Integrated Electronics

Audio Amplifier

AMPLIFIER

The amplifier circuit, which consists of a BJT that is **biassed using a feedback resistor**, receives a low voltage input signal. This configuration yields a **gain of 57** for the stated input impedance in this stage.

BUFFER

In the CC Amplifier arrangement, an NPN transistor acts as the buffer. We have used a buffer at this stage of the circuit to **output the same voltage** and also for **impedance matching** that is fed into it from the potentiometer and the previous stage.

Potentiometer: It is used to regulate the second stage amplifier's gain.

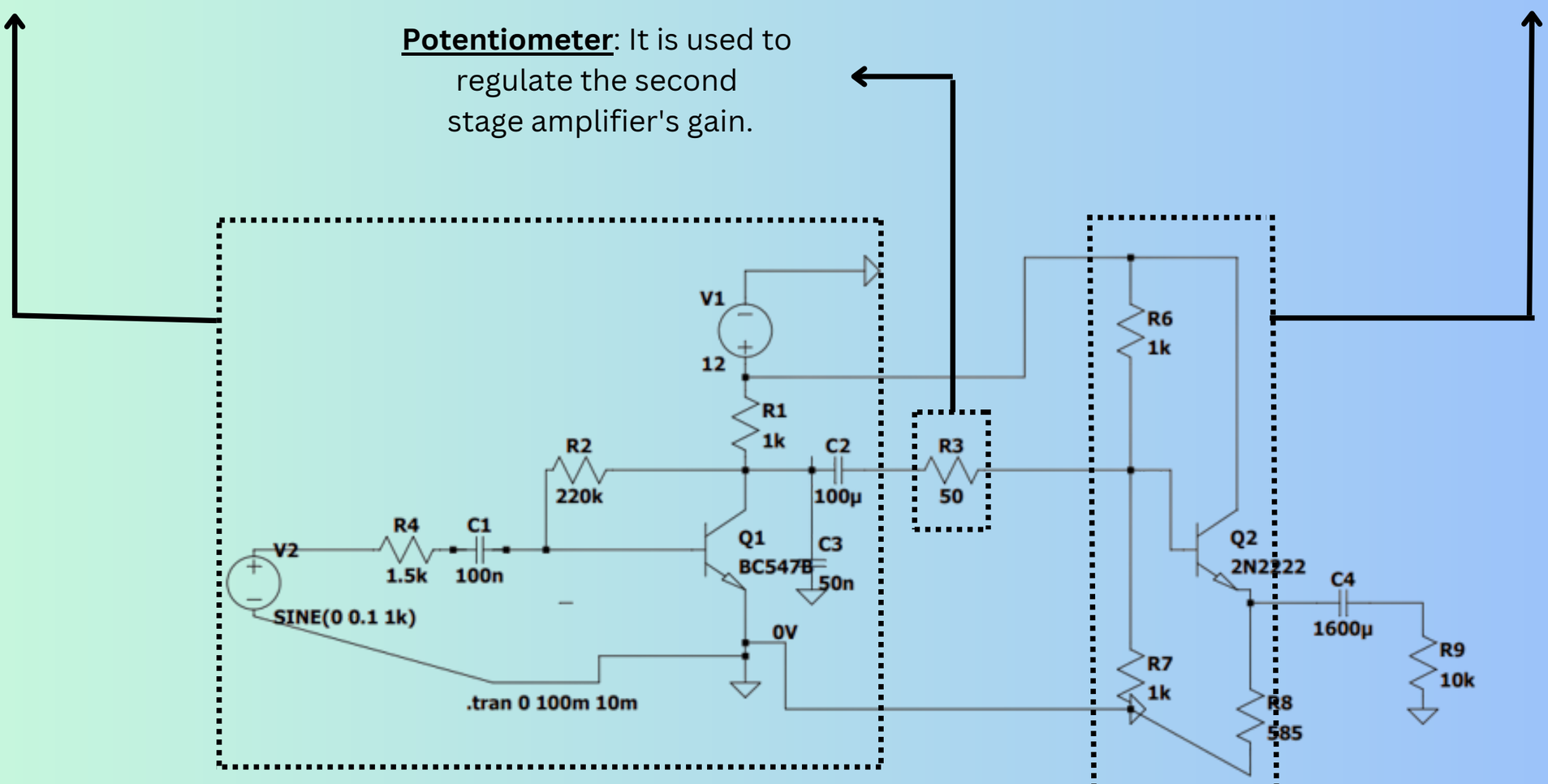
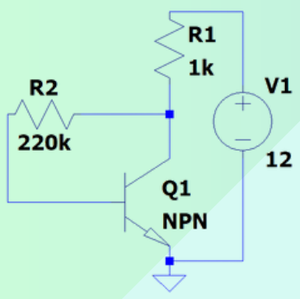


fig.Main circuit

Circuit Analysis

DC ANALYSIS



$$I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta+1)R_C}$$

$$\Rightarrow I_B = 23.9\,\mu A$$

And, $I_c = \beta \cdot I_B$

$$\Rightarrow I_c = 5.9\,mA$$

$$g_m = \frac{I_c}{V_T} = 0.2285$$

$$A_{V_b} = V_o / V_b$$

$$\left\{ \frac{V_o}{V_{in}} = \frac{V_o}{V_b} \times \frac{V_b}{V_{in}} \right\}$$

$$\Rightarrow A_{V_b} = \frac{V_o}{V_b} = -g_m(R_C \parallel R_2)$$

$$\Rightarrow A_{V_b} = -226.9$$

Now, by Miller's Theorem:

$$R_1 = \frac{R_B}{1 - A_V}$$

$$\Rightarrow R_1 = 965\,\Omega$$

and, $r_\pi = \frac{\beta}{g_m}$

$$\Rightarrow r_\pi = 1096.5\,\Omega$$

Small Signal Model

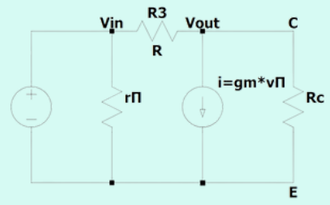
$$Z_{in} = 513.36\,\Omega$$

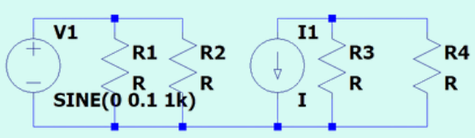
$$\frac{V_b}{V_{in}} = \frac{Z_{in}}{Z_{in} + R_S}$$

$$= 0.254$$

So, gain $= 226.9 \times 0.254$

$$= 57.63$$





Using millers theorem

OBSERVATION:

The Circuit is Successfully tested and verified on both Ltspice and oscilloscope.

APPLICATIONS:

- In various instruments that relate to music, these amplifiers are installed.
- For the wireless transmission of the signals, audio amplification is required.