

A Review on The impact of Transistor Configuration as An Amplifier

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ABSTRACT

In the electronic era, the development of the transistor is unquestionably one of the most valuable contributions in the field of Electronic components. Transistor has an application to work as a switch and as an amplifier and almost in all cases he transistor is taken as the use of an amplifier because it gives proper biasing. In this review paper, we are going to compare the Transistor as an amplifier with three configurations and select one desirable configuration with perfect amplification & that is CE configuration and taken as used in everywhere mostly.

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1. Introduction

A transistor is an important integral of each electronic circuit like it make our electronics world go around. To amplify, control & generate electric signals transistor is used. The ingenious idea behind a transistor is that it allows you to control the current flow through one channel by changing the strength of a much lesser current that's flowing through another channel. Based on the transistor circuit many projects are established. Transistors are the active components of microchips. [1]A transistor having many functions of working like a transistor acts as a switch having its property for its working condition; a transistor acts as an amplifier having the ability to amplify a signal.

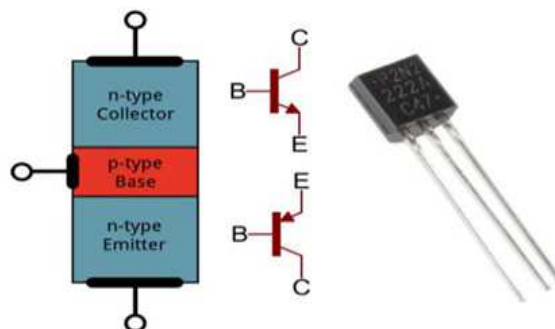


Figure 1. Transistor

1.1 Transistor as an Amplifier

It is the most powerful application of a transistor that involves amplification. In short, its working is to turn a low power signal into one of a higher power. The voltage of the signal can be increased by an amplifier from μV range to a more useful mV or V level. They have a capacity for amplifying

current up to a higher magnitude. [2] Amplifiers also have features for taking in current and producing higher voltage called trans resistance and transconductance. Transistors are a key component to many amplifying circuits. There are a seemingly infinite variety of transistor amplifiers. A transistor amplifier needs a transistor to amplify the signals which are connected in one of the three configurations. A HIGH input impedance better amplification takes place. And for better output voltage gain and power gain should be high.

Here the different configuration is:

1. CB Amplifier
2. CC Amplifier
3. CE Amplifier

1.2. CB Amplifier

The amplifier circuit that is formed using a CB configured transistor combination is called a CB amplifier. An input signal is applied at the emitter-base junction and the output signal being taken from a collector-base junction. The emitter-base junction is forward biased by VEE and the collector-base junction is reverse biased by VCC. The operating point is adjusted with the help of resistors R_e and R_c . Thus the values of I_c , I_b , and I_{cb} are decided by VCC, VEE, R_e , and R_c . When no input is applied, the quiescent conditions are formed and no output is present. As V_{be} is at negative concerning ground, the forward bias is decreased, for the positive half of the input signal. As a result of this, the base current I_B also gets decreased.

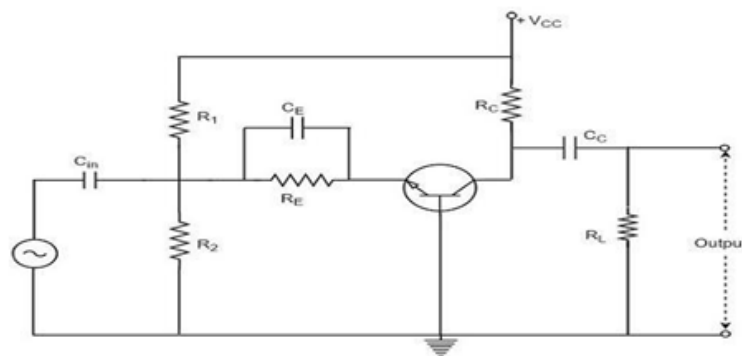


Figure 2. Transistor as an Amplifier in CB Configuration [5]

1.3. CE Amplifier

The amplifier circuit that is formed using a CE configured transistor combination is called a CE amplifier. The common emitter amplifier circuit using NPN transistor is as shown below, the input signal is applied at the emitter-base junction and the output signal being taken from the collector-base junction. [3] The emitter-base junction is forward biased by VEE and the collector-base junction is reverse biased by VCC. The operating point is adjusted with the help of resistors R_e and R_c . Thus the values of I_c , I_b , and I_{cb} are decided by VCC, VEE, R_e , and R_c .

When no input is applied, the quiescent conditions are formed and no output is present. When the positive half of the signal is being applied, the voltage between base and emitter V_{be} is increased because it is already positive concerning ground. As forward bias increases, the base current to increases accordingly. Since $I_C = \beta I_B$, the collector current increases as well.

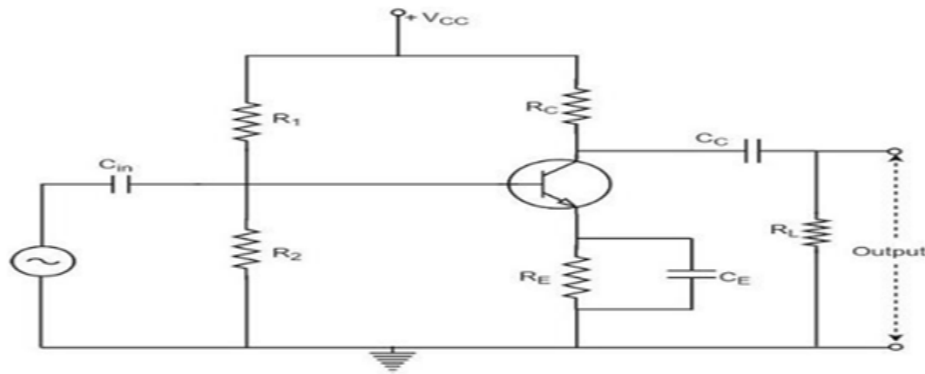


Figure 3. Transistor as an in CE Configuration

1.4. CC Amplifier

The amplifier circuit that is formed using a CC configured transistor combination is called a CC amplifier. The common-collector amplifier circuit using NPN transistor is as shown below, the input signal is applied at a base-collector junction and the output signal being taken from the emitter-collector junction [5]. The emitter-base junction is forward biased by VEE and the collector-base junction is reverse biased by VCC. The Q-values of I_b and I_e are adjusted by R_b and R_e .

When no input is applied, the quiescent conditions are formed and no output is present. When the positive half of the signal is being applied, the forward bias is increased because V_{be} is positive concerning collector or ground. With this, the base current I_B and the collector current I_C are increased.

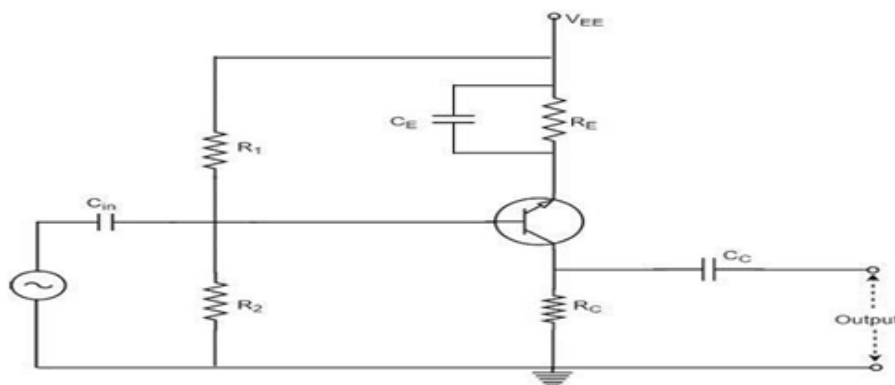


Figure 4. Transistor as an Amplifier in CC

Configuration Comparison among Transistor Configurations

Table 1. Comparison among Transistor Configurations

Transistor Configuration	Common Base	Common Collector	Common Emitter
Voltage gain	High	Low	Medium
Current gain	Low	Medium	High
Power gain	Low	Medium	High
Input resistance	Low (30-150ohm)	High (20-500)ohm	Medium (1k to 2 k)
Output resistance	High (500)	Low(50-1000k)ohm	Medium (50k)

2. Implementation: Through Proposed Approach

a) Transistor as an amplifier as CB Configuration:

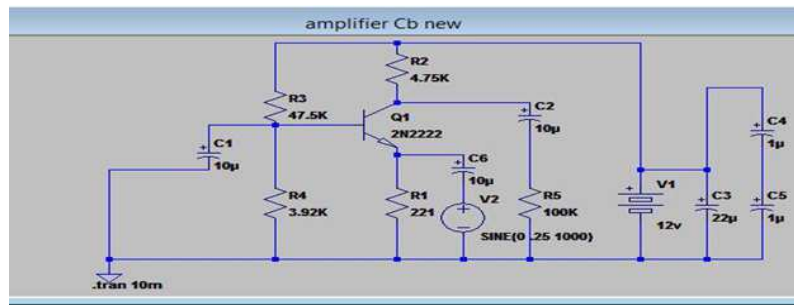


Figure 5. Transistor as an amplifier as CB Configuration

b) Transistor as an amplifier as CC Configuration

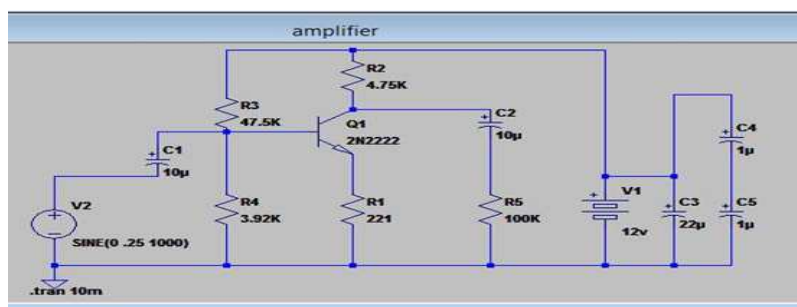


Figure 6. Transistor as an amplifier as CC Configuration

3. Result

a) Waveform of transistor as an amplifier in CB configuration

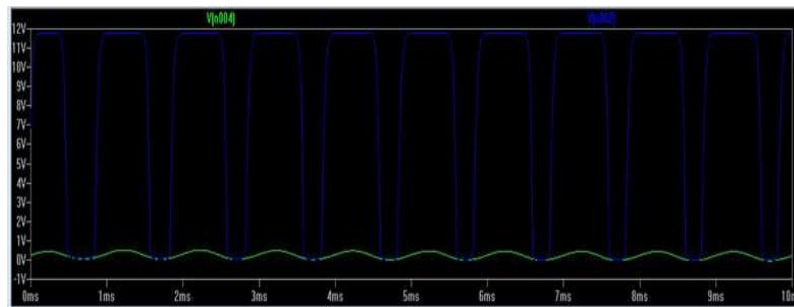


Figure 7. Waveform of transistor as an amplifier in CB configuration

b) Waveform of transistor as an amplifier in CC configuration

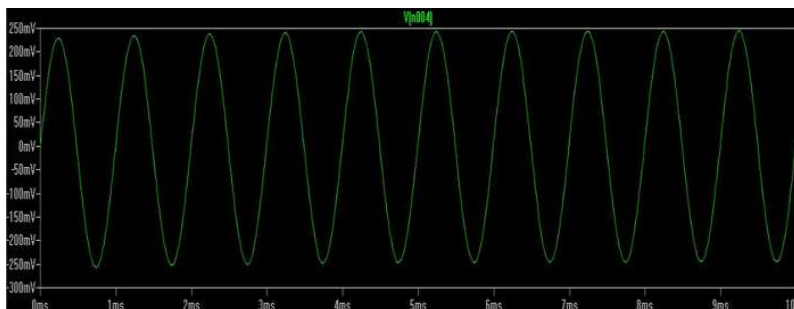


Figure 8. Waveform of transistor as an amplifier in CC configuration

c) Waveform of transistor as an amplifier in CE configuration

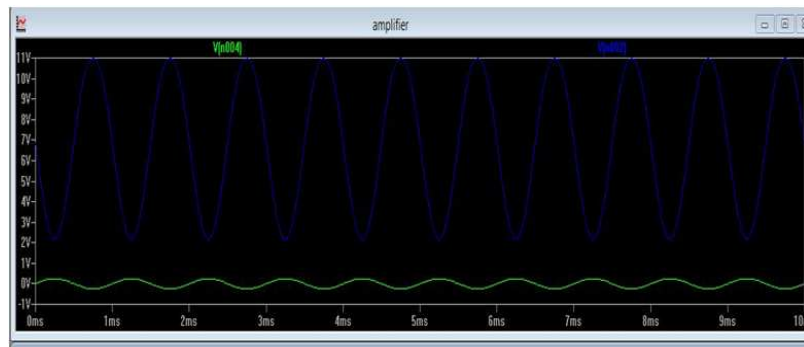


Figure 9. Waveform of transistor as an amplifier in CE configuration

4. Conclusion

In conclusion, we are seeing that the CE configuration is best and highly amplified. As we can see the all configuration are amplified, in CB configuration the input is applied at 0 volt, and by amplifying we are getting at 7v- 12 volt. In CC configuration the input is applied and by amplification, the range is going from 0-200mv. And in CE configuration input is applied at 0 v and after amplification the range is from 7v-11v. CE configuration is highly biased and used for amplification everywhere.

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