

Transistor amplifier - part 1

1. Scope

- Determine the transistor characteristics in common emitter configuration (CE).
- Calculate parameters of the amplifier circuit to achieve reference gain.
- Determine frequency (amplitude and phase) characteristics.

2. Transistor characteristics in common emitter configuration.

Your goal is:

- plot the characteristic of the unknown transistor (already placed in simulation),
- change the transistor parameters to model BC109,
- plot the characteristic of the BC109 and compare with the datasheet.

In order to achieve goals follow the further part of instruction.

Run Matlab and load file named LAB2.slx. There is a basic circuit for measurement of the transistor characteristics works in CE configuration. Uncomment block 1. *Characteristics*. The circuit is presented in Fig. 1.

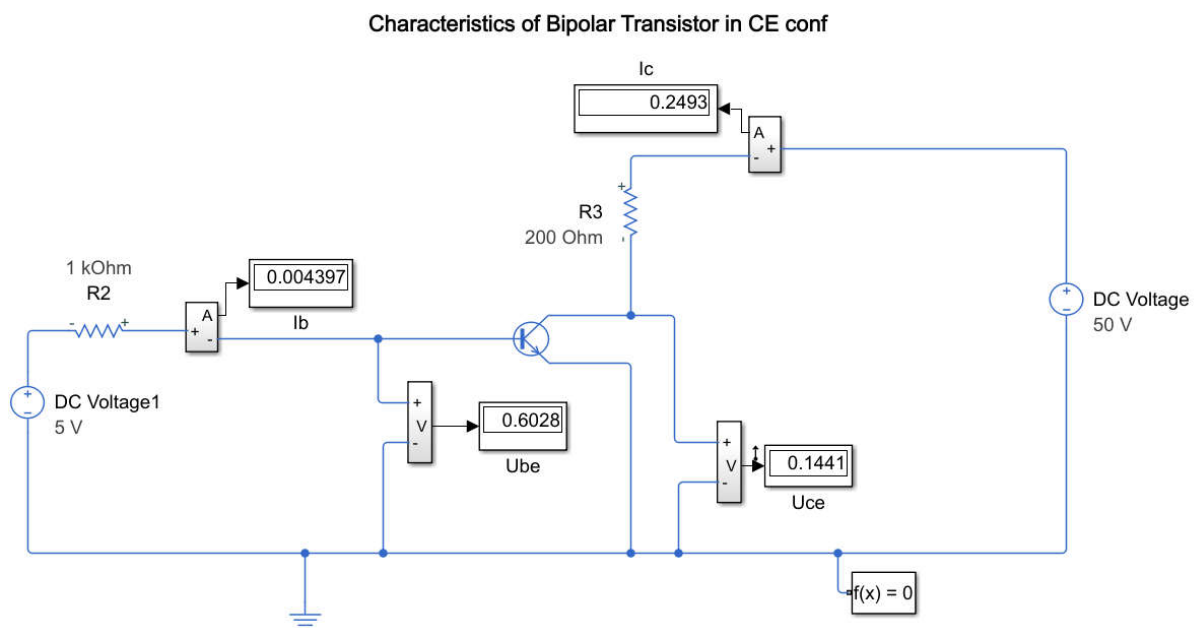


Fig. 1 Schematic of the measurement circuit

Change the values of DC voltage sources in such way that you will determine the following characteristics:

- $I_c = f(U_{ce})$, $I_b = \text{const}$,
- $I_c = f(I_b)$, $U_{ce} = \text{const}$,
- $I_b = f(U_{be})$, $U_{ce} = \text{const}$,
- $U_{be} = f(U_{ce})$, $I_b = \text{const}$.

Before you start measurement open the file BC109.pdf and find exactly these characteristics. Your results will be differ because of the unknown NPN transistor parameters. However, the shape of plot line should be similar. Plot your results in Fig. 2-5.

Fig. 2 $I_b=f(U_{be})$, $U_{ce}=\text{const}$

Fig. 3 $I_c=f(U_{ce})$, $I_b=\text{const}$

Fig. 4 $I_c=f(I_b)$, $U_{ce}=\text{const}$,

Fig. 5 $U_{be}=f(U_{ce})$, $I_b=\text{const}$

Next double click on transistor and look at the parameters. Try to find these parameters in BC109 datasheet file and change transistor parameters in simulation. Repeat the procedure for determination characteristics and plot results.

Fig. 2 $I_b=f(U_{be})$, $U_{ce}=\text{const}$

Fig. 3 $I_c=f(U_{ce})$, $I_b=\text{const}$

Fig. 4 $I_c=f(I_b)$, $U_{ce}=\text{const}$,

Fig. 5 $U_{be}=f(U_{ce})$, $I_b=\text{const}$

Did you achieve characteristics similar to datasheet? Comment differences.