Position-Sensing Detector

PDQ80A

Description

The PDQ80A detector is a segmented, position sensing, silicon, quadrant detector for precise path alignment of light in the 400 to 1050 nm range. The device is capable of measuring beams with a spot size smaller than 7.8 mm, which is the diameter of the quadrant photodiode array. However, to prevent beam walk-off, we recommend that the beam diameter be less than 3.9 mm. Also, since the detected signal strength decreases significantly when large portions of the spot cross the boundary between the quadrants, beam diameters greater than 1 mm are suggested. Therefore, we recommend this device to be used with beams with a diameter between 1 mm and 3.9 mm.

Specifications

Electrical Specifications	Value
Wavelength Range	400 - 1050 nm
Peak Responsivity	0.4 A/W @ 633 nm 0.64 A/W @ 900 nm
Transimpedance Gain	10 kV/A
Max Photocurrent	200 µA
Output Voltage Range	±2 V_{min}
Signal Output Offset	100 mV_{max}
Bandwidth	150 kHz
Recommended Spot Size	Ø1.0 mm to Ø 3.9 mm
Supply Voltage Requirement	±5 VDC to ±15 VDC
Operating Temperature	10 to 40 °C
Storage Temperature	-20 to 80 °C

Physical Specifications	Value
Sensor Size	Ø7.8 mm
Clear Aperture	Ø1/2" (Ø12.7 mm)
Aperture Thread	SM05 (0.535" -40)
Dimensions	2.00" x 1.20" x 0.65" (50.8 x 30.5 x 16.5 mm)
Mounting Thread	8-32 x 0.25" Min Depth
Metric Adapter	M4 to 8-32 Adapter (Item # AS4M8E)
Cable Length	5.0' (1.5 m)
Connector Plug	Hirose HS10A-7P-6P
Main Receptacle	Hirose HR10A-7R-6S
Weight	0.25 lbs. (114 g)

Instructions

1. Unpack the PDQ80A sensor. Install the adapter if metric mounting is preferred.
2. Plug the connector into one port of a PDQ80S1 hub.
3. Follow the directions for operation of the hub as described in its operating manual.
4. Place a spot onto the detection window for measurement. The input beam spot size should be between ∅0.2 mm and ∅7 mm. For best results the spot should be located within 80% (7.2 mm x 7.2 mm) of the center of the detector. Adjust the power level so that the sum output voltage is less than or equal to 4 V. This will ensure the best signal to noise ration and that the system is not saturated.

Application Note

For best results low power levels should be used for the position sensor. For the PDQ80A the max
photocurrent is 2 V / 10 kV/A = 200 µA. Using the photosensitivity curve below, the system saturation power can be calculated as:

$$P_{max} = \frac{200\ \mu A}{Photosensitivity\ (A/W)}$$

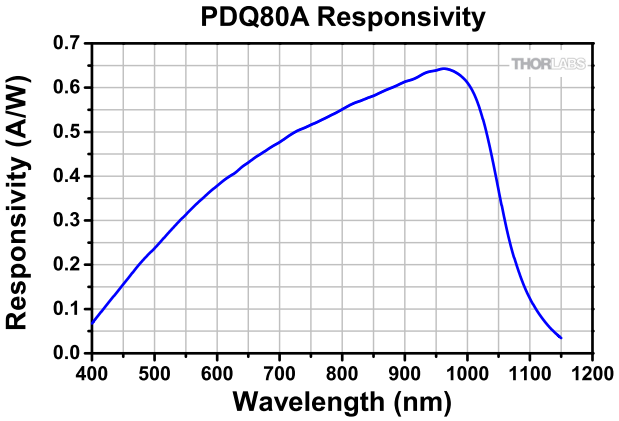
The PDQ80S1 hub has a sample resolution of 12 bits with an input voltage range of ±5 V (10 V range), or a voltage resolution of:

$$V_{step} = \frac{10\ V}{2^{12}} = 2.44\ mV$$

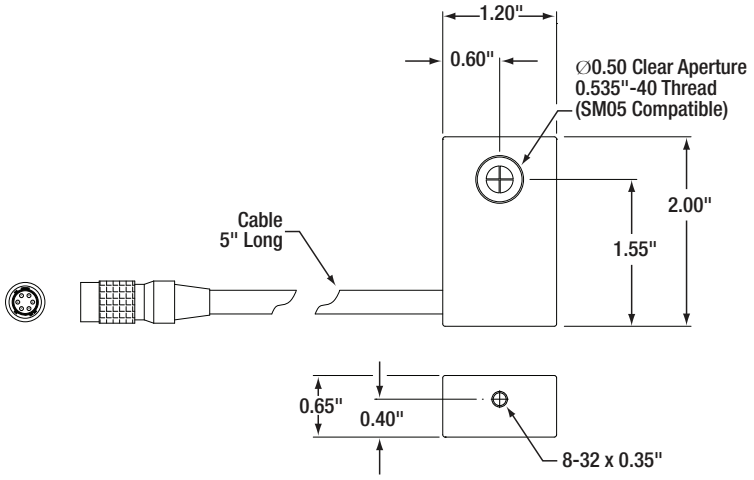
$$I_{step} = \frac{V_{step}}{10\ kV/A} = 244\ nA$$

From this the minimum power required can be determined based on the required accuracy. For example if the user requires an accuracy of 1% then the reading must be accurate to 1 part in 100. The minimum photocurrent is therefore the I_{Step} x 100, or 24.4 µA. Use the Formula below to find the minimum optical power for a given wavelength.

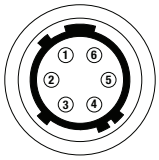
$$P_{min} = \frac{24.4\ \mu A}{Photosensitivity\ (A/W)}$$



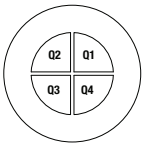
Drawings



Pin Assignments	
Pin 1	X-Axis (Q2 + Q3) - (Q1 + Q4)
Pin 2	Y-Axis (Q1 + Q2) - (Q3 + Q4)
Pin 3	SUM (Q1 + Q2 + Q3 + Q4)
Pin 4	+V (+5 to +15V)
Pin 5	Common
PIN 6	-V (-5 to -15V)



HIROSE CONNECTOR



PHOTODIODE DETAIL