Photodiode as current source

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

Photo Diode as current source

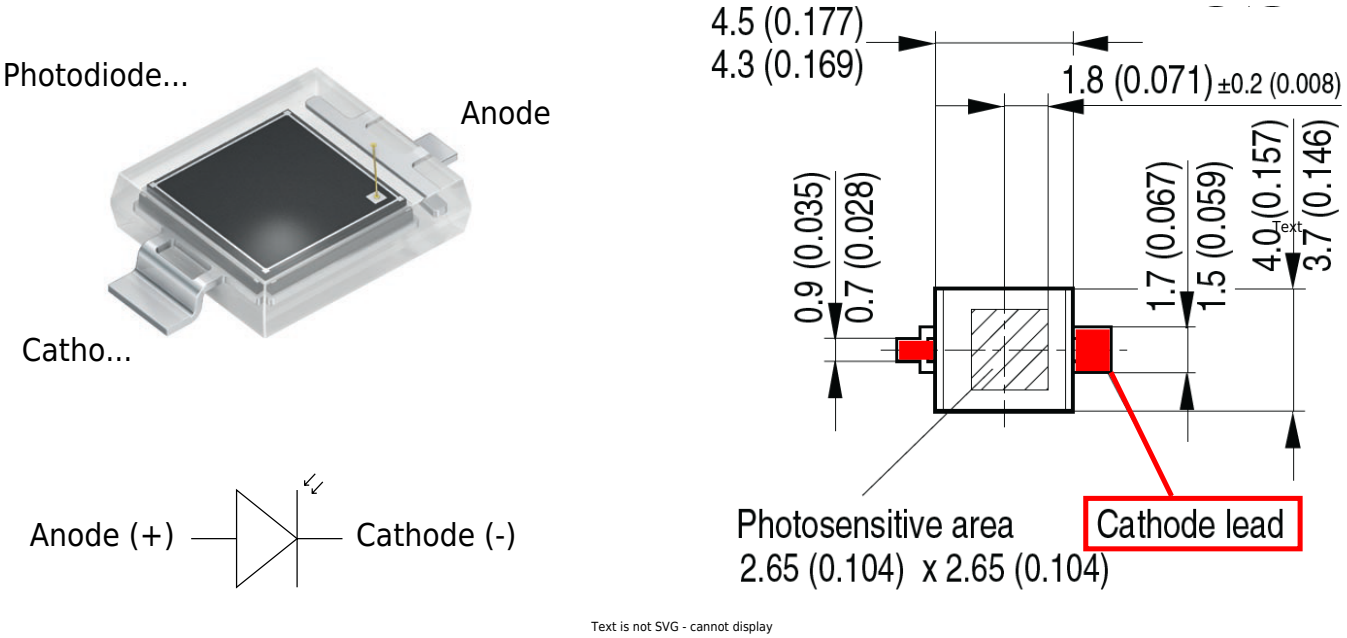

Fig. 2: Inverting Op-Amp: Photo Diode BPW 34 S

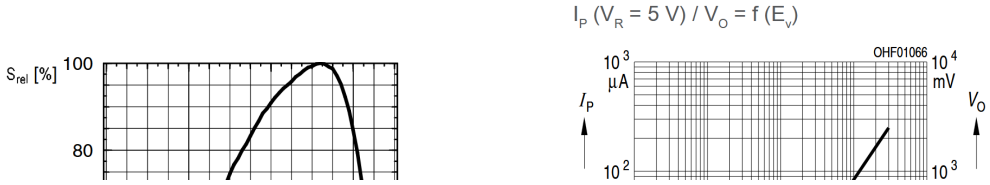

Fig. 3: Inverting Op-Amp: Diagramms of BPW 34 S

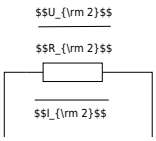

Fig. 4: Inverting Op-Amp: Photo Diode as current source

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

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.
In the diagram in figure 3 we see that the sensitivity of the photo diode at 500 nm ist only 30%. The maximim current (100%) at 300 lx is 30 ${\rm\mu}$A.
Now we can calculate the current we expect from the diode at 300 lx:

$I_{\rm 1} = 30 {\rm~\mu A} * 0.3$
$I_{\rm 1} \approx 10 {\rm~\mu A}$

30% of 30 ${\rm\mu A}$ is roughly 10 ${\rm\mu A}$.

Complete the arrows in the scematic of the circuit.
Calculate ${\rm R_2}$ so that $U_{\rm OUT}$ = 5 V at 300 lx. Take a resistor from the E6 series that is as close as possible to the calculated value.

$I_{\rm D}{\rm~=}$

$I_{\rm 2}{\rm~=}$

$U_{\rm OUT}{\rm~=}$

$U_{\rm 2}{\rm~=}$

$R_{\rm 2}{\rm~=}$

What are your results?

${\rm .....}$

${\rm .....}$

${\rm .....}$

What will happen if you short-circuit $R_{\rm 2}$?
Try it and explain your results.

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$

${\rm .....}$