

OUTPUT SIGNALS

- Sum of all four quadrants.
- Difference between lower and upper halves.
- Difference between left and right halves.

DESCRIPTION

The **BPD-8L** is designed for precise light beam position detection. The **BPD-8L** provides accurate measurement of small changes in the position of a light beam. Its large quad cell design accommodates both high resolution and larger area light detection.

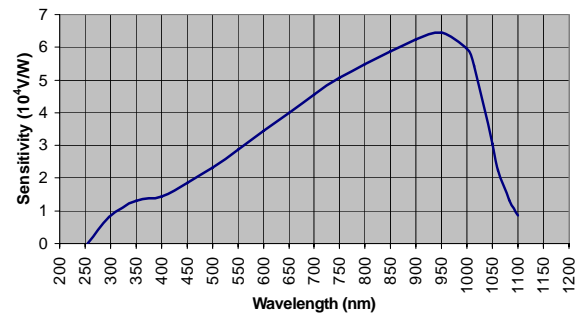
APPLICATIONS

- Military
- Industrial
- Instrumentation

ABSOLUTE MAXIMUM RATING (TA)= 23°C UNLESS OTHERWISE NOTED

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V _s	Voltage Supplies	± 5	± 15	± 18	V
T _{STG}	Storage Temperature	-25		+100	°C
T _A	Operating Temperature	0		+70	°C

SPECTRAL SENSITIVITY



ELECTRO-OPTICAL CHARACTERISTICS RATING (TA)= 23°C. V_c = ± 12V UNLESS OTHERWISE NOTED

SYMBOL	CHARACTERISTIC	TEST CONDITIONS	MIN	TYP	MAX	UNITS
f _{3db}	Cutoff Frequency	V _s = ± 15 V		220		KHz
G _s	Output 1 = (I ₁ +I ₂ +I ₃ +I ₄) × G _s	V _s = ± 15 V	.98×10 ⁴	10 ⁴	1.02×10 ⁴	
G _l	Output 2 = ((I ₁ +I ₂)-(I ₃ +I ₄)) × G _l	V _s = ± 15 V	.98×10 ⁴	10 ⁴	1.02×10 ⁴	
G _{tb}	Output 3 = ((I ₁ +I ₄)-(I ₂ +I ₃)) × G _{tb}	V _s = ± 15 V	.98×10 ⁴	10 ⁴	1.02×10 ⁴	
I _T	Cross Talk	V _s = ± 15 V			1	%
I _N	Input Voltage Noise	V _s = ± 15 V		20		nV/Hz ^{1/2}
I _{out}	Output Current Limit	V _s = ± 15 V		25		mA

Information in this technical datasheet is believed to be correct and reliable. However, no responsibility is assumed for possible inaccuracies or omission. Specifications are subject to change without notice.

Using the BPD for Position Sensing:

Quadrant photodetectors can be used for high-resolution position sensing of light beams. They provide very accurate position measurement using simple circuitry.

When a light beam of a proper size illuminates a quad photodiode, it generates a photocurrent in each quadrant. By comparing those photocurrents, a change of a position in two axes can be detected. Figure 1 shows a typical quad-cell with a beam illuminating its surface.

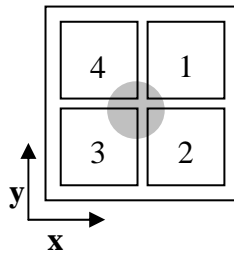


Figure 1

The X and Y axis displacements of the beam relative to center of the quad cell can be calculated using the following formulas:

$$X = \frac{(i_1 + i_2) - (i_3 + i_4)}{i_1 + i_2 + i_3 + i_4}$$

$$Y = \frac{(i_1 + i_4) - (i_2 + i_3)}{i_1 + i_2 + i_3 + i_4}$$

The accuracy of measurement depends on the beam size and the gap between the segments. To optimize the BPD's performance, the following design rules should be observed:

- The beam diameter must be bigger than the gap between the segments, such that when the beam is positioned in the center of the quad photodiode, it will still illuminate part of the active area. See Figure 2.
- The beam area cannot exceed the total active area of the detector in order for the displacement of the beam to produce a change in photocurrents. See Figure 3.
- The light beam spot size is proportional to the detection range, and inversely proportional to the detection resolution. Figure 4 shows the positional signal vs. beam position for three different beam sizes. As the beam size becomes smaller, the slope of the positional signal becomes steeper, which leads to a higher position detection accuracy.
- Linearity of the sensor output is proportional to the uniformity of the light beam.

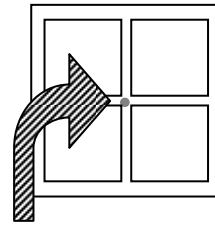


Figure 2
Beam size too small

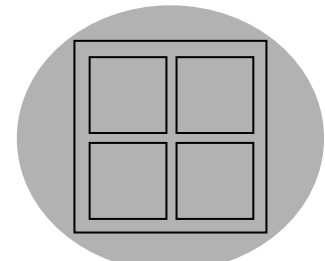
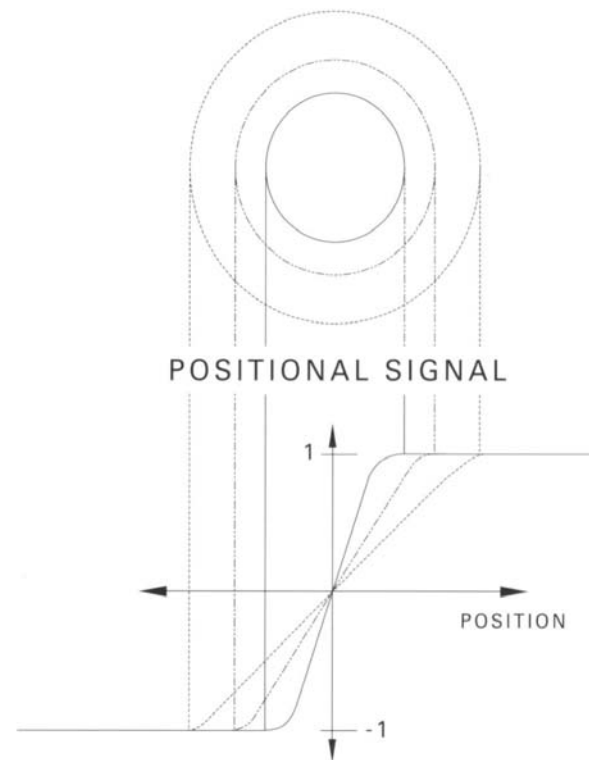


Figure 3
Beam size too large

Figure 4.



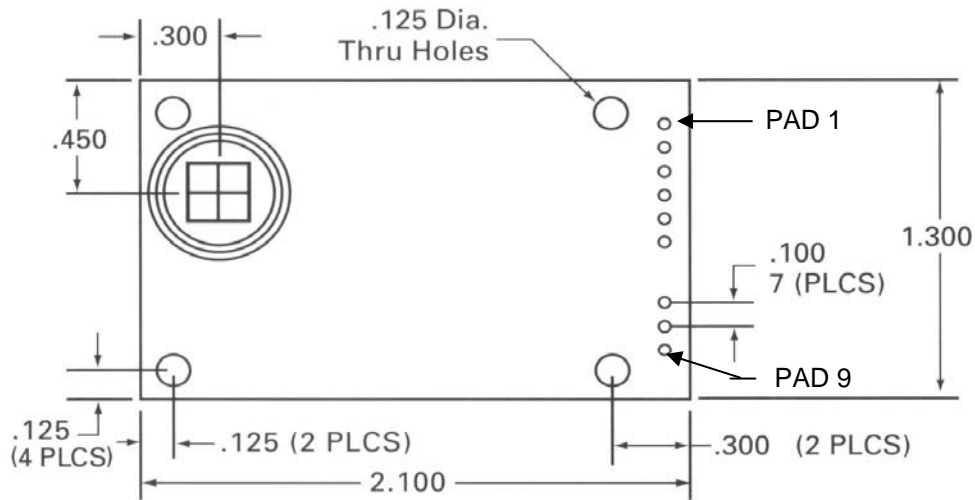


Figure 5: BPD dimensional drawing

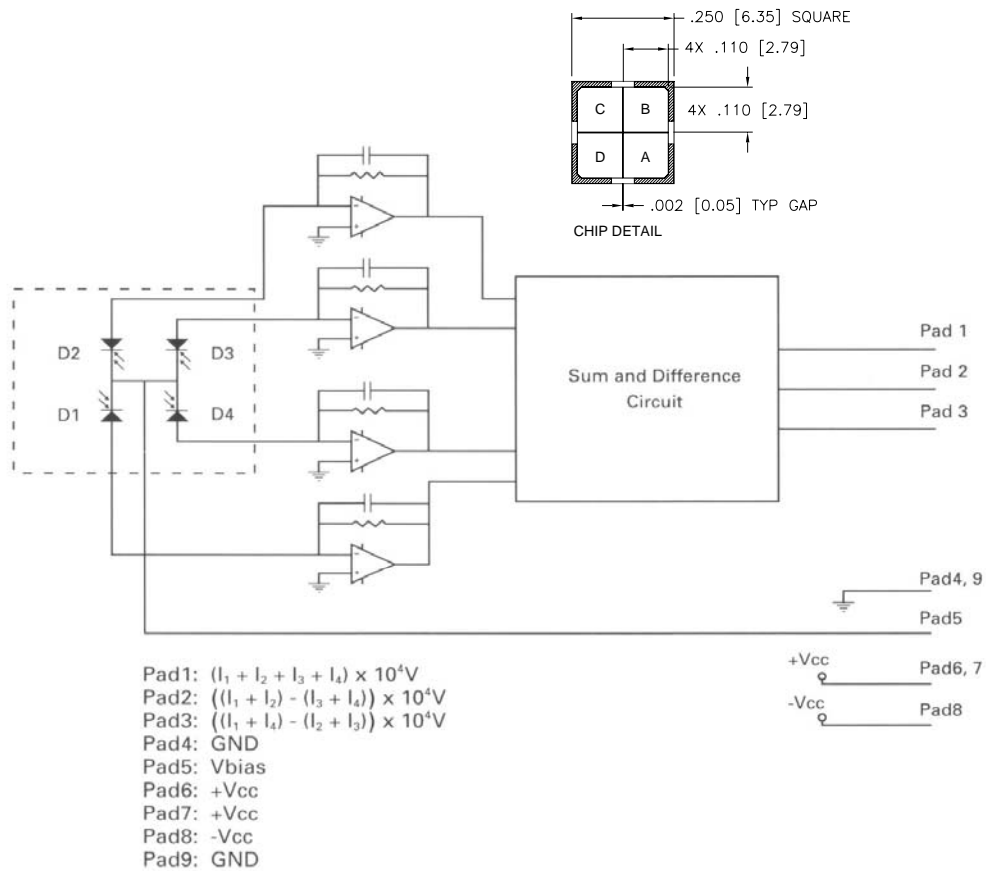


Figure 6: BPD schematic