EEPC19 – Power Electronics

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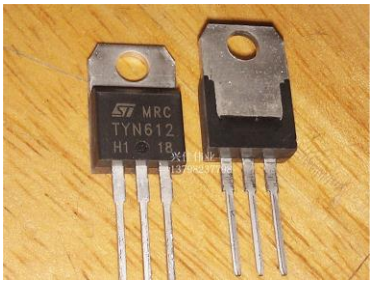


SCR Triggering Model

Using Rasp berry Pi Pico and IR Sensor

Aim/Objective:-

The goal of this study is to investigate the triggering of a SCR (Thyristor) using various methods, one of which involves the utilization of Microcontrollers like the Raspberry Pi Pico.

Abstract:-

This study focuses on the triggering of a Silicon-Controlled Rectifier (SCR or Thyristor) using the Raspberry Pi Pico microcontroller and explores the practical applications of this technique. The report outlines the equipment used, the theory behind the experiment, the experimental procedure, the results, and the implications of the findings.

Components/Equipment Used:-

Sr.No.	*Equipment/component*	*Ratings*	*Quantity*
1	Raspberry Pi Pico	-	1
2	IR Sensor (Flying Fish)	-	1
3	PoT / Rheostat	10 kΩ	2
4	Connecting Wires / Jumpers	-	As required
5	LCD 16x2 Display (non I2C)	-	1
6	Digital Multimeter & DSO	-	1
7	LED Bulbs	-	1
8	SCR (TYN 612)	-	1
9	Optocoupler (PC 817X)	-	As required
10	Diodes (1N4148)	-	As required
11	Resistors & Capacitors	Different values	As required

Theory and background of model:-

Introduction:

The experiment investigates the firing of an SCR, focusing on gate-triggering as a primary method. In this method, the SCR conducts when a gate pulse is applied, and it ceases conduction when the gate signal is removed. Variations in this mechanism can be achieved by modifying the MicroPython code in Thonny IDE.

Circuit Working:

A Raspberry Pi Pico microcontroller is mounted on a breadboard. An IR sensor module (Flying Fish) is connected to the Pico through jumpers and GPIO pins. A standard LCD 16x2

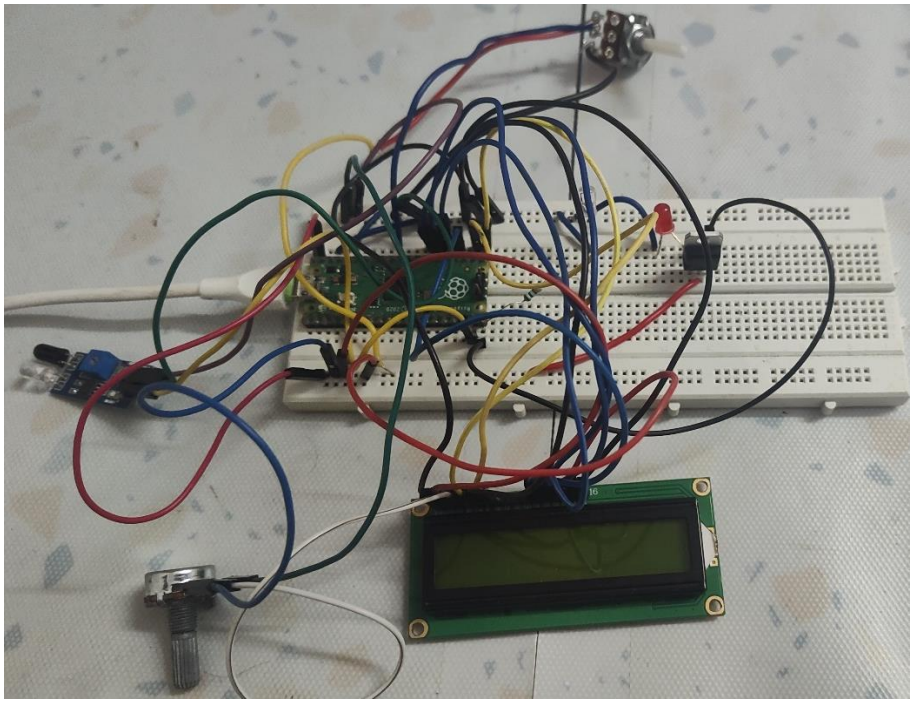
display circuit is configured to present relevant information. The SCR is connected to a 5V DC source at the Anode and grounded at the Cathode via the microcontroller. A GPIO pin triggers the SCR. LED bulbs indicate SCR conduction. Potentiometers adjust display contrast and trigger time (firing angle). MicroPython code in Thonny IDE controls the system.

Procedure:-

The circuit operates as follows:

- After code is uploaded, the LCD displays "Try Triggering."
- When a hand enters the IR sensor's detection range, an LED illuminates, signalling signal reception and SCR conduction.
- Simultaneously, the LCD displays "SCR is ON \n Remove the Gate."
- Removing the hand turns off the SCR after a delay, indicated by the LED turning off and the LCD showing "SCR is OFF!"
- A potentiometer controls the SCR turn-off delay.

Circuit Diagram:-



Experimentation & Discussion:-

1. The experiment presents a basic SCR triggering method using gate-triggering.
2. Enhancements can be made by incorporating external components such as diodes and optocouplers to improve SCR conduction control.
3. With minor circuit and code modifications, this setup can be adapted for various applications.

Results:-

The model successfully triggers the SCR according to user-defined parameters.

Implications:-

- This microcontroller-based model offers precise control over SCR triggering.
- It can be optimized for diverse applications with minor adjustments, making it versatile and adaptable.

Conclusions:-

This investigation demonstrates the effective triggering of an SCR using a Raspberry Pi Pico microcontroller. The versatility and accuracy of this control method make it applicable in various scenarios where SCR conduction control is required.

Recommendations for Enhancements:-

To further improve this experiment, the following enhancements are suggested:

- Incorporate additional external components such as diodes and optocouplers to enhance SCR conduction control.
- Explore the use of more advanced microcontrollers (say Raspberry Pi) and programming languages for increased flexibility and functionality.
- Conduct experiments with different types of SCRs and load configurations to investigate broader applications.

Files:-

- gpio_lcd.py (https://drive.google.com/file/d/1fNCss7cvmWrkAU6sbZQquyqzVxuqzuWG/view?usp=drive_link)
- scr_trig.py (https://drive.google.com/file/d/1bS8UlFBnw6kelXuQPrpkM_WZXDNnHW4O/view?usp=sharing)
- Working Video Link (https://drive.google.com/file/d/1sbaxKwhldwVVhjL61QKhvRvpHoVze0O6/view?usp=sharing)