

# Photodiode as current source

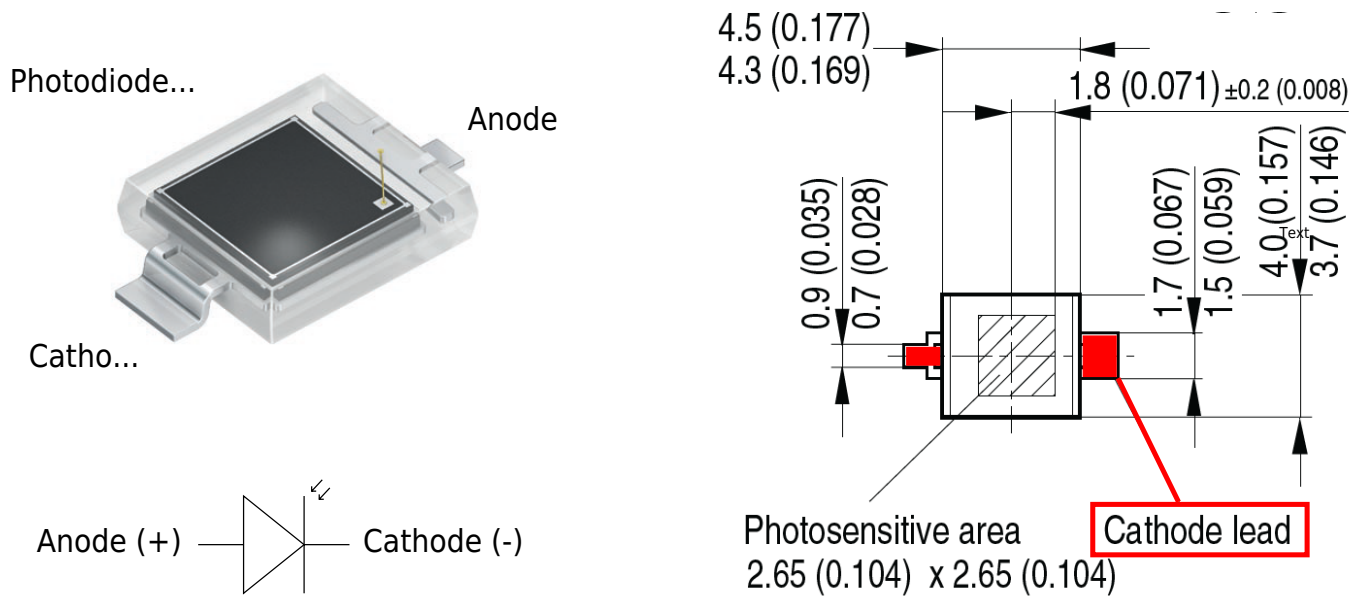
## Student Group

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## Table of Contents

Photo Diode as current source ..... 2

### Photo Diode as current source



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lab05:Fig-110\_inverting\_op-amp\_photo\_diode\_diagramms.svg

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

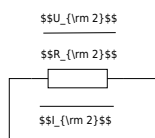


Fig. 4: Inverting Op-Amp: Photo Diode as current source

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

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  $\mu\text{A}$ .

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  $\mu\text{A}$  is roughly 10  $\mu\text{A}$ .

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	$(U_{OUT})$ [V]	$(I_1)$ [ $\mu$ A]	$(I_2)$ [ $\mu$ A]	$(U_D)$ [mV]	$(U_D)$ [mV]
dark...					
300 lx...		...			

Tab. 1: Photodiode measured values

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