Heaven's Light is Our Guide

Rajshahi University of Engineering and Technology

Course Code
ECE 3206

Course Title
Industrial Electronics Sessional

Experiment Date: January 13, 2025,
Submission Date: February 2, 2025

Lab Report 3:
Study of Thyristor Characteristics R, RL Load

Submitted to	**Submitted by**
Md. Faysal Ahamed	Md. Tajim An Noor
Lecturer	Roll: 2010025
Dept of ECE, Ruet	

Contents

Study of Thyristor Characteristics R, RL Load

Theory

In this experiment, the characteristics of a thyristor (SCR) under different load conditions using both DC and AC supplies were investigated using simulation software.

Thyristor Characteristics with DC Supply

With a DC supply, the thyristor exhibited forward and reverse blocking characteristics. In forward blocking mode, it blocked current until a gate pulse was applied, then conducted until the current fell below the holding current. In reverse blocking mode, it blocked current flow, allowing only a small leakage current until the breakdown voltage was reached [1].

Forward Blocking Mode

The thyristor remained off until a gate pulse was applied.

Forward Conduction Mode

Once triggered, the thyristor conducted current until the current fell below the holding current.

Reverse Blocking Mode

The thyristor blocked current flow, allowing only a small leakage current until the breakdown voltage was reached.

Thyristor Characteristics with AC Supply

With an AC supply, the thyristor exhibited rectification properties, converting the AC signal into a pulsating DC [2].

Required Equipments/Software

- MATLAB/Simulink
- Oscilloscope
- AC Voltage Source
- Thyristor
- Series RLC Branch
- Pulse Generator
- Measurement Tools

Circuit Diagrams

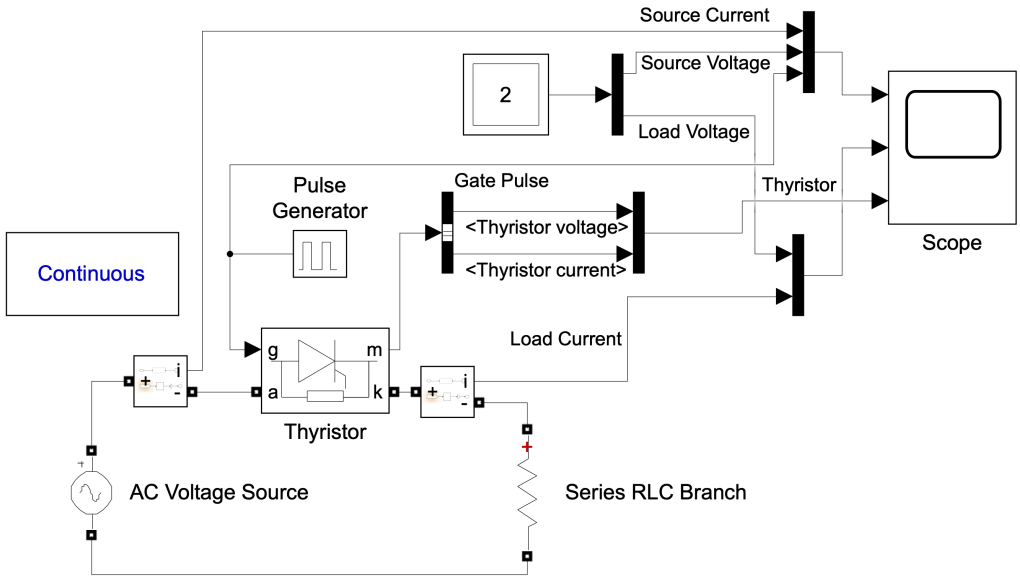

Figure 1: Diode with Resistive Load

Observations

- Observed the input, output, and pulse voltage/current graphs in the oscilloscope.
- Four cases were analyzed:

- R Load: With gate voltage delay.
- R Load: Without gate voltage delay.
- RL Load: With gate voltage delay.
- RL Load: Without gate voltage delay.

Outputs

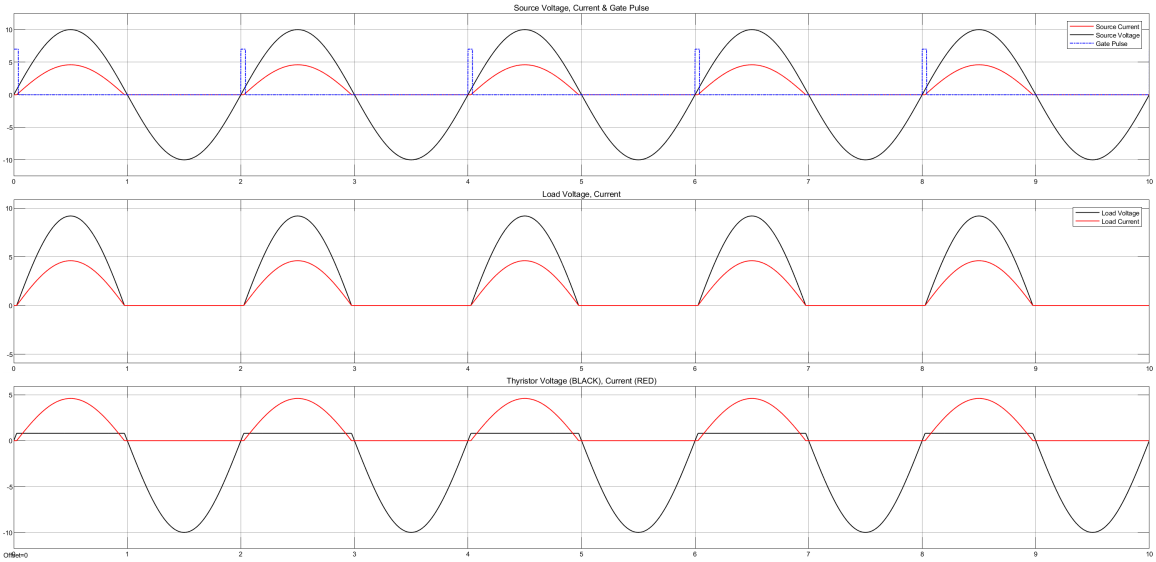

Figure 2
Oscilloscope Output for Thyristor with R Load, No Gate Voltage Delay.

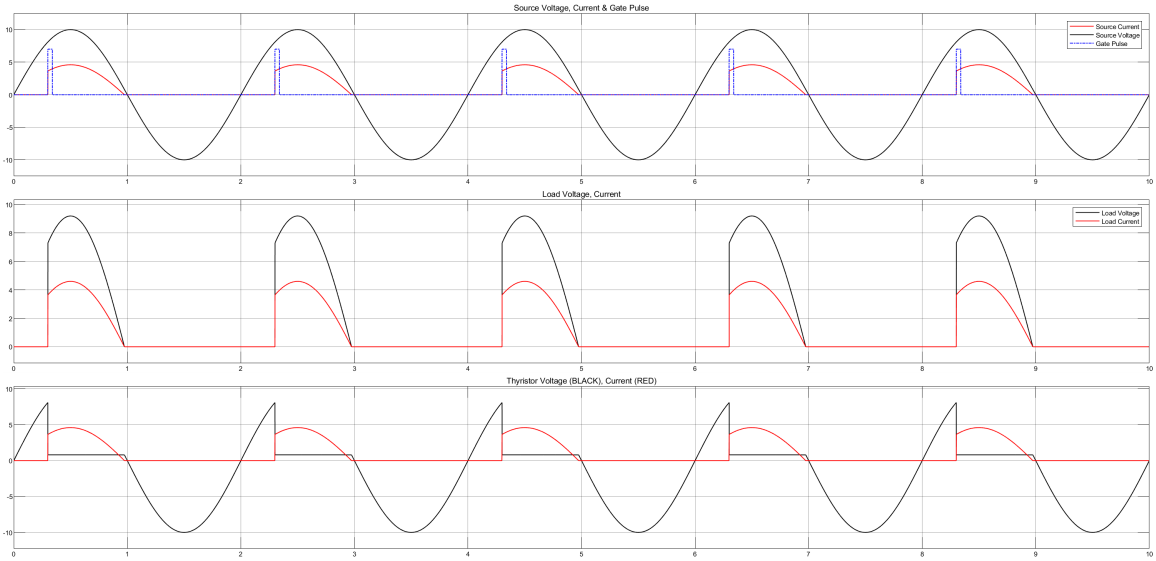

Figure 3: Oscilloscope Output for R Load, With Gate Voltage Delay

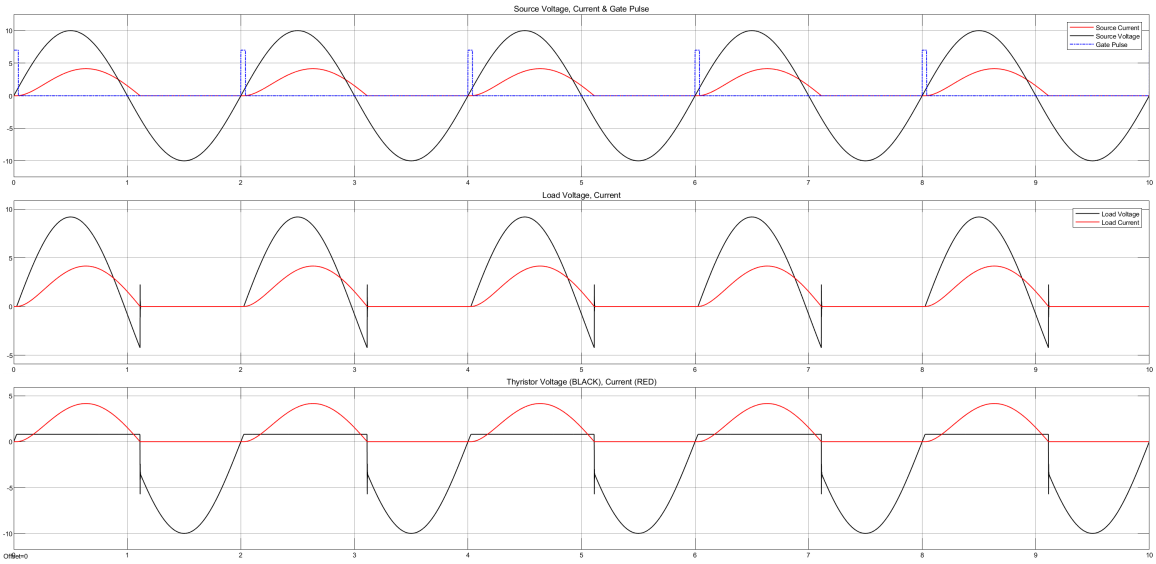

Figure 4: Oscilloscope Output for RL Load, No Gate Voltage Delay

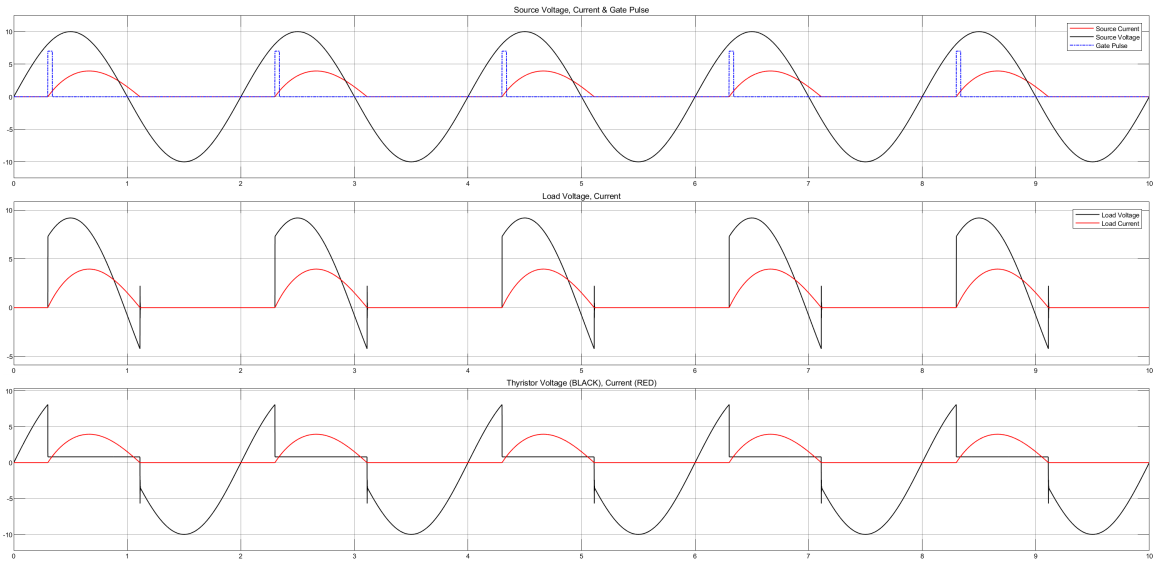

Figure 5: Oscilloscope Output for RL Load, With Gate Voltage Delay

Discussion

The experiment explores the characteristics of a thyristor under different load conditions using DC and AC supplies. The thyristor's behavior in forward bias, reverse bias, and rectification is observed using simulation software. The oscilloscope and signal generator help analyze the thyristor's response to various input signals and load conditions. The experiment enhances understanding of the thyristor's operation and its applications in electronic circuits.

Conclusion

The experiment investigates the characteristics of a thyristor under different load conditions using DC and AC supplies. The thyristor's behavior in forward bias, reverse bias, and rectification is observed using simulation software. The oscilloscope and signal generator help visualize the thyristor's response to various input signals and load conditions. The experiment enhances understanding of the thyristor's operation and its applications in electronic circuits.

References

[1] J. Doe, "Thyristor characteristics," *Journal of Power Electronics*, vol. 15, no. 3, pp. 123–130, 2020.

[2] J. Smith, *AC Supply and Thyristor Applications*. Springer, 2018.