

Training objectives and introduction



The zener diode constitutes an essential component of many circuits. Since the diode's production process dictates that a certain constant voltage always drops across this component, this diode is often used to stabilise voltages.

Training content

Zener diodes or Z-diodes for short were named after the physicist C.M. Zener. In electronics Z-diodes have become so important thanks to their voltage limiting properties.



Figure 1:
 Z-diodes with
 various Zener
 voltages and
 varying maximum
 levels of power
 loss.



Figure 2:
Normally the Zener voltage, here 18V, is printed on the component. As in the case of other diodes the cathode is labelled with a ring.



Anode

Cathode

Figure 3:
Circuit symbol of the Zener diode.

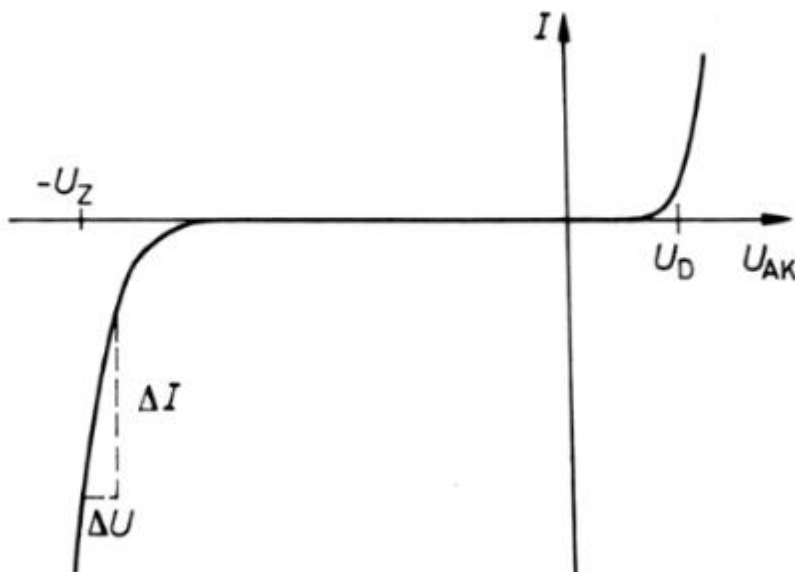
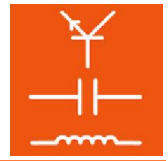


Figure 4:
Conducting and blocking characteristic of a Zener diode.



Functional description:

Zener diodes also act like a valve for electric current. They allow the current to pass in the forward or conducting direction, from anode to cathode and respond overall like normal silicon diodes here. In the reverse direction they block but only up to a specifically defined voltage, the so-called Zener voltage. When Zener voltage levels are reached the Zener diode conducts through.

The Zener voltage is predetermined during the production process. There are various types starting with low voltages, like e.g. 2.7V up to ranges exceeding 100 V. Zener diodes are normally operated in the blocking direction.

Real diodes:

A type designation is printed on real diodes (see Figures 1+2). The cathode is designated using a coloured ring. The breakdown voltage, i.e. Zener voltage is also printed on the diode (Fig. 2).

The properties of real diodes differ only slightly from ideal diodes having neither ideal forward conducting nor ideal blocking properties. These attributes are particularly obvious in the Z-diode characteristic (Fig. 4). At high frequencies even more disturbing effects can be seen which however will be ignored here.

- **Conducting direction:**
Z-diodes possess a low conducting state voltage of approx. 0.7 V. The conducting state region is not of interest for typical applications.
- **Blocking properties:**
Z-diodes become conductive starting at the Zener voltage. This means they have a low resistance, whose value can be determined from the slope of the blocking characteristic.
Z- diodes have limiting data, e.g. maximum temperature or maximum power dissipation which may not be exceeded.