High Frequency Amplifier

1 Introduction

An amplifier is an electronic device that can increase the power of a signal (a time varying voltage or current). Depending on its frequency of operation we have several types of amplifiers. As name suggests high frequency amplifiers are designed to operate at high frequencies. These have a vast variety of applications like telecommunication, high-speed electronic measurements, laser research and photonic research. When designing a high frequency amplifier, factors like bandwidth, low noise, high gain and noise immunity are extremely important. Your project is to build a high frequency amplifier using transistors which can drive a headphone.

2 Requirements/Outcomes

- Design a high frequency amplifier which can drive a load impedance of 8Ω (head-phone).
- The design must be compatible with working 12V.
- The design must be able to amplify a sine wave of 0.1V (peak-peak voltage).
- The design must be work in the frequency range of 20 kHz – 100kHz (Bandwidth requirement)
- The design must consist of minimum 3 transistors (usage of op-amps is prohibited).
- Apart from the demonstration, a datasheet must be provided for the design.

3 Additional Information

- Any change of project specifications is negotiable only before the mid review.
- All the circuits must be simulated using software (Ex- LT Spice, Multisim, PLECS etc.) before the implementation.

- Schematics should be verified and evaluated by the assigned supervisor
- All circuits should be tested on the breadboard and reviewed by the assigned supervisor before moving further
- Design for manufacturability should be considered when designing the PCB
- All the circuits must be designed using professional software used in electronic product design and manufacturing. (Ex – Orcad, Altium Designer)
- Complete set of design and manufacturing documents such as Schematics, Layout, 3D Model, Gerber files, Assembly files, Bill of Materials (BOM) etc. must be generated and properly documented.
- It is encouraged to procure materials/components from a reputable electronic component distributor such as Mouser, Digi-Key, Arrow Electronics, LCSC etc. (Latter two suppliers offer affordable shipping options.)
- It is encouraged to outsource PCB manufacturing to external suppliers (Ex- PCBWay, JLCPCB etc.), and discouraged from making PCBs in-house.
- Main functionality of the project must be achieved with basic electronics components such as Resistors, Capacitors, Inductors, Diodes, Transistors and other analog Integrated Circuits. Using any other pre-built programmable ICs are prohibited.
- Microcontrollers can be only used for User Interface operation.
- Enclosure design must be done using a professional software (e.g., Solidworks)
- Enclosure and 3D Model of the circuit must be assembled and inspected before manufacturing.
- 3D printing, Laser Cutting and Sheet Metal bending can be used to manufacture the enclosure.
- Final implementation of the project need to done in a PCB.
- Follow provided “General guidelines”.