

# Photodiode as current source

## Student Group

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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

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

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.

In figure 3 we can see that the sensitivity of the photo diode at 500 nm is only 30%. The maximum current (100%) at 300 lx is 30  $\mu\text{A}$ .

Now we can calculate the current we expect from the diode at 300 lx:

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

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

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

**TODO**

- Complete the arrows in the schematic of the circuit.
- Take the values for  $U_1, U_2, U_{OUT}$  from .
- Use these values to calculate the sum of the voltages at node  $N_{12}$ .
- Compare your result by measurement.

$U_{\text{1}}$

$U_{\text{2}}$

$U_{\text{OUT}}$

Calculated  $U_{\text{12}}$

Measured  $U_{\text{12}}$

What are your results?

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What will happen if you short-circuit  $R_{\text{2}}$ ?

Try it and explain your results.

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