Operating point of a diode

The circuit is shown in Figure 1:

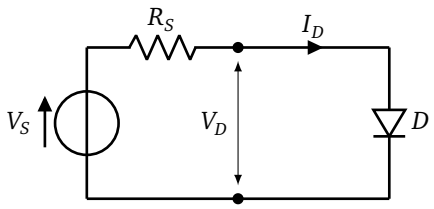

Figure 1: *Series circuit of a voltage source, a resistor and a diode.*

The voltage of the source is 1.0 V. The resistance of the resistor is 0.025 kΩ.

The voltage-current relation of a diode is:

$$I_D = I_S \cdot \left(e^{\left(\frac{V_D}{n \cdot V_T}\right)} - 1 \right) \tag{1}$$

With:

I_D: The diode current;
I_S: The reverse bias saturation current, typically 1×10^{-12} A;
V_D: The voltage in forward direction;
n : The ideality factor, typically 1 (between 1 and 2);
V_T: The thermal voltage, 25.692 57 mV at 25 °C;

The curves of the load lines are shown in Figure 2. The blue line is the load line of the voltage source and the resistor, the red line is the load line of the diode. Where they intersect, is the operating point of the diode.

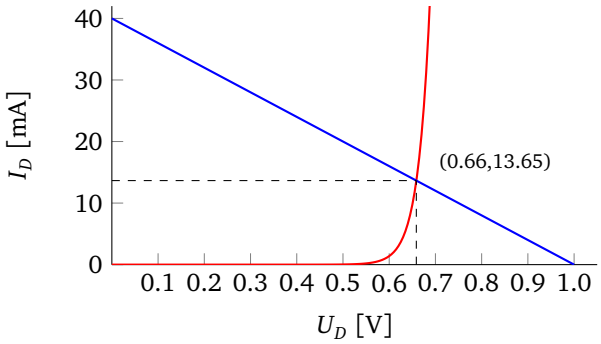

Figure 2: *Load line of the series circuit of a diode, a resistor and a voltage source.*

For the operating point, the diode forward voltage is 0.66 V and the diode current is 13.65 mA.