

# Quad Photodiode Amplification Module

## Application Notes

### Introduction:

The SiQu50-M is a complete module that combines a Silicon Quadrant Photodiode (4-element array) with the necessary amplifiers and position sensing circuitry needed to accurately sense and read the position of, or the movement of, a light beam on the sensing area. Silicon Photodiodes produce a current that is proportional to the light falling on it. This current is converted and amplified to a useable voltage. The resulting voltages are then summed and divided by this module to provide X, Y and Sum outputs.

### Assumptions:

The light beam must be within the detectors detection range of 400-1100nm (or 190-1000nm in the case of our 9mmUV enhanced version).

The light beam must have a smaller diameter than the detector.

The light beam must be larger than the separation between the individual elements.

### Operation:

When a beam illuminates the quadrant detector, each individual quadrant produces a current. Since the detector is one monolithic piece of Silicon the response from each quadrant is identical. By comparing the current produced, we can then determine the beam's location. When the beam is centered, it will illuminate each of the four quadrants equally. As the beam moves across the detector face, we can compare the outputs as follows:

$$X = [(i_1 + i_2) - (i_3 + i_4)] 10^4 / (i_1 + i_2 + i_3 + i_4)$$

$$Y = [(i_1 + i_4) - (i_2 + i_3)] 10^4 / (i_1 + i_2 + i_3 + i_4)$$

Linearity is proportional to the uniformity of the light beam.

Resolution is dependant on the ratio of beam size to detector, i.e. the smaller the beam size, in proportion to the sensing area, the higher the overall resolution.

There is no need to supply a separate bias to the detector (pin 1).

By observing the Sum output (pin 7) the beam's intensity or fluctuation can be determined.



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