X230994

UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Department of Electrical Engineering

Experiment No._____Transistor Amplifier Configurations

INTRODUCTION

There are three basic transistor amplifier configurations generally identified as common-emitter, common-base, and commoncollector (sometimes called emitter-follower).Each of these configurations exhibit certain characteristics that make them more desirable in certain circuit applications than others.A qualitative comparison of the three configurations is shown below.

	Common-emitter	Common-base	Common-collector
Input Impedance	Medium	Low	High
Output Impedance	Medium	High	Low
Current Gain	High (β)	Low (α)	High
Voltage Gain	High	High	Low
Power Gain	High	Medium	Low

Generally, the common-emitter and common-collector have a lower Frequency bandwidth than does the common-base.The purpose of this experiment is to determine some of the characteristics listed above for the three different transistor amplifier configurations and compare them.

PRELIMINARY

P-1. Obtain from the manufacturer's specifications the absolute maximum values of the parameters listed below for the 2N3904 or its equivalent).

Collector-Base Voltage,VCBO:_____60 v_____.
Collector-Emitter Voltage,VCEO:_____40 v_____.
Emitter-Base Voltage, VEBO:_____6V_____.
Continuous Collector Current:_____200mA_____.
Continuous Power Dissipation @ 25 C:___310mV_____.

For solutions to preliminary questions and additional reference,

refer Refer pg.376 (chapter 11,Low frequency Amplifiers)

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P-1. Cont.)
Also sketch the pin-out configuration of the transistor:

Refer MANUAL for pin configuration

P-2. Obtain a set of common-emitter output characteristic curves for the transistor of Procedure P-1 above (either from a curve tracer or from a previous experiment). Specify a set of quiescent conditions for the transistor within its operating range and determine all the necessary element values (see Figure 1).

P-3. Realizing that the capacitors, C1 and C2, should provide a low-impedance path to AC, specify reasonable values for them.

P-4. Briefly discuss the reasons for having the capacitors, C1 and C2, in the circuit.

Suggested reference

For solutions to preliminary questions and additional reference,

Refer pg.376 (chapter 11, Low frequency Amplifiers)

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INSTRUCTOR'S SIGNATURE_____DATE_____

PROCEDURE

F-1. Connect the circuit of Figure 1 using element values calculated in the Preliminary exercise above. Make sure that the quiescent parameters are within limits.

F-2. Using a duel-trace oscilloscope, adjust and record the magnitude of the sinusoidal signal source, es, so that the output signal, eo, is just beginning to distorted at a

frequency of 5 K-Hertz. At this frequency, take the data necessary to determine the input impedance of the transistor amplifier. Also, record the phase relationship between the input signal, ei, and the output signal, eo.

F-3. Again using a duel-trace oscilloscope, take the data necessary to plot a frequency response curve (eo/ei versus frequency)for the amplifier, between "break-points" if possible,holding the magnitude of the sinusoidal signal source constant at the value set in Procedure F-2 above.

F-4. Repeat Procedures F-1 through F-3 above for the circuit of Figure 2.

F-5. Repeat Procedures F-1 through F-3 above for the circuit of Figure 3.

REPORT (should include at least the following)

R-1. Plot normalized-voltage-gain versus frequency for the three amplifier configurations on the same graph. Use log-log paper.

Normalized-voltage-gain = Av/(Av @ 5 K-Hertz)

R-2. Determine the transistor input impedance (Zi and Zt), current gain (Ai), voltage gain (Av), and power gain (Ap) for each of the three amplifier configurations at 5 K-Hertz and compare them in a Table.

$$Ap = Av \times Ai$$

R-3. Discuss the results of the experiment.

NOTE: REVERSE THE POLARITY OF THE POWER SUPPLY AND THE POLARIZED CAPACITOR IN THE CIRCUITS OF FIGURES 1, 2, AND 3 IF THE TRANSISTOR IS A PNP!

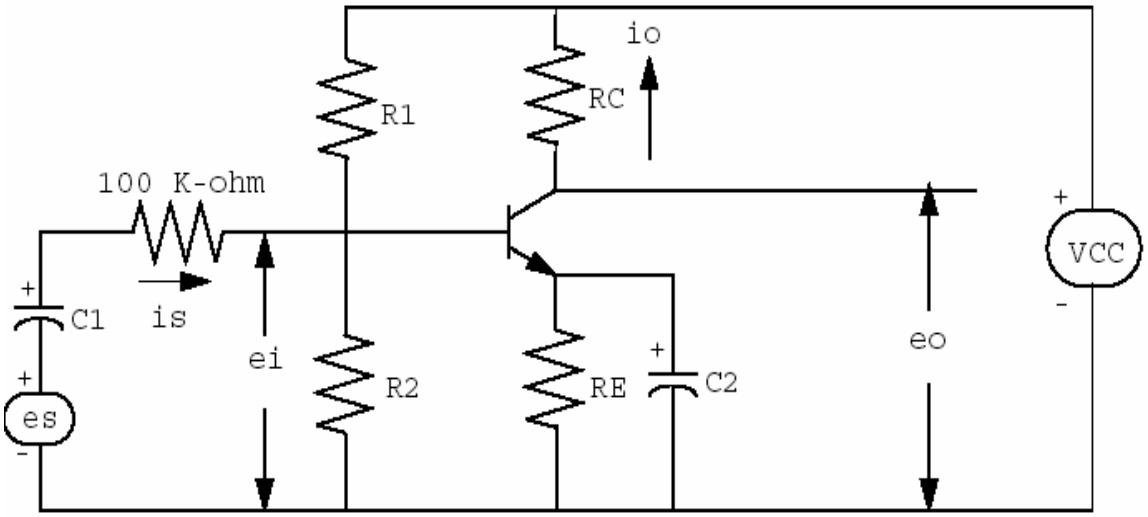

Figure 1. Common-emitter

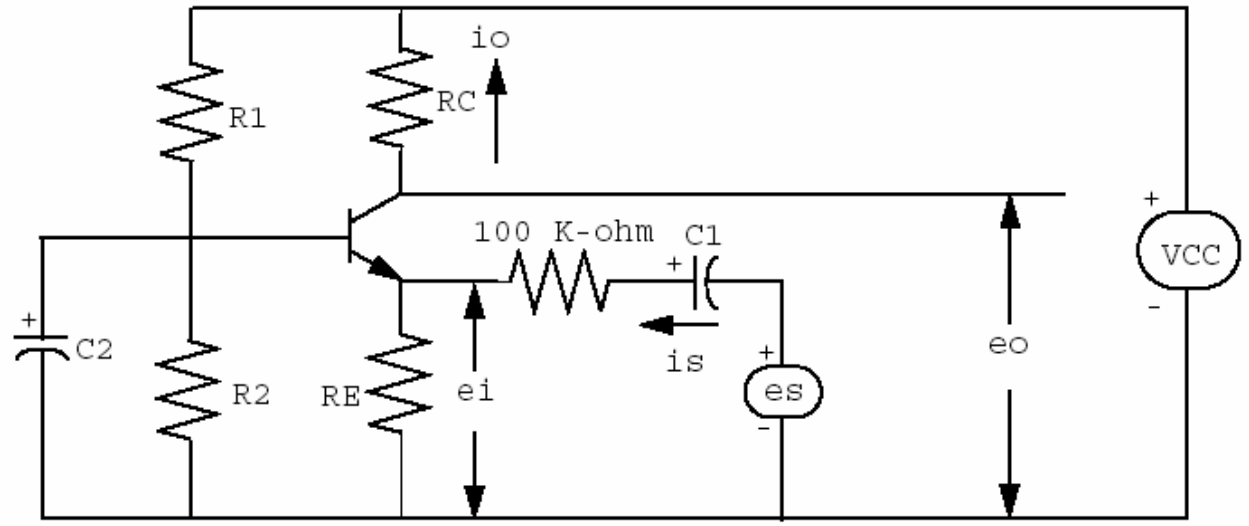

Figure 2. Common-base

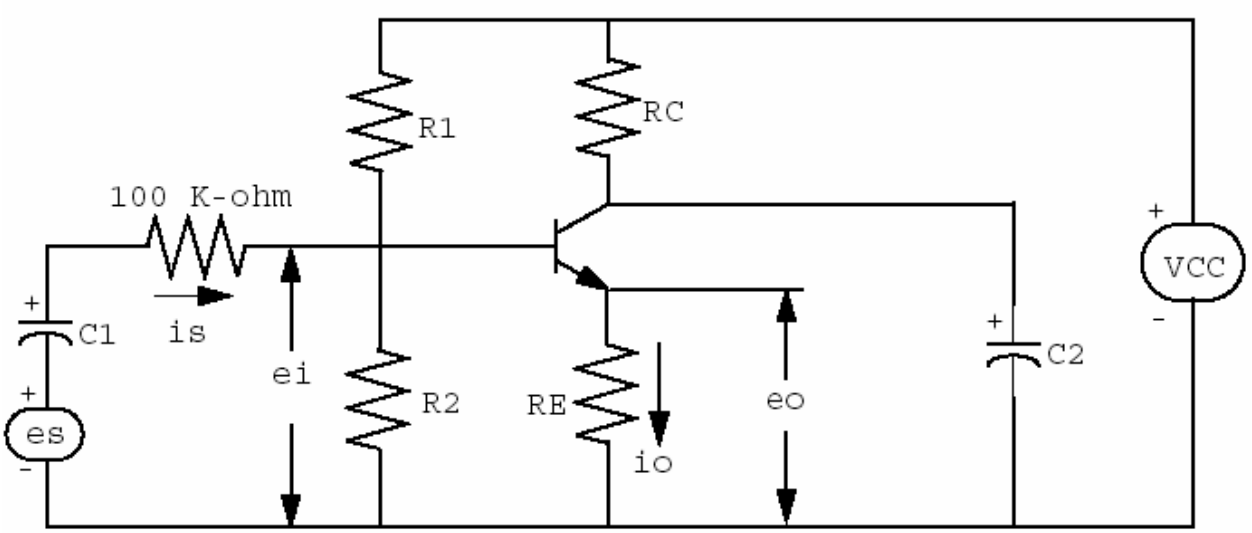

Figure 3. Common-collector