

Audio Power Amplifier

UPPALA BHARGAVA SAI, VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

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Abstract

The implementation of Audio Power Amplifier is inspired from past implemented Audio Power Amplifier circuits using BJTs, FETs and combination of BJTs and MOSFETs. The circuit mentioned here includes three stages Voltage Amplification Stage, Driver Stage and Output Stage. The output stage includes pushpull arrangement which helps in getting better efficiency, cancellation of even harmonics and cancellation of DC current at the output etc. As the reference circuit is designed using BJTs, those BJTs will be replaced by MOSFETs in the working circuit. The circuit designed will be implemented in eSim EDA tool and will be done using Sky Water's 130nm PDK.

2 Implemented Circuit

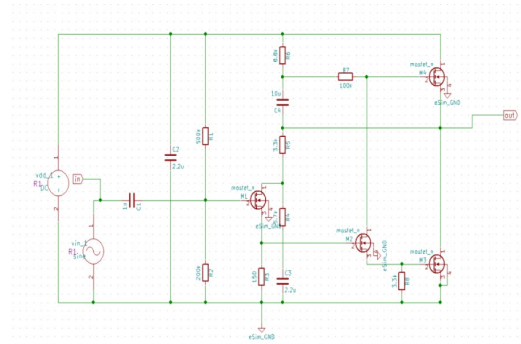


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

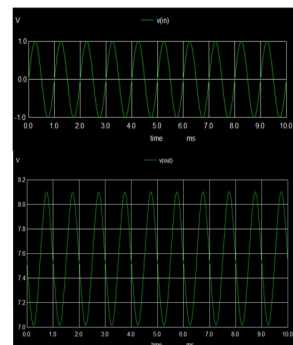


Figure 2: Implemented waveform.

1 Circuit Details

The Audio Power Amplifier is an electronic amplifier which amplifies the low-power input signal (ex: signal from radio receiver) to high-power signal (ex: High enough for driving Loudspeakers). Theoretically, every audio amplifier gives some amount of power amplification, but when it comes to practical scenario every audio amplifier cannot be called a Power amplifier. To find if it is power amplifier or not, we should measure the amount of power amplification. Audio Power Amplifier consists of three stages of working: Voltage Amplification stage, Driver stage, Output stage. The Voltage Amplification stage provides the necessary improved voltage(amplifies from low voltage to required(high voltage) for the next stage. The purpose of Driver stage is to produce enough current gain in order to proceed to output stage which has low input impedance. Since there is sufficient current gain, it produces the suggestable amount of power gain too. The output stage is connected to loud speaker which further improves the power gain and transfers the power to loud speaker with minimum loss. As the reference circuit uses BJTs, I will replace those BJTs with necessary MOSFETs, because compared to BJTs, MOSFETs have positive temperature coefficient, less leakage of voltage while amplification and it is a high power application.

References

- [1] <https://www.circuitstoday.com/practical-power-amplifier-stages-and-block-diagram>.
- [2] https://www.electronicstutorials.ws/amplifier/amp_1.html.
- [3] https://en.wikipedia.org/wiki/Audio_power_amplifier.