

Synopsis

Title:

Implementation and Simulation of an Original Amplifier Using Only Emitter and Base of a Si Bipolar Transistor in eSim

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Problem Statement:

Traditional bipolar junction transistors (BJTs) require all three terminals — emitter, base, and collector — for amplification. However, recent studies propose that a transistor can function as an amplifier without using the collector, based on the internal photovoltaic effect.

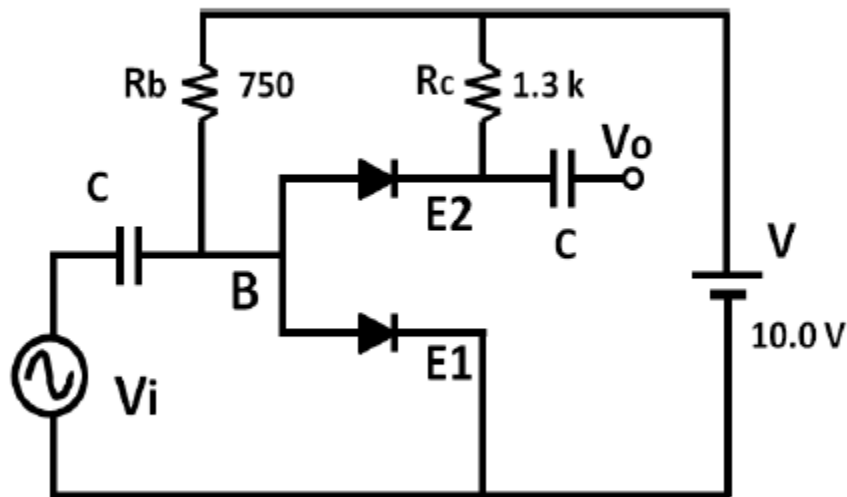
This project aims to explore this innovative concept by replicating and simulating a collectorless amplifier circuit in eSim, using only the emitter and base terminals of a silicon transistor.

Abstract:

Abstract—We demonstrate in this paper that it is possible to operate a certain bipolar transistor as an amplifier using only the emitter and base without using the collector. This study was performed based on the novel hypothesis that the

bipolar transistor works by the internal photovoltaic effect.

Circuit Model:



REFERENCES:

[1] K. Okamoto, "Novel Theory on the Operation of Bipolar Junction Transistor Using Internal Photovoltaic Effect Model", Symposium Proceedings of 2011 International Semiconductor Device Research Symposium (ISDRS2011), WP5-06, 7 December 2011.

[2] Kensho Okamoto and Junichi Fujita, "Novel Transistor composed of LED and Photodiode", The IEEE 10th International Conference on Power Electronics and Drive System 2013, Kitakyushu International Conference center, Kitakyushu, Japan, 24 April

2013, PEDS 2013 Proceedings,pp.992-997 (2013).