

# Examination of zener diodes

## Tasks:

### **I. Practical measurements:**

1. Measure the V-A characteristic in forward and reverse direction of zener diode with low breakdown voltage for two different temperatures –  $T_1$  (25°C) and  $T_2$  (50 °C).
2. Measure the V-A characteristic in forward and reverse direction of zener diode with high breakdown voltage for two different temperatures –  $T_1$  (25°C) and  $T_2$  (50 °C).

### **II. Graphics:**

1. In common coordinate systems draw the V-A characteristics of the zener diode with low breakdown voltage for the two temperatures.
2. In common coordinate systems draw the V-A characteristics of the zener diode with high breakdown voltage for the two temperatures.

### **III. Calculations:**

1. Calculate the dynamic resistance  $r_d$  in reverse direction from the measurements for current with value  $I_Z=9\text{mA}$  for both diodes.

$$r_z = \frac{U_{z2} - U_{z1}}{I_{z2} - I_{z1}} \text{ for } I_Z=9\text{mA} = \text{const}$$

2. Calculate the value of temperature coefficient  $TKU_Z$  for current with value  $I_Z=9\text{mA}$ , for both diodes.

$$TKU_Z = \frac{U_{z2} - U_{z1}}{T_2 - T_1} \text{ for } I_Z=9\text{mA} = \text{const}$$

### **Answer the questions**

1. What is the main application of Zener diodes? Draw the schematic of voltage regulator.
2. What are the values of breakdown voltages for both diodes?
3. What are the polarities of  $TKU_Z$  for both diodes?
4. Which of both diodes has lower dynamic resistance? How this will influence on voltage regulator ability of the Zener diode?

**Characteristic:**

Table 1

I, mA	Low breakdown voltage zener diode				High breakdown voltage zener diode			
	U <sub>F</sub> , mV		U <sub>Z</sub> , V		U <sub>F</sub> , mV		U <sub>Z</sub> , V	
	25 °C	50 °C	25 °C	50 °C	25 °C	50 °C	25 °C	50 °C
0.25								
0.5								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Remark:

**First measure all characteristics for T=25°C** and after switch on heating. Otherwise we need to wait for diodes cooling.