Diodes

Please do the following exercises individually.

Material properties

Please find without any aid some more conductors and insulators.

Positive charge carriers

P-typed doped semiconductors have too little electrons. These holes behave like positive charge carriers. Please explain why.

Electrical resistance

At a diode we measure a forward current of 300 mA and a voltage drop of 0.7V and a reverse current of 5 µA with a voltage drop of 70 V. Please calculate the electrical resistance[1]. Did you expect the result?

[1] The necessary formula is $R = \frac{V}{I}$. R: Resistance [Ohm Ω], V: Voltage [Volt V], I: Current [Ampère A].

Diodes

Please do the following exercises individually.

Material properties

Please find without any aid some more conductors and insulators.

Conductors: metals like gold, aluminum, iron, graphite, etc.

Insulators: Glass, paper, rubber, etc.

Positive charge carriers

P-typed doped semiconductors have too little electrons. These holes behave like positive charge carriers. Please explain why.

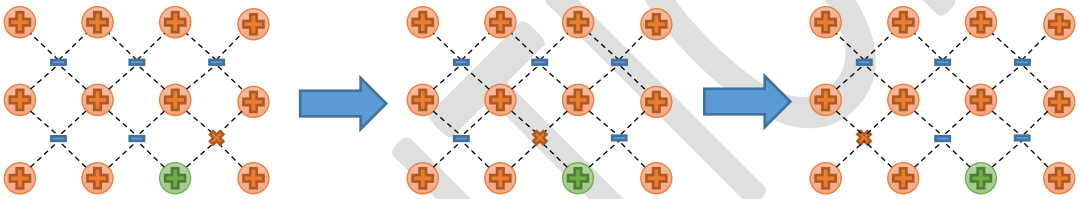

Figure 1 Figure 2 Figure 3

An electron can easily fall into a hole in the neighborhood. But then a new hole is created (Fig. 1 → Fig. 2). This new hole can be filled by another electron (Fig. 3). The electrons move for example from left to right and the wholes from right to left. This is the direction positive charge carriers would move.

Electrical resistance

At a diode we measure a forward current of 300 mA and a voltage drop of 0.7V and a reverse current of 5 µA with a voltage drop of 70 V. Please calculate the electrical resistance[1]. Did you expect the result?

R = U/I = 0.7 V / 0.3 A = 2.33 Ω

R = U/I = 70 V / $5 \cdot 10^{-6}$ = $14 \cdot 10^{6}$ Ω = 14 MΩ

The result is expected. The forward resistance is very small. The reverse resistance is very high.

[1] The necessary formula is $R = \frac{V}{I}$. R: Resistance [Ohm Ω], V: Voltage [Volt V], I: Current [Ampère A].