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STUDY AND PERFORMANCE TESTING OF TRANSISTOR WITH COMMON EMITTER AMPLIFIER CIRCUIT

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ABSTRACT

The transistor has ranking in 20th century technology. It is finding the application in all electronic devices as radios, computers. Integrated circuits are containing various transistors, which are made by silicon. The transistors are used to handle large current and/or large voltages. As example, the final audio stage in the stereo system used a power transistors amplifier to drive the various speakers. Transistors are device, which are utilizes a change in current to produce a large change in voltage, current, or power.

Keywords:
primary winding turns, secondary winding turns, transformer core.

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1. INTRODUCTION

There are two type of transistor which are used in power electronics devices.

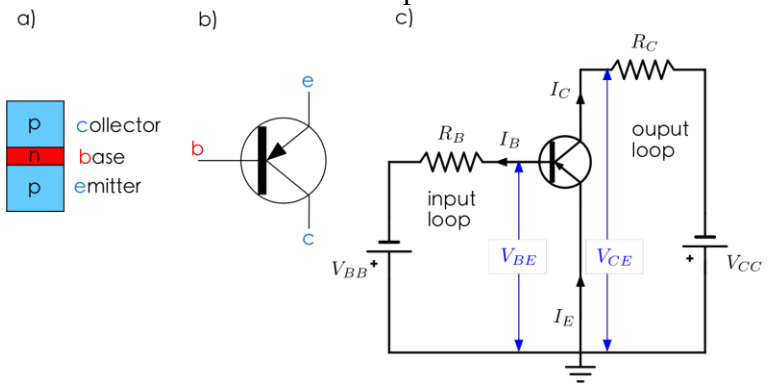

Figure 1: a) The schematics diagram of PNP Transistor
b) Circuit symbol c) common emitter circuit

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The PNP transistors are shown in figure. These are consisting of a p-type emitter, an n-type base and a p-type collector, which are together form two PN junctions. In this amplifier circuit, voltages are supplied, so that the emitter base junctions are forward-biased and the collector base junction is reverse-biased. This means $V_{CE} > V_{BE}$. Common emitter circuit, so called because the emitter is common to the input circuit on the left and the output circuit on the right.

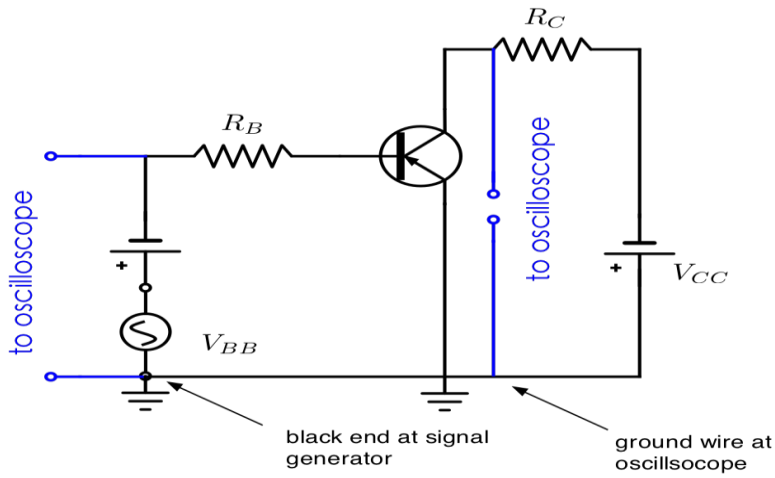

Figure 2: AC amplifier circuit

Consider the first of the entire forward-biased emitter-base junction. It is also very narrow (< 1 μm) making it easy for a large fraction, α, of the holes to diffuse across to the collector-base junction where the junction voltage accelerates them into the collector region to form the collector current, I_C.
Thus, $I_C = \alpha I_E$

The remaining fraction, (1-α), of holes leave the base through the external connection to form the base current, I_B, where
$I_B = (1-\alpha)I_E$
The "current gain", β, of the transistor are defined by

$\beta = I_C/I_B$
$= \alpha/(1-\alpha)$.

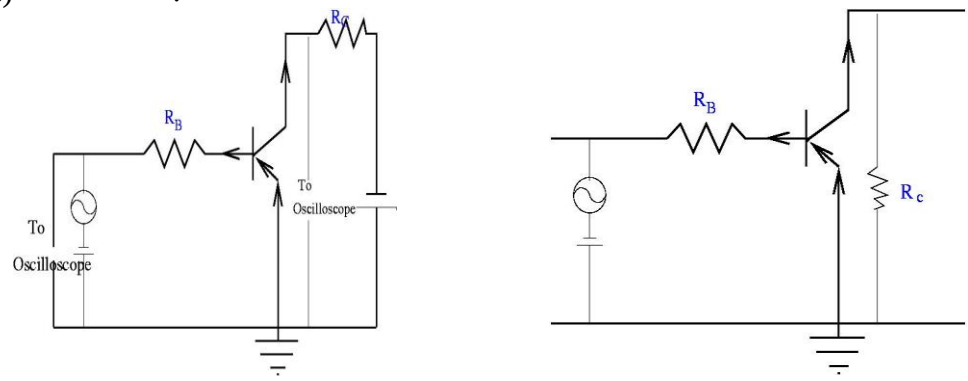

Figure 3: a) AC amplifier b) equivalent circuit

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Figure are shows the transistor used as an AC amplifier to amplify a small signal from a signal generator. Now the two batteries in the circuit behave like large capacitors with impedances $(1/\omega C) \sim 0$, so that the equivalent circuit is as shown in figure. The voltage gains are given by equation. However, these are a simplified situation.

2. PROCEDURE

The power supply outputs for the voltages V_{BB} and V_{CC}. The symbols e, b and c denoting the transistor connections. Use a 3000 Ω resistor for R_B and a 220 Ω resistor for R_C. Turn the supply outputs to zero then turn on the unit. Set one of the digital meters to the 20 V DC range and connect it to measure V_{CC} (+ lead to ground on the transistor board). Adjust V_{CC} to approximately 15 V. Reconnect the meter to measure V_{CE}. This should also read 15 V, indicating $I_C = 0$. Connect the second meter to measure V_{BB}, also with the + lead to ground. Slowly increase V_{BB} up to 2 V and note V_{CE} decreasing, indicating an increasing I_C. Your amplifier is now working.

3. TRANSISTOR AS A SWITCH

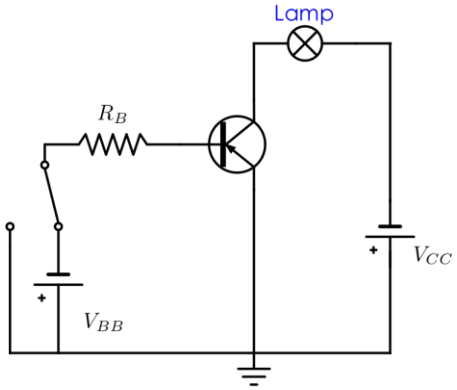

Figure 4: the transistor as a switch

4. AC AMPLIFIER

Increase V_{CC} to 15 V and turn V_{BB} down to zero. Increase V_{BB} until $V_{CE} = 7.5$ V. Connect the signal generator in series with V_{BB} and adjust it to 100 Hz. the black leads to ground on the transistor board for both connections. Observe the input and output waveforms. Note that adjusting V_{BB} causes distortion of the output waveform. From the ratio of peak-to-peak voltages, determine A_V for frequencies of 100 Hz, 1 kHz, 10 kHz and 20kHz

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