

Research Migration Project

<https://esim.fossee.in/research-migration-project>



The Research Migration Project is an initiative of FOSSEE, IIT Bombay that promotes the use of eSim for reproducing published research circuits originally implemented using proprietary simulation tools. The objective is to migrate these validated designs to eSim to build an open source resource database.

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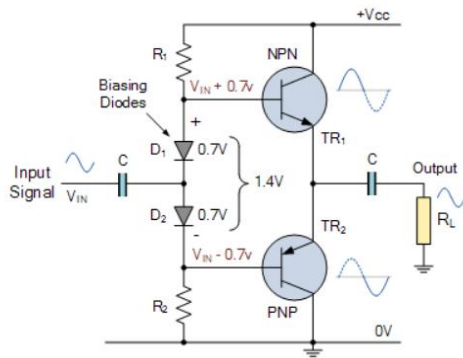
Title of the circuit : Class-AB Push-Pull Amplifier for Low-Distortion Audio Signal Amplification

Theory/Description : A Class-AB amplifier reduces crossover distortion of Class-B while maintaining good efficiency. It uses a push-pull pair of complementary transistors (BC547 and BC557) biased with diodes (~1.4 V) to keep both devices slightly ON. The input signal is amplified alternately by NPN and PNP transistors, producing a low-distortion output across the load. This makes it suitable for audio amplification.

Reason to reproduce with eSim : This circuit is ideal for eSim due to its simplicity and fundamental role in analog electronics. The open-source nature of eSim enables easy simulation and verification without licensing limitations. It allows clear observation of amplifier behavior, including gain and reduction of crossover distortion, making it highly useful for learning, analysis, and validation of theoretical concepts.

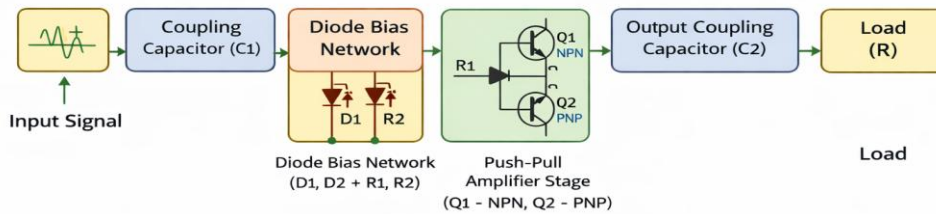
Expected Outcome/outputs : Input Signal: A sinusoidal input signal of 3 V peak at a frequency of 1 kHz is applied to the circuit. Output Observations: At the junction of the NPN and PNP transistors (push-pull stage), the output voltage reaches approximately 8.7 V peak, indicating proper amplification. On the negative side, the voltage is around 3.3 V, showing asymmetry due to biasing and transistor characteristics. After the output coupling capacitor, the voltage across the load resistor is approximately 2.5 V peak. The output waveform remains sinusoidal with a smooth transition near the zero-crossing region, confirming reduced crossover distortion.

Circuit Diagram(s) :



Block Diagram (s):

Class-AB Amplifier Block Diagram



Expected Results (Input, Output waveforms and/or Multimeter readings): A 3 V peak, 1 kHz sinusoidal input (~ 2.06 V RMS) produces an amplified output of ~ 8.7 V peak (~ 6.32 V RMS at V_{out}). After the coupling capacitor, the load voltage is ~ 2.5 V peak (~ 1.77 V RMS). The output waveform is sinusoidal with reduced crossover distortion.

Research Paper/Journal/etc. :

Title : (Design and Construction of a 100-Watt Class AB Audio Amplifier)

Author : (John Jeremiah Jay et al.)

Page No. : (1–10)

Link : (<https://dsjournals.com/dst/DST-V3I4P101>)

Source/Reference(s) : (Boylestad – Electronic Devices and Circuit Theory; BC547/BC557 Datasheets; Texas Instruments Application Notes)

Note: Fields marked with an asterisk (*) are mandatory and must be filled for successful submission.