Smart Temperature Monitoring System

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1. Analysis of the Problem Statement

In modern homes and industries, efficient monitoring of temperature is crucial for safety, energy efficiency, and automation. Our project aims to design a compact and low-cost **Smart Temperature Monitoring System** using an STM32F030R8T6TR microcontroller. This system reads temperature from an analog temperature sensor and displays the real-time value on a 16x2 LCD screen.

This project addresses the need for:

- Real-time temperature display
- Cost-effective embedded monitoring system
- Compact design with user interface

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2. Budget Planning

Component	Quantity	Cost per Unit (INR)	Total (INR)	Source
STM32F030R8T6TR MCU Chip	1	84	84	ROBU.IN
LM35 Temperature Sensor	1	79	79	ROBU.IN
16x2 LCD Display	1	76	76	ROBU.IN
Push Button	4	8	32	ROBU.IN
Capacitors & Resistors	~10	~2	~20	ROBU.IN
PCB	1	80	80	ROBU.IN
Jumper Wires & Connectors	-	30	30	ROBU.IN
Power Supply (5-10 V battery)	1	85	85	ROBU.IN
Total Estimated Cost			**486 INR**	

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3. Approach to Solving the Problem

- **Sensor Interface**: LM35 sensor connected to PA0 (Analog Input) of the STM32F0.
- **Display**: A 16x2 LCD module connected to GPIO pins (PA5 for control, PA1 for data, etc.).
- **User Input**: one push buttons connected to available GPIO pins (e.g., PB0). For temperature change (other unit)
- **Microcontroller Programming**: Using STM32 HAL libraries with temperature reading logic, display interface, and button interrupt handling.
- **Power Supply**: 5-10V battery that can converted to lower voltage as per requirement

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4.Circuit explain:

Voltage regulator : Zener diode of 4 v is placed and which gives ~(4v-0.6v=3.4v) at emitter side the current is according to collector resistance , low for controller and high for peripherals.

Reset circuit:

As soon as the controller on the output will be low for few milli seconds and push button discharges the capacitor too quick for manual reset

Lcd and lm35 link: using the hall library and pins

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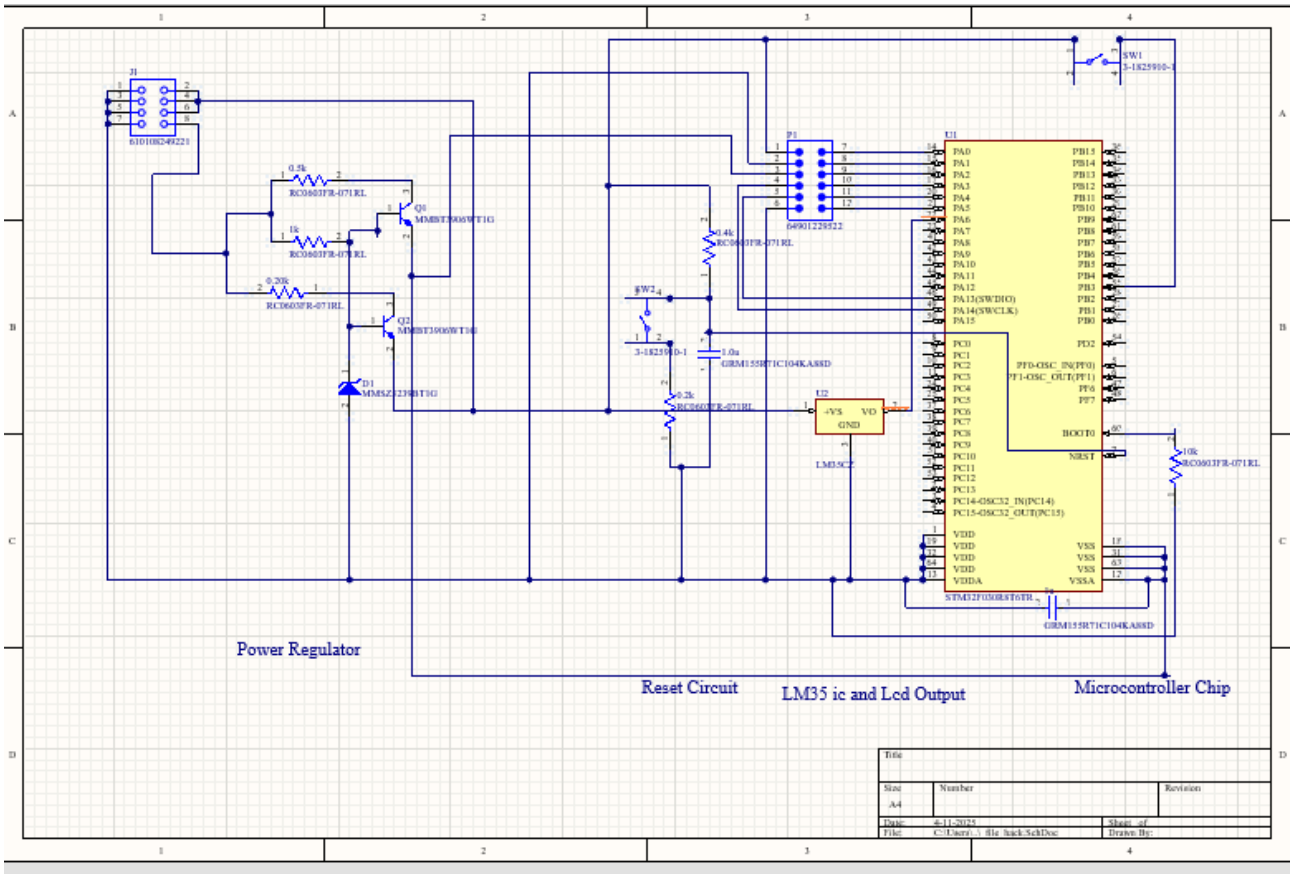
5. Software Used

- **STM32CubeIDE**: For coding in C using STM32 HAL libraries. And chip pin reference
- **Altium Designer**: For schematic and PCB design.

Systematic



Here pins are given (female header) for programming and (male header) for led link

Pin configuration

Component	***Function***	***STM32 Pin***
LCD 16x2	*RS (Register Select)*	*PA5*
EN	*Enable*	*PA4*
D4	*gpio*	*PA3*
D5	*gpio*	*PA2*
D6	*gpio*	*PA1*
D7	*gpio*	*PA0*
LM35	*Analog Output*	*PA7 (ADC Input)*
Push Button	*Mode Toggle*	*PB3*

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THANK YOU