

DET410 - HIGH-SPEED InGaAs DETECTOR

DESCRIPTION:

Thorlabs' DET410 is a ready-to-use high-speed photo detector. The unit comes complete with a photodiode and internal 12V bias battery enclosed in a ruggedized aluminum housing. The head includes a removable 1" optical coupler (SM1T1), providing easy mounting of ND filters, spectral filters and other Thorlabs 1" stackable lens mount accessories. Also available are fiber adapters (SMA, FC and ST style). An #8-32 tapped hole is provided on the base of the housing to mount the detector directly to a Thorlabs' positioning device (1/2" post holder, mounting plates, etc.).

SPECIFICATIONS:

Detector:	InGaAs PIN	Housing:	Black Anodized Aluminum
Spectral Response:	700-1800nm	Size:	φ1.43" x 1.67"
Peak Wavelength:	1500nm+/-50nm	Output:	BNC, DC-Coupled
Rise/Fall Time¹:	5ns	Bias:	12V Battery (Type A23)
Diode Capacitance:	22pF	Mounting:	8-32 (M4) Tapped Hole
NEP:	$1 \times 10^{-14} \text{ W}/\sqrt{\text{HZ}}$	Diode Socket:	TO-5, Anode Marked
Dark Current:	25nA	Damage Threshold:	100mW CW 0.5 J/cm ² (10ns pulse)
Active Area:	φ1mm (0.8mm ²)	Operating Temp:	0 to 85°C
Linearity Limit:	1mW	Storage Temp:	-40 to 125°C
Max Reverse Current:	10mA		

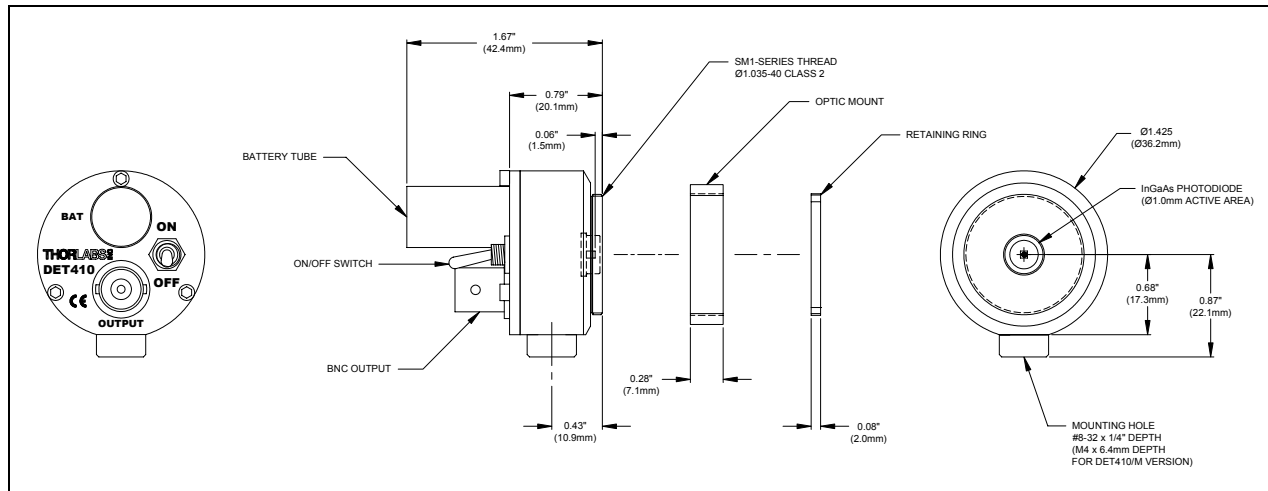


Figure 1. - Mechanical Dimensions

OPERATION:

Thorlabs DET series are ideal for measuring both pulsed and CW light sources. The DET410 includes a reversed-biased PIN photo diode, bias battery, and ON/OFF switch packaged in a ruggedized housing. The BNC output signal is the direct photocurrent out of the photo diode anode and is a function of the incident light power and wavelength. The Spectral Responsivity, $\mathfrak{R}(\lambda)$, can be obtained from Figure 2 to estimate the amount of photocurrent to expect. Most users will wish to convert this photocurrent to a voltage for viewing on an oscilloscope or DVM. This is accomplished by adding an external load resistance, R_{LOAD} . The output voltage is derived as:

$$V_O = P * \mathfrak{R}(\lambda) * R_{LOAD}$$

The bandwidth, f_{BW} , and the rise-time response, t_R , are determined from the diode capacitance, C_J , and the load resistance, R_{LOAD} as shown below:

$$f_{BW} = 1 / (2 * \pi * R_{LOAD} * C_J)$$

$$t_R = 0.35 / f_{BW}$$

For maximum bandwidth, we recommend using a 50 Ω coax cable with a 50 Ω terminating resistor at the end of the coax. This will also minimize ringing by matching the coax with its characteristic impedance. If bandwidth is not important, you may increase the amount of voltage for a given input light by increasing the R_{LOAD} up to a maximum of 10K Ω .

Note: The detector has an AC path to ground even with the switch in the OFF position. It is normal to see an output response to an AC signal with the switch in this state. However, because the detector is unbiased, operation in this mode is not recommended.

Figure 2 - DET410 Spectral Responsivity Curve

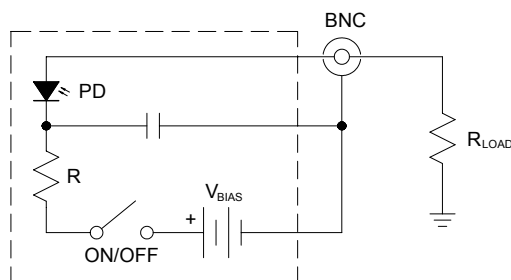
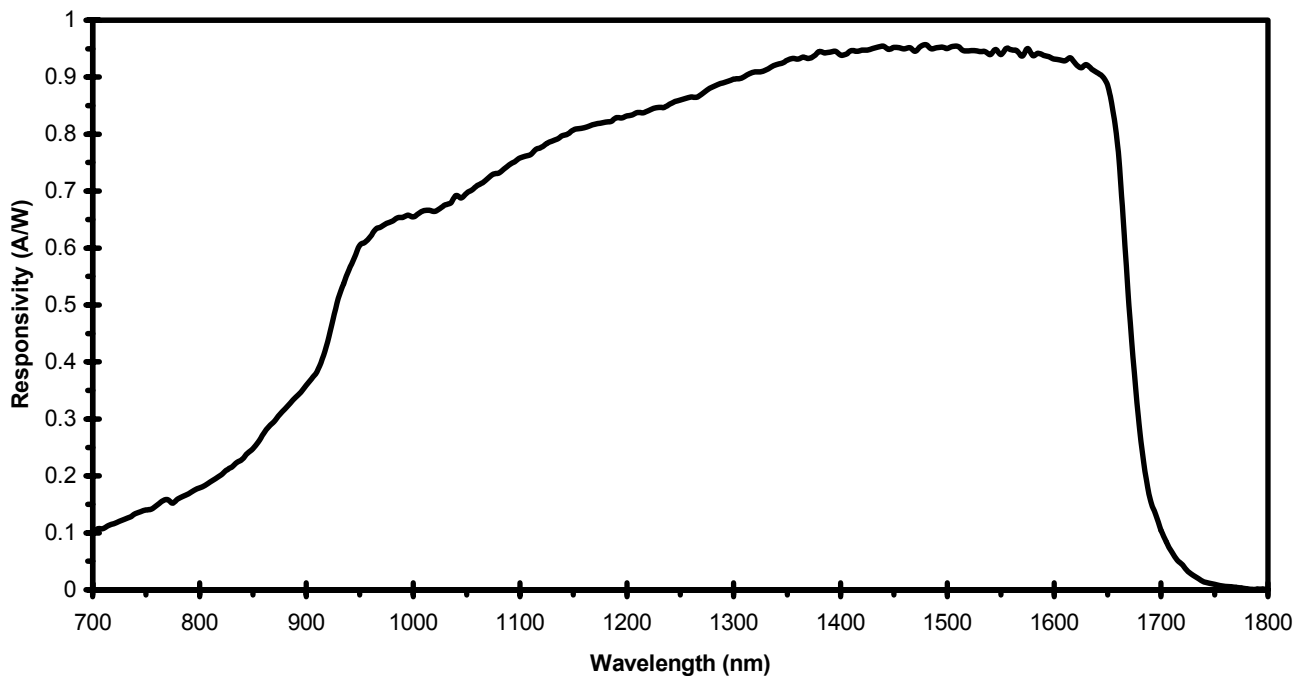


Figure 3 – Circuit Block Diagram

FIBER ADAPTERS AND OTHER ACCESSORIES

Thorlabs sells a number of accessories that are compatible with the 1" thread on the DET housing including FC, SMA, and ST fiber adapters, stackable lens tubes for mounting optics, and cage assemblies that allow the DET to be incorporated into elaborate 3-D optical assemblies.

Caution: The DET410 was designed to allow maximum accessibility to the photo detector by having the front surface of the diode extend outside of the DET housing. When using fiber adapters, make sure that the fiber ferrule does not crash into the detector. Failure to do so may cause damage to the diode and / or the fiber. An easy way to accomplish this is to install a SM1RR retaining ring (included with the DET410) inside the 1" threaded coupler *before* installing the fiber adapter.

Also available are 1ns Si detectors, large area Si detectors, and a complete line of amplified detectors.

MAINTAINING THE DET410

There are no serviceable parts in the DET410 optical head. The housing may be cleaned by wiping with a soft, damp cloth. The window of the detector should only be cleaned using optical grade wipes. If you suspect a problem with your DET410 please call Thorlabs and technical support will be happy to assist you.