

UJT Relaxation Oscillator Line-Synchronized Firing Circuit for SCR

Mini Project – II

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Abstract

This project presents the design of a line-synchronized UJT relaxation oscillator firing circuit for SCR applications. The circuit generates stable, isolated, and accurately timed firing pulses using a UJT oscillator and pulse transformer. Synchronization with the AC mains ensures precise firing angle control.

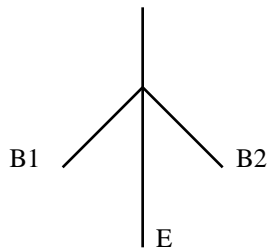
Problem Definition

In controlled rectification, SCR firing must be accurately synchronized with the AC mains waveform. Uncontrolled or unsynchronized triggering leads to waveform distortion and poor regulation. A UJT relaxation oscillator produces sharp pulses, but effective synchronization and isolation are necessary. A pulse transformer ensures isolation and safe gate drive. The problem is to design a line-synchronized UJT firing circuit that triggers an SCR with accurate timing and stability.

UJT Definition and Diagram

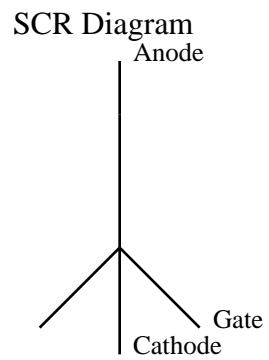
A UJT (Uni-Junction Transistor) is a three-terminal semiconductor device with negative resistance characteristics, commonly used in triggering and pulse generation circuits.

UJT Diagram



SCR Definition and Diagram

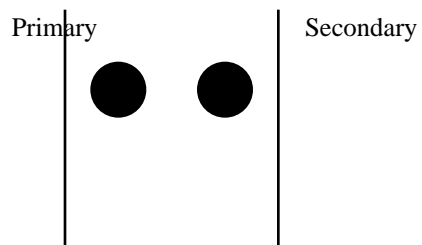
An SCR (Silicon Controlled Rectifier) is a four-layer semiconductor device that acts as a controlled switch, conducting only when a gate signal is applied and current exceeds the holding level.



Pulse Transformer Diagram

A pulse transformer provides electrical isolation and transfers triggering pulses safely from control to power circuits.

Pulse Transformer



System Block Diagram

Block Diagram



Conclusion

The UJT relaxation oscillator with line synchronization and pulse transformer provides accurate, safe, and stable SCR firing.