

Nasr 69

# ELECTRIC WATER HEATER

Ammar Yasser  
Hassan Mohamed  
Mohanad Ehab  
Mohamed Gaser



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# Overview

- This presentation focuses on the specialized software developed for embedding within a AVR ATMEGA32 microcontroller.
- The primary purpose of this software is to effectively regulate and control the operations of an electric water heater, ensuring optimal performance and efficiency.





# System Process



- Temperature Regulation: Users can set a desired temperature for the water. The system actively cools the water if it's above the set point and heats it if below, maintaining a range within 5 degrees of the desired temperature.
- Display : the 7 Segments display continuously show the current water temperature.
- Memory and Data Handling: The microcontroller (MC) records the current temperature. This allows for immediate display to the last recorded temperature when the heater is restarted.
- Communication Protocol: Utilizes the TWI (I2C) communication protocol for efficient data transmission to and from the EEPROM, ensuring seamless operation and control.

## LM35 Temperature sensor

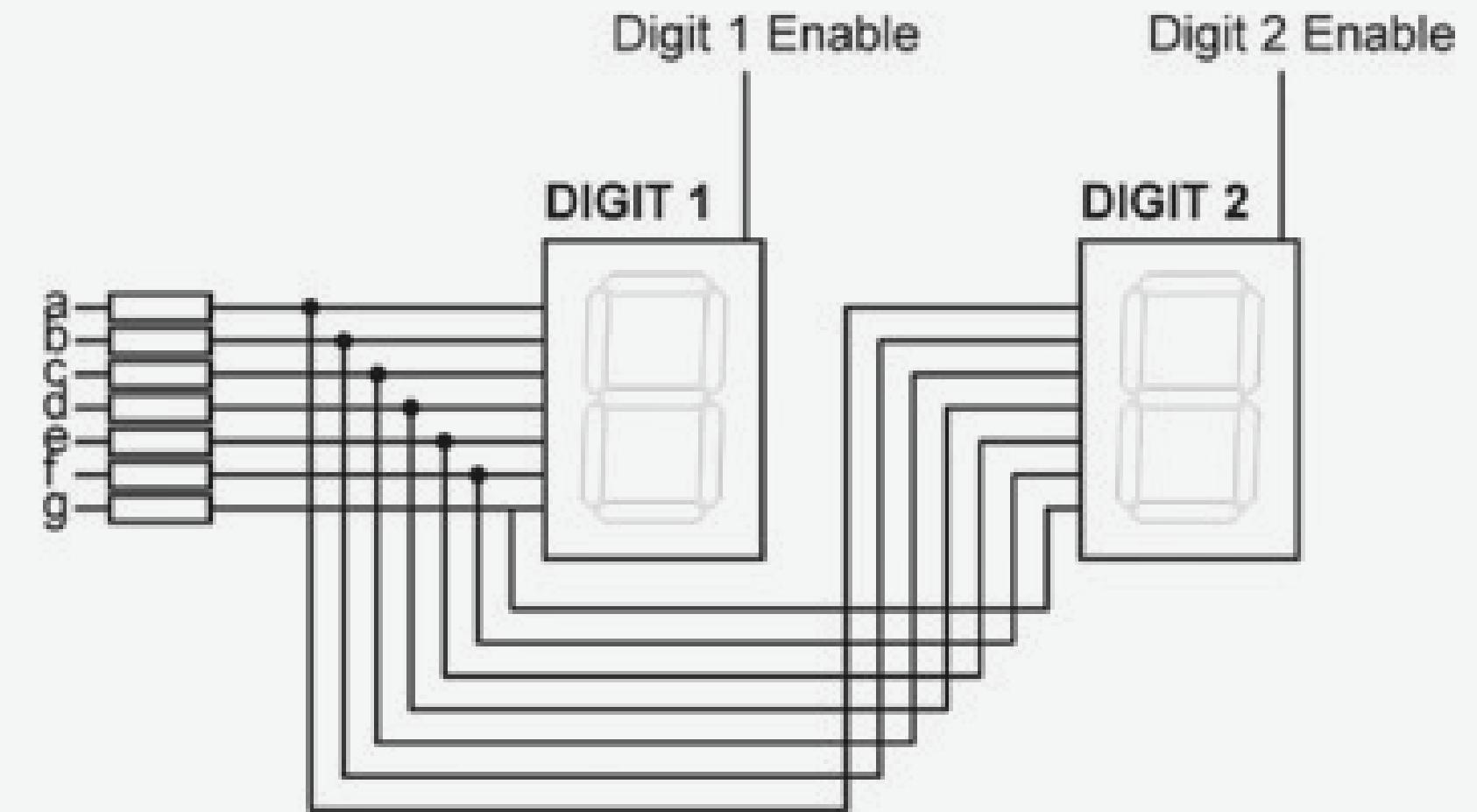
Precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature.



## Tools & Components

### Seven Segment Display

A seven-segment LED is a digital display module specialized to display numerical information about the temp.

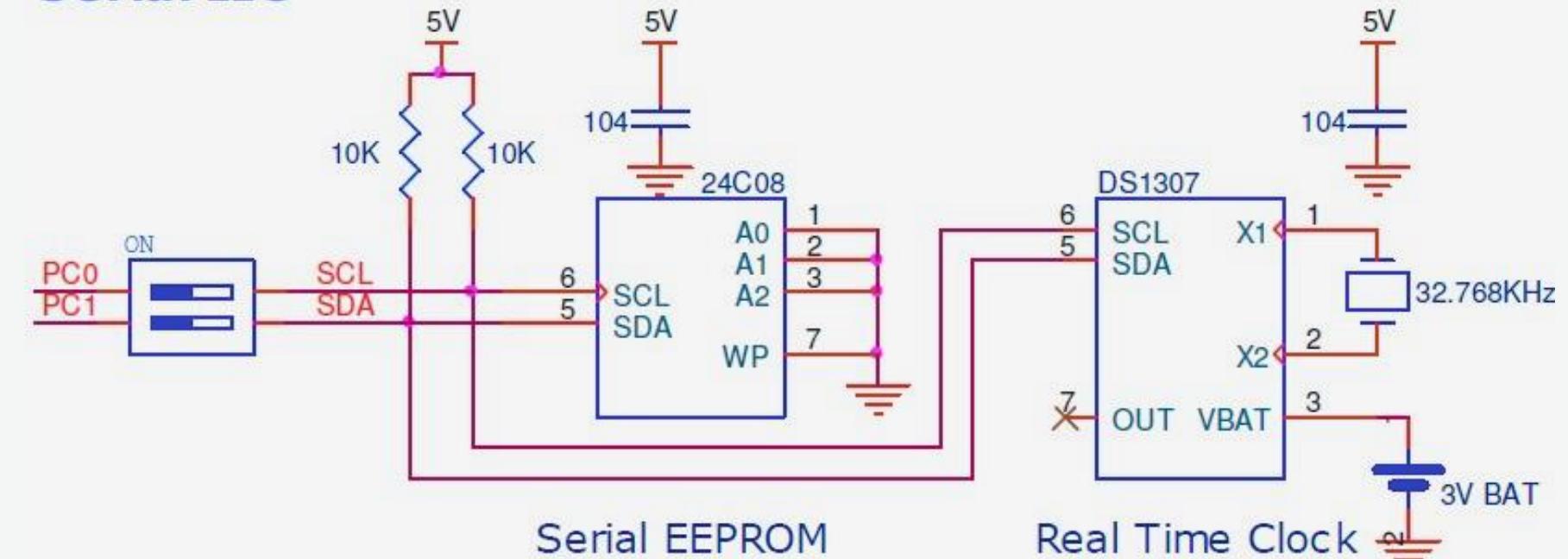


## Tools & Components

### 24C08 EEPROM

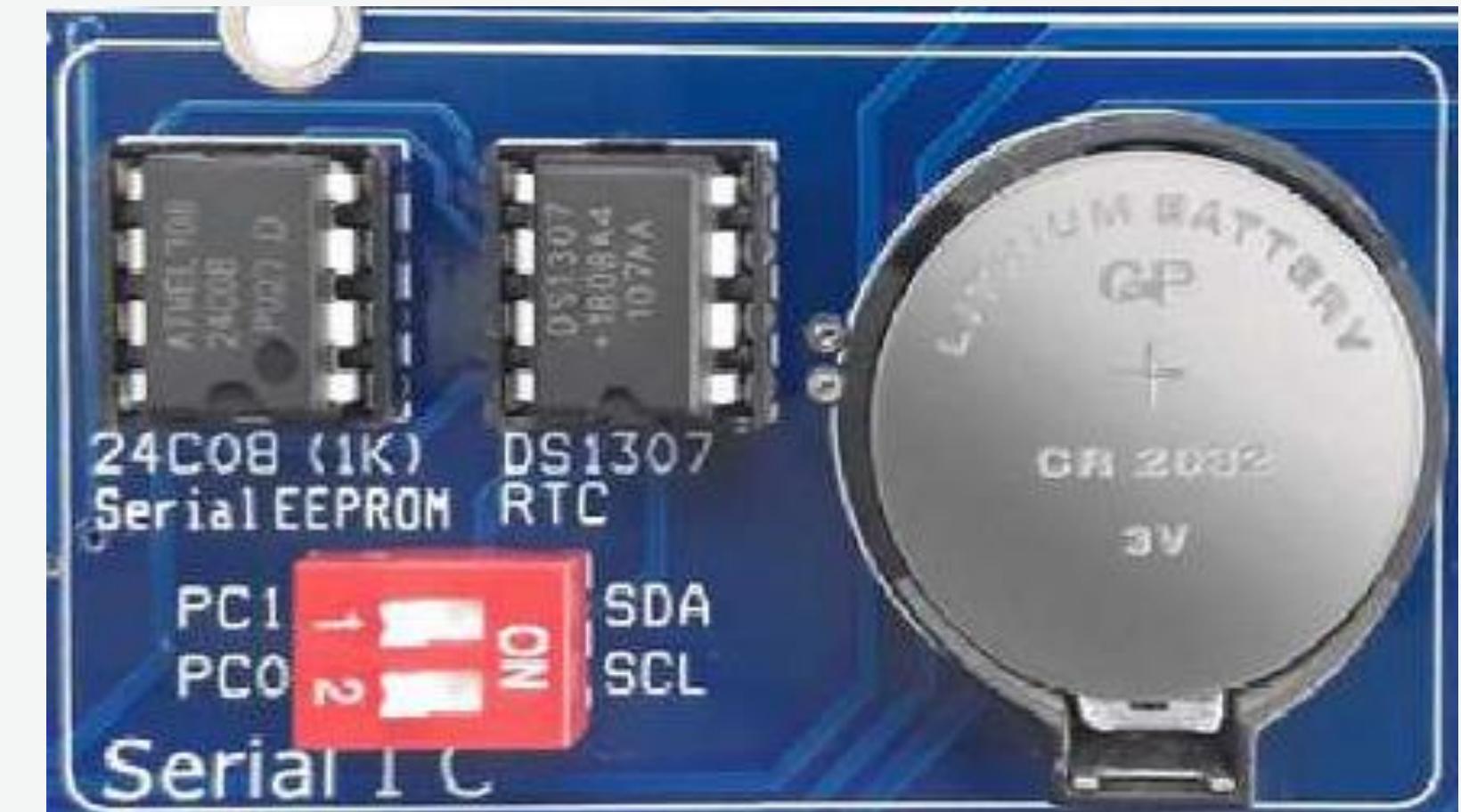
The 24C08 provides 8192/16384 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 1024/2048 words of 8 bits each. The device is optimized for use in many industrial and commercial applications.

#### Serial IIC



Serial EEPROM

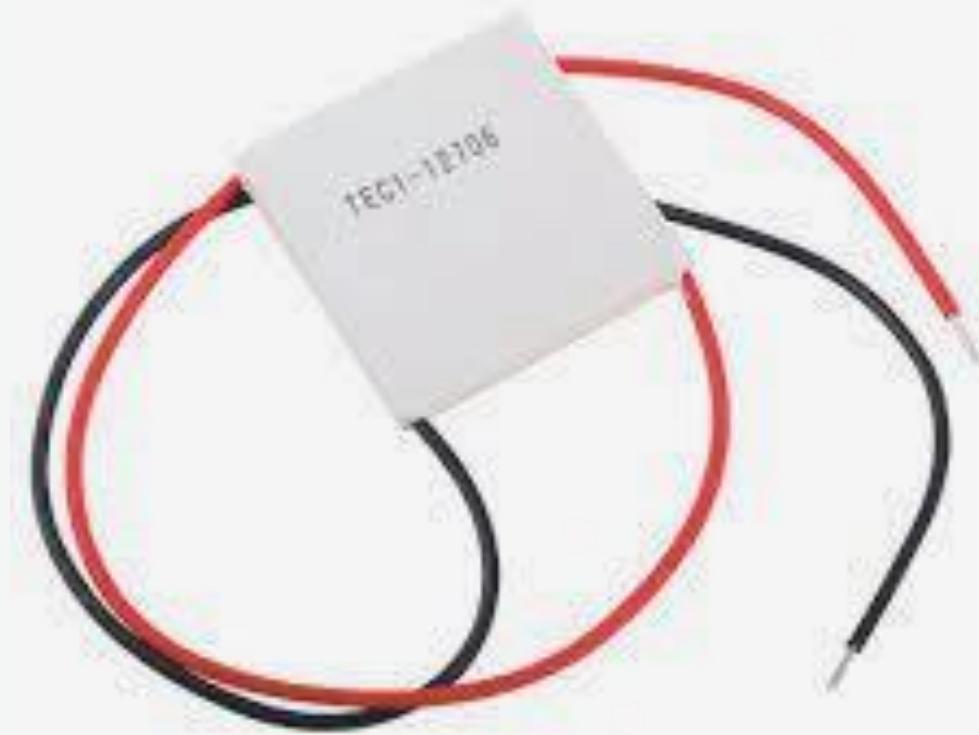
Real Time Clock



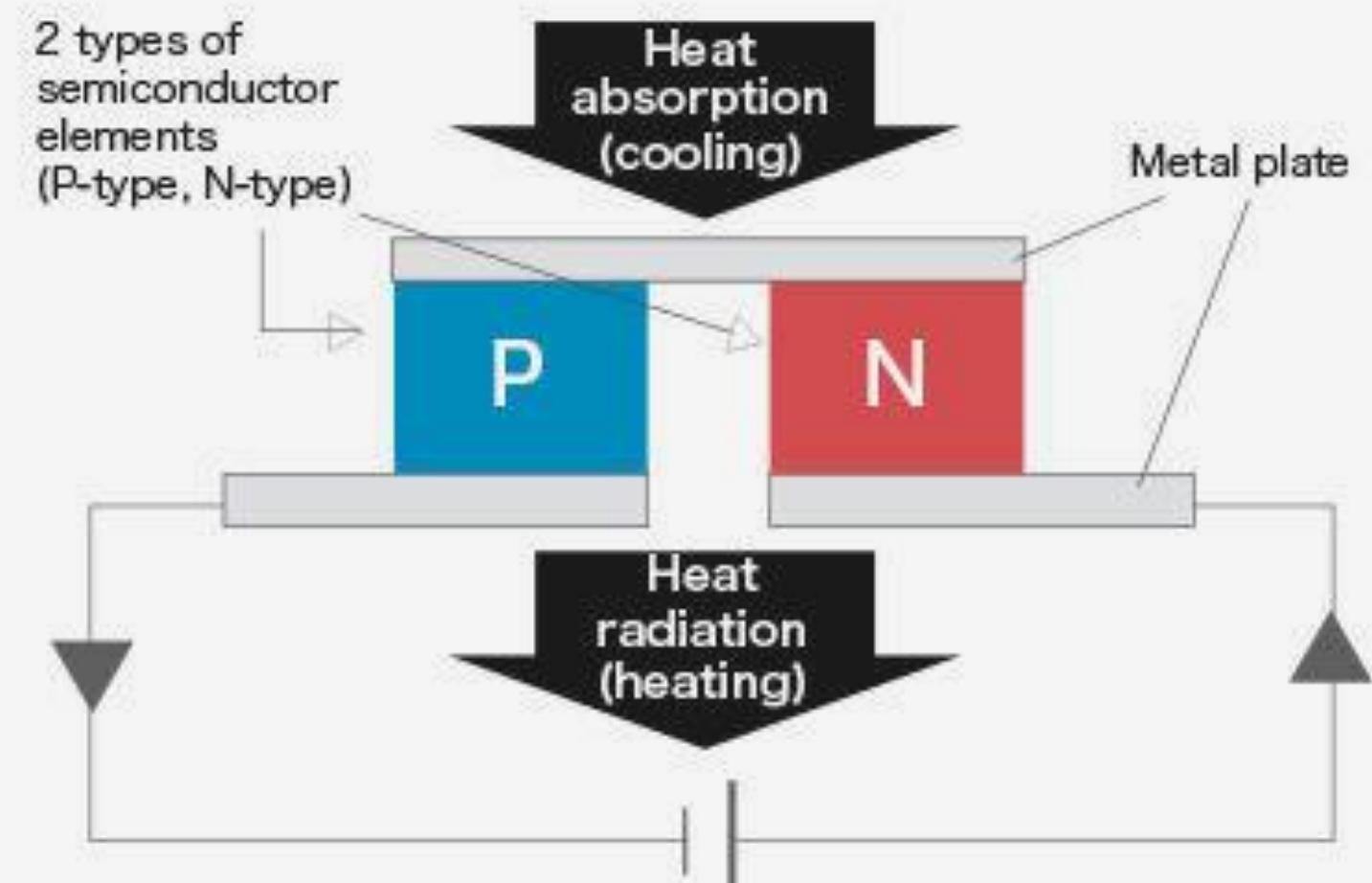
## Tools & Components

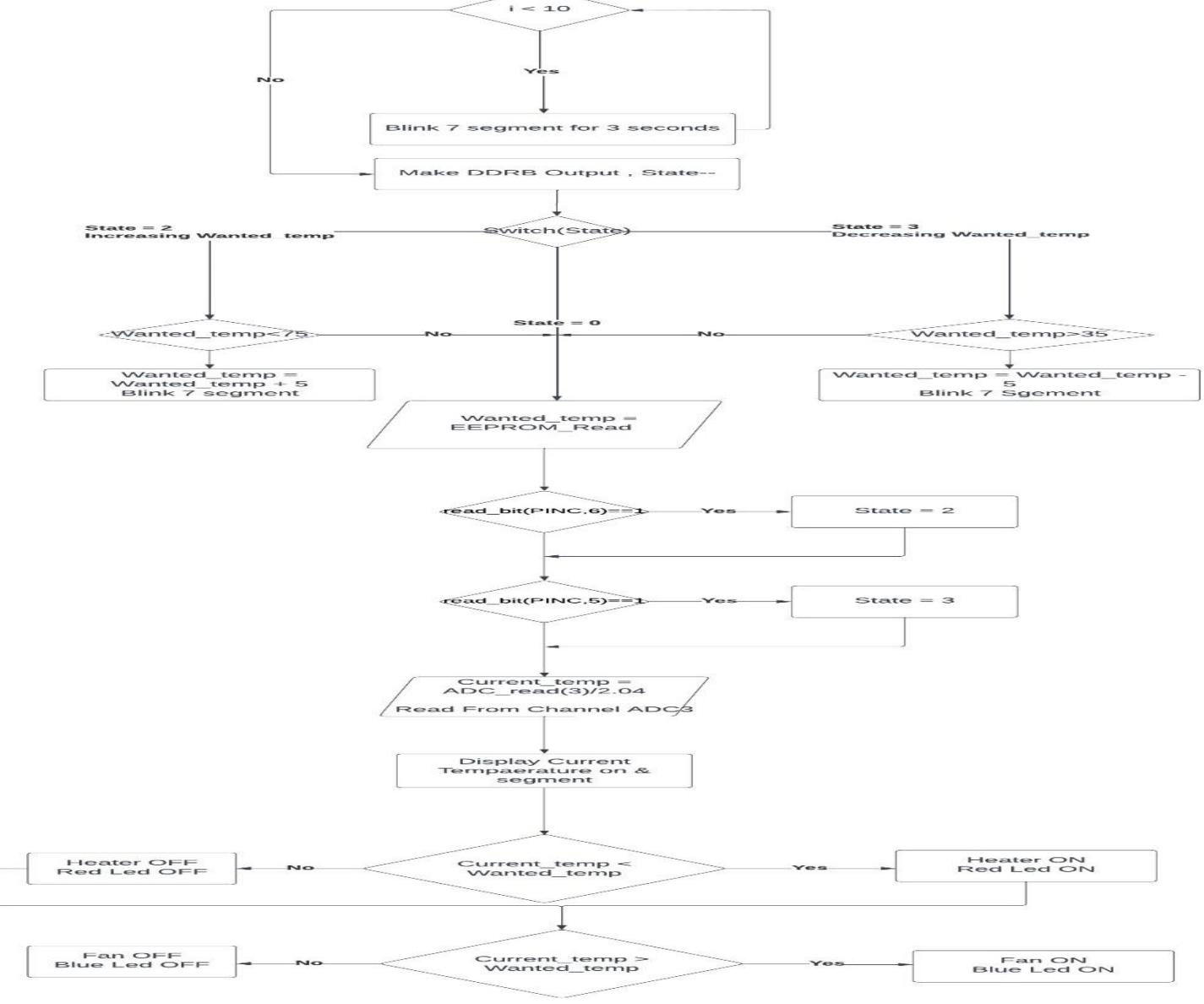
### Peltier

- Thermoelectric coolers also are known as TEC or Peltier Module create a temperature differential on each side. One side gets hot and the other side gets cool.
- Therefore, they can be used to either warm something up or cool something down, depending on which side you use

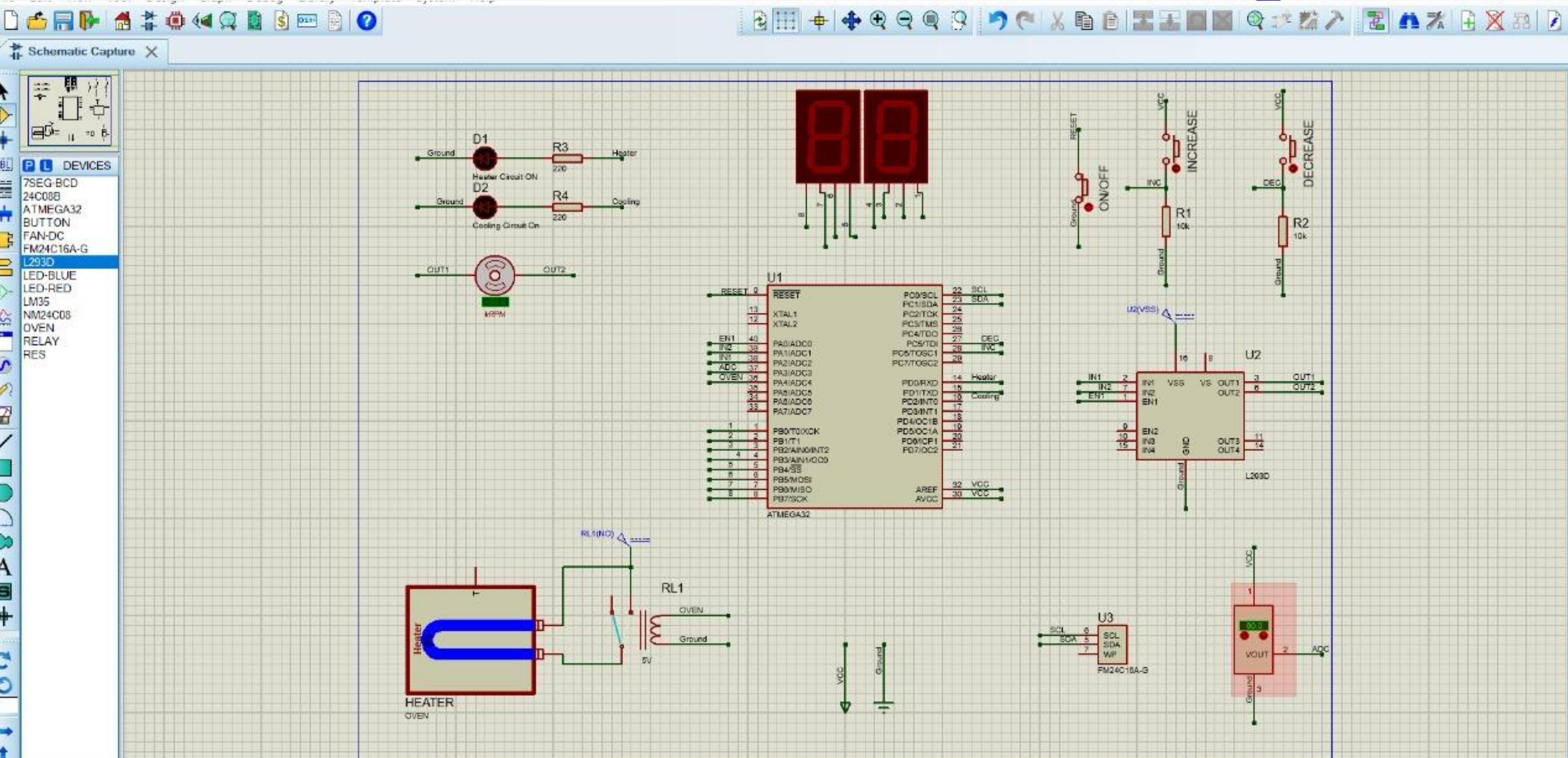


Peltier effect

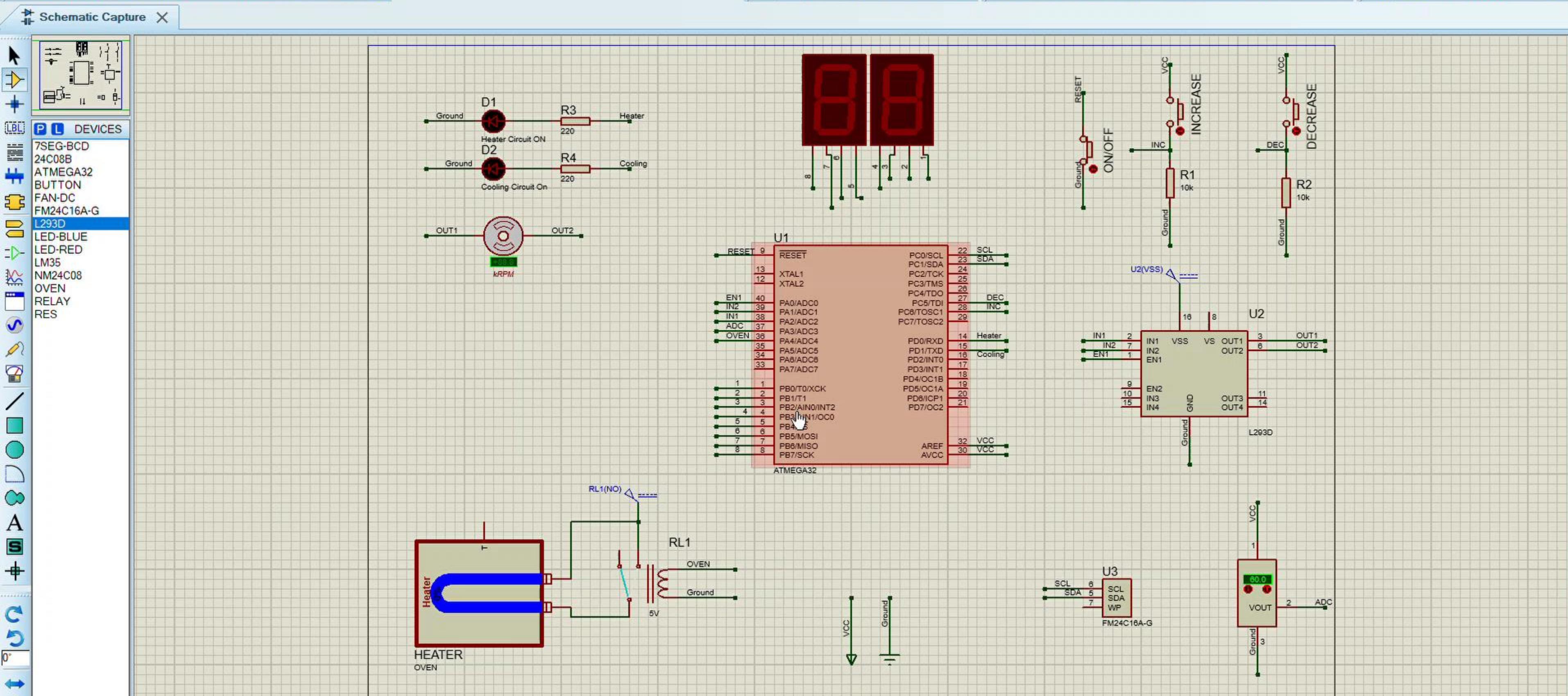




# Circuit design



# Simulation



# Conclusion

The project successfully implemented an embedded system for controlling an electric water heater, demonstrating effective integration of various hardware components and software logic.





THANK YOU