`ee101_diode_circuit_3.sqproj`

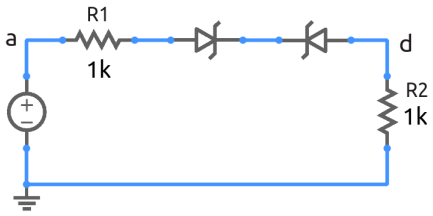

Figure 1: Circuit with zener diodes connected back-to-back.

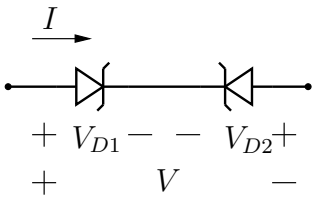

Figure 2: Zener diodes connected back-to-back.

In the diode circuit shown in Fig. 1, we have two zener diodes connected back-to-back. For this combination to conduct, one of the diodes must conduct in the forward conduction mode, and the other in the reverse conduction (zener breakdown) mode. Refering to Fig. 2, we must have $V_{D1} = V_{\text{on}}$ and $V_{D2} = -V_Z$ or $V_{D2} = V_{\text{on}}$ and $V_{D1} = -V_Z$, where V_{on} is about 0.7 V and V_Z is the zener breakdown voltage (taken to be a positive number here).

In the first case, the current I is positive, $V = V_{\text{on}} + V_Z$ is also positive. In the second case, I is negative, and $V = -V_{\text{on}} - V_Z$ is also negative. As a first approximation, we can say that when this combination of zener diodes conducts, the voltage drop remains constant (either $(V_{\text{on}} + V_Z)$ or $-(V_{\text{on}} + V_Z)$), irrespective of the current.

Exercise Set

1. Plot the output voltage (V_d) versus the input voltage (V_a) for $-8\,\text{V} < V_a < 8\,\text{V}$. Assume V_Z is 5 V and V_{on} is 0.7 V.

2. Compare your plot with simulation results.