

Photodiode as current source

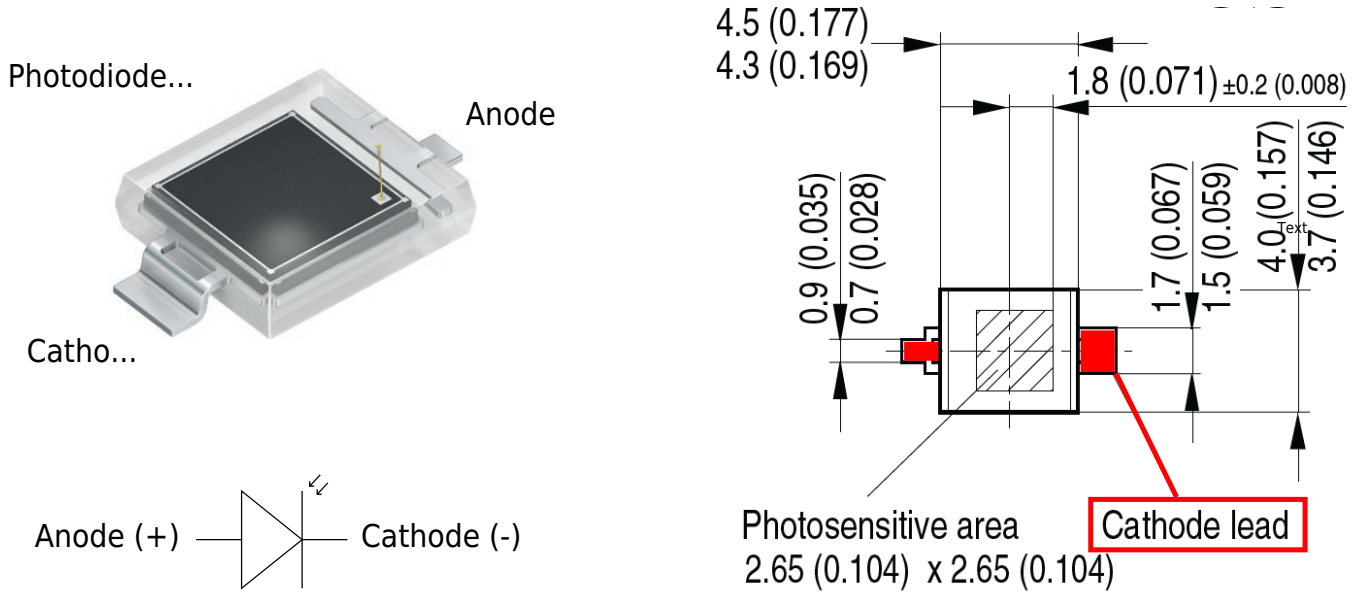
Student Group

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lab05:Fig-110_inverting_op-amp_photo_diode_diagramms.svg

Fig. 2: Inverting Op-Amp: Photo Diode BPW 34 S

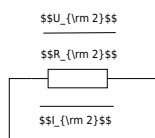


Fig. 4: Inverting Op-Amp: Photo Diode as current source

$$U_{DD} = 10\text{ V}, U_{SS} = -10\text{ V}$$

We assume a good illuminated room of 300 lx, illuminated by a white LED. White light is a mixture of many wavelengths across the visible spectrum, roughly 380 to 780 nm.

For a typical white LED, the spectrum usually comes from a blue LED chip with a peak around 450 nm, plus a broader phosphor emission that spreads across green, yellow, and red wavelengths.

For an easier calculation, we take a mean value of 500 nm which is close to the peak value of the blue LED (in reality a greenish light) and 300 lx for the illumination.

The graph in [figure 3](#) shows that the photodiode sensitivity at 500 nm is only 30%. The maximum current (100%) at 300 lx is 30 μA .

We can now estimate the current we would expect from the diode at 300 lx:

$$I_1 = 30\ \mu\text{A} * 0.3 = 9\ \mu\text{A}$$

$$I_1 \approx 10\ \mu\text{A}$$

30% of 30 μA is roughly 10 μA .

Complete the arrows in the schematic of the circuit.

Calculate R_2 so that $U_{OUT} = 5\text{ V}$ at 300 lx. Take a resistor from the E6 series that is as close as possible to the calculated value.

Also fill in the values for I_1 , I_2 , U_{OUT} and U_2

$$I_1 =$$

$$I_2 =$$

$$U_{OUT} =$$

$$U_2 =$$

R_2

What value would you expect for U_D and why?

U_D

.....

.....

.....

.....

.....

.....

What value would you expect for U_D at 300 lx when it is not connected to the Op-Amp or any other electronic component (open-circuit voltage) and why?

U_D

.....

.....

.....

.....

.....

.....

Illumination	(U_{OUT}) [...]	(I_{1}) [μA ...]	(I_{2}) [μA ...]	(U_{D}) [mV...]	(U_{D}) [mV...]
dark...					
300 lx...		...			

Tab. 1: Photodiode measured values

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