

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.

Name of the participant : Amrutha M

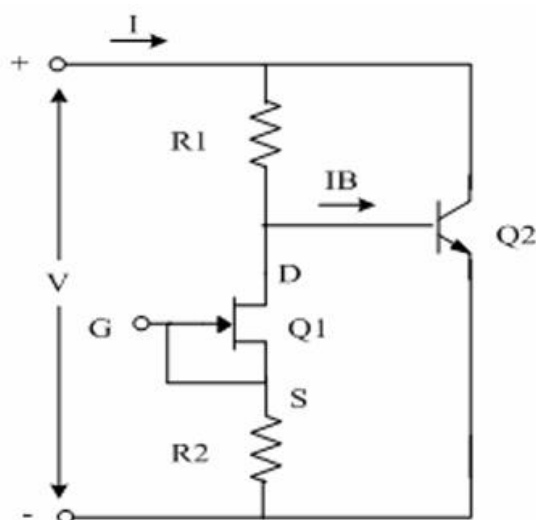
Affiliation / Institution : Division of Electronics and Communication Engineering, SOE, Cochin University of Science and Technology, Kochi, Kerala, India.

Title of the circuit : Negative Differential Resistance using JFET and BJT Configuration

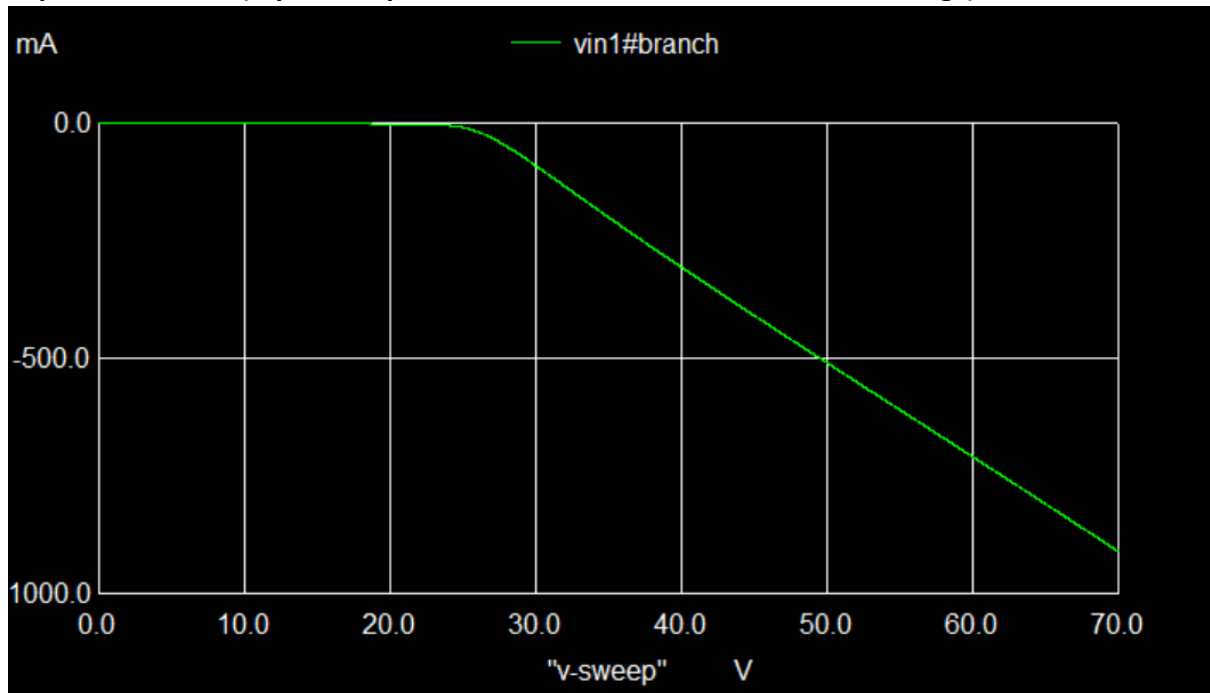
Theory/Description : The circuit implements **negative differential resistance (NDR)** using a bipolar-JFET configuration. Its operation is based on the interaction between a **JFET and bipolar transistor**, producing an S-shaped I-V characteristic with a region where an increase in voltage causes a decrease in current. The circuit uses resistors for biasing and feedback to establish the required operating conditions. By appropriately biasing the FET and transistor, the circuit exhibits controllable NDR behavior suitable for nonlinear circuit applications.

Expected Outcome/outputs : Simulation is expected to produce the characteristic **S-shaped I-V curve**, demonstrating a negative-slope differential resistance region. The key outputs are the terminal voltage and current, from which the **peak and valley points** and corresponding differential resistance can be determined. The simulated curve can be validated by comparing its overall shape and characteristic points with the results reported in the reference paper.

Circuit Diagram(s) :



Expected Results (Input, Output waveforms and/or Multimeter readings) :



Research Paper/Journal/etc. :

Title : Simulation of a Novel Bipolar-FET Negative Differential Resistance Circuits

Author : MAZDAK RAD MALKESHAHI, Mohsen Hayati

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Link : [\(PDF\) Simulation of a Novel Bipolar-FET Negative Differential Resistance Circuits](#)

Source/Reference(s) : Hayati, Mohsen & MALKESHAHI, MAZDAK. (2006). Simulation of a Novel Bipolar-FET Negative Differential Resistance Circuits.
