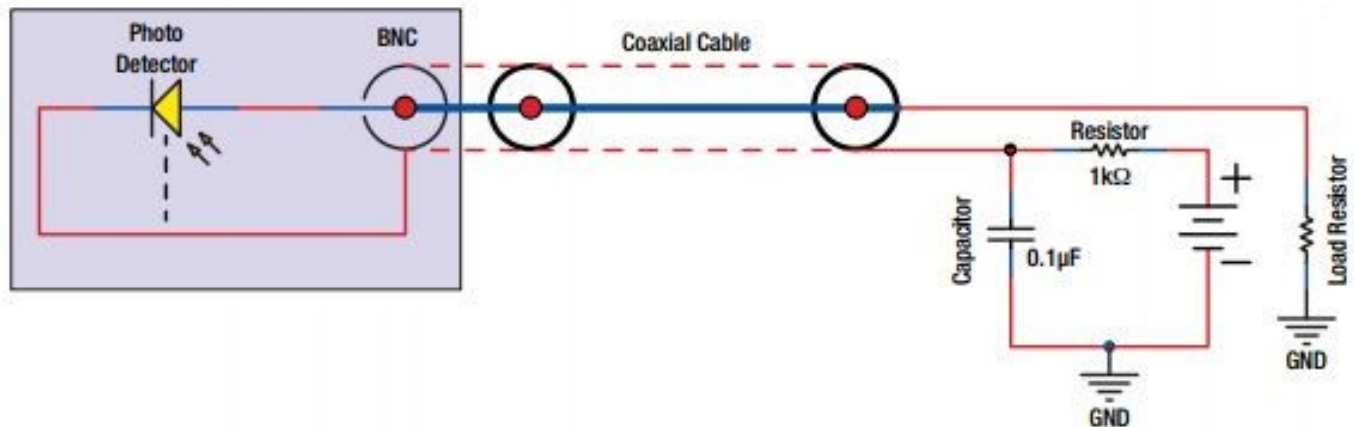
Maximum Rating	
Max Bias (Reverse) Voltage	5 V
Reverse Current	N/A
Operating Temperature	-20 to 60 °C
Storage Temperature	-20 to 80 °C

# ▶ Detectors

(525-4002)

▶ Single Channel

## Recommended Circuit Diagram

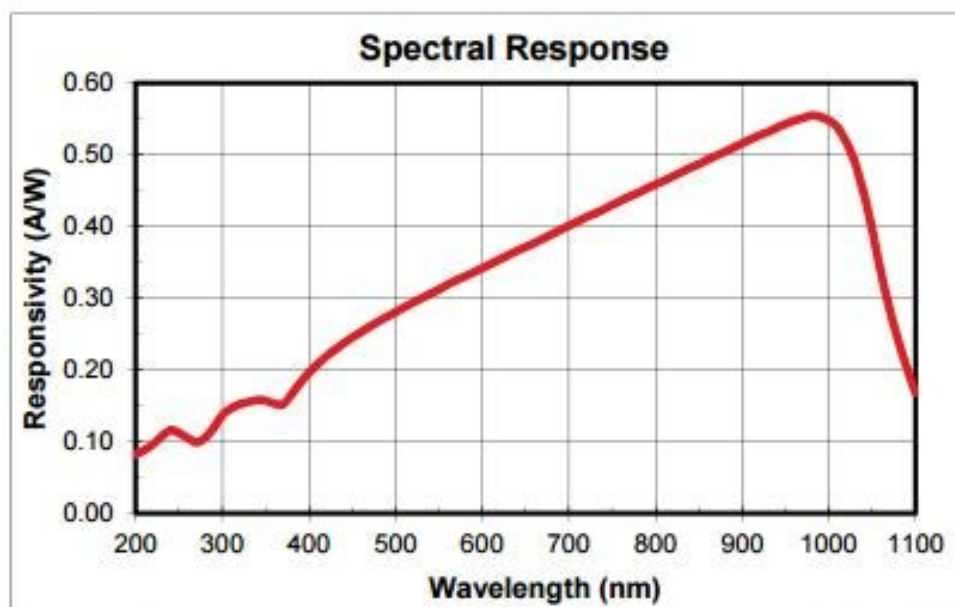


## Spectral Response

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.



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## Drawing

