

# SINGLE PHASE FULL BRIDGE INVERTER WITH RL LOAD

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**Abstract** - This project presents the simulation and analysis of a Single-Phase Full Bridge Inverter with RL Load designed in eSim. The inverter converts DC input into an AC output, making it suitable for applications like UPS systems, induction heating, and AC motor drives. The simulation demonstrates the operation of four switching devices arranged in a bridge configuration that produces an alternating output voltage across the RL load. The project emphasizes switching control, waveform generation, and the effect of an inductive-resistive load on current and voltage waveforms.

## I. Objective

The main objective of this project is to design and simulate a single-phase full-bridge inverter circuit using eSim to:

1. Convert DC input voltage to an AC output voltage.
2. Understand the switching mechanism of BJTs in bridge configuration.
3. Observe the phase relationship between voltage and current in an RL load.
4. Analyze the waveform characteristics and inverter performance.

## II. Circuit Schematic

- The circuit consists of four BJTs arranged in an H-bridge configuration each connecting with an anti-parallel diode to allow current flow during the freewheeling period.
- The diagonal pair of switches conducts alternately to generate positive and negative half cycles of the AC output.
- The RL load is connected across the bridge output.

- Control signals are applied in a complementary fashion to ensure proper inverter action.

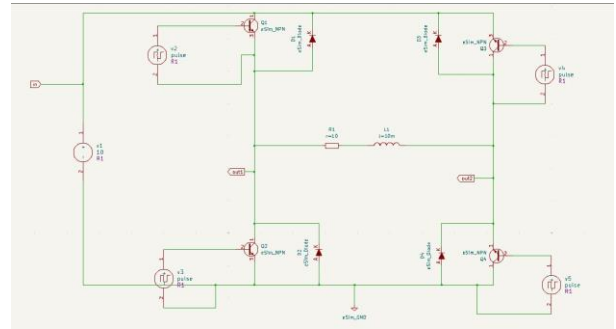


Figure 1: Circuit schematic diagram

## III. Simulation Result

The simulation demonstrates:

- Proper alternation of output voltage waveform corresponding to the switching sequence.
- The voltage across the RL load showing an AC pattern with phase shift due to inductive behavior.
- The current waveform lagging slightly behind the voltage waveform.
- During the non-conducting intervals of the BJTs, the freewheeling diodes conduct and provide a path for the inductive current, ensuring smooth current flow through the RL load.

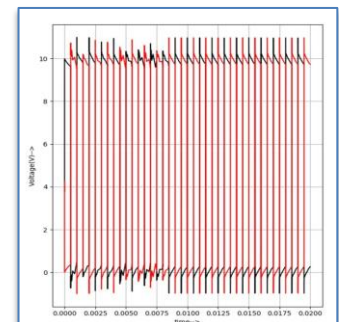
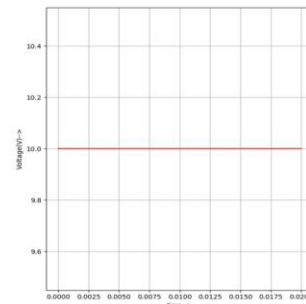


Figure 2: Simulation result diagram

## **IV. Conclusion**

The Single-Phase Full Bridge Inverter with RL Load was successfully designed and simulated in eSim. The simulation verified that the inverter efficiently converts DC to AC power with appropriate switching control. The RL load analysis shows a phase shift between voltage and current, confirming the inductive characteristics of the load. This project helps understand inverter operation and switching concepts in power electronics.

## **V. GitHub Repository Link**

[https://github.com/jyotsana224/Single\\_phase\\_full\\_bridge\\_inverter\\_with\\_RL\\_load](https://github.com/jyotsana224/Single_phase_full_bridge_inverter_with_RL_load)

## **VI. README Description**

This repository contains the design and simulation files for the project “Single Phase Full Bridge Inverter with RL Load” developed using eSim.

It includes:

- The eSim project files (schematic, netlist, and simulation results).
- The project report (PDF format).
- A GPL license file.

To run the project:

1. Open the .zip file in eSim.
2. Load the schematic and verify connections.
3. Run Ngspice simulation to observe voltage and current waveforms across RL load.

## **VII. Reference**

Dr. Ashish Srivastava and Vikas Singh Bhardwaj, “1-Phase Full-Wave Inverter with R-L Load – Overview”, Department of Electrical Engineering, SR Group of Institutions, Jhansi.