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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Name of the participant : Yogeswaran I

Affiliation / Institution : Department Of Electronics and communication Engineering , Meenakshi Sundararajan Engineering College , Chennai

Title of the circuit : BJT differential pair pre-amplifier circuit with AD797 gain stage

Theory/Description : This circuit is a **composite low-noise differential amplifier** using a discrete BJT input stage and an AD797 operational amplifier. The transistor differential pair converts very small input voltages into differential currents with extremely low noise. The AD797 provides high open-loop gain, precision amplification, and low-impedance output. Negative feedback sets the overall gain and improves stability and linearity. This configuration is used for amplifying **microvolt-level signals** with high accuracy and low distortion, such as biomedical and sensor applications.

Reason to reproduce with eSim : This circuit is reproduced in eSim to verify correct biasing, stability, and closed-loop operation before hardware implementation. Simulation helps observe amplification of very small input signals and confirm proper gain and frequency response. Using eSim reduces design errors and ensures reliable performance of the AD797-based composite amplifier

Expected Outcome: The simulated **:** The expected outcome is a **stable amplified output waveform** corresponding to the applied micro-volt level input signal. The output should show the correct gain with no oscillations or clipping, and a small DC offset due to biasing. This confirms proper operation, stability, and low-noise performance of the AD797-based composite amplifier.

Circuit Diagram:
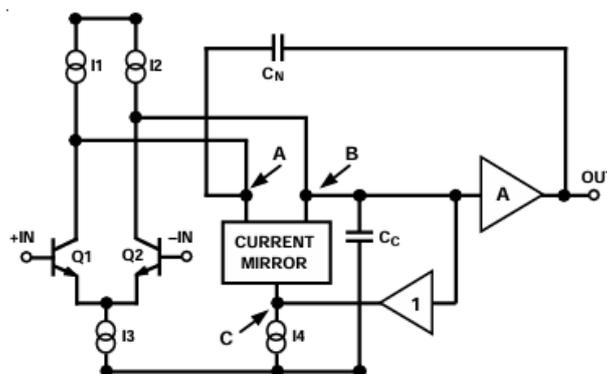
INTERNAL CIRCUIT DIAGRAM OF AD797
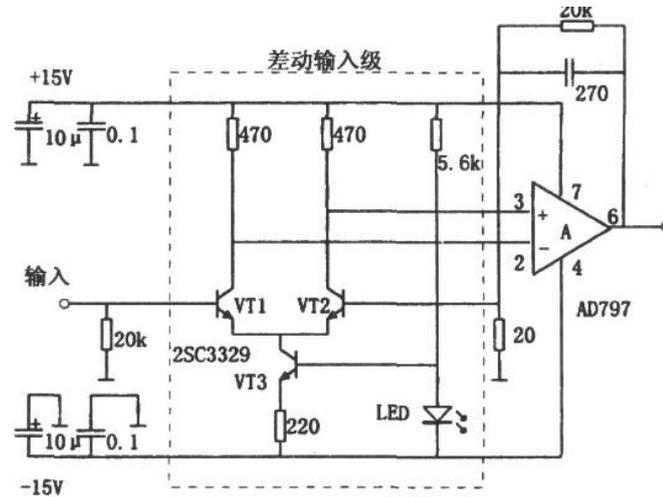
PRE-AMPLIFIER CIRCUIT

Research Paper/Journal/etc. :

1. Analog Devices, *AD797 Ultralow Noise, High Precision Operational Amplifier Datasheet*, Analog Devices Inc.
– Primary reference for theory, noise analysis, and application circuits.
2. P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, Wiley.
– Explains differential amplifiers, current sources, and low-noise design theory.

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