IIT HYDERABAD

EE4130

PCB DESIGN AND LAYOUT FOR ELECTRONIC SYSTEMS

P SRIKAR VARMA	EE23BTECH11215
R V S S S R VARUN	EE23BTECH11220
RADHA SAI SUJAN	EE23BTECH11219
K MANOHAR	EE23BTECH11208
PILLI KALYAN	EE23BTECH11216
P HARSHA VARDHAN	EE23BTECH11214
KURRE VINAY	EE23BTECH11036

OLED Display Integration with DA14531 MCU

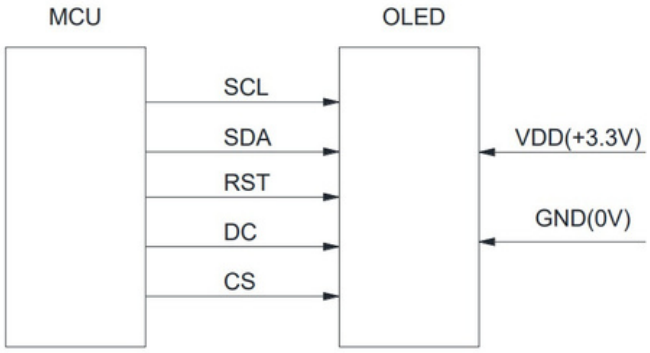
The objective of this project is to design a schematic and PCB layout for interfacing an SPI-based OLED display (e.g., SSD1306 128x64) with the DA14531 microcontroller (MCU). The design ensures proper signal routing, decoupling, and includes level shifters if necessary to handle compatible voltage levels.

Design Process

Device selection

- Microcontroller : DA14531 (supports interrupts on GPIO pins).
- Microcontroller : DA14531 (supports SPI communication).
- OLED Display : SSD1306 128x64 (SPI interface).
- Level Shifter : AOM12864A0-1.54WW-ANO

Block Diagram



Component Selection

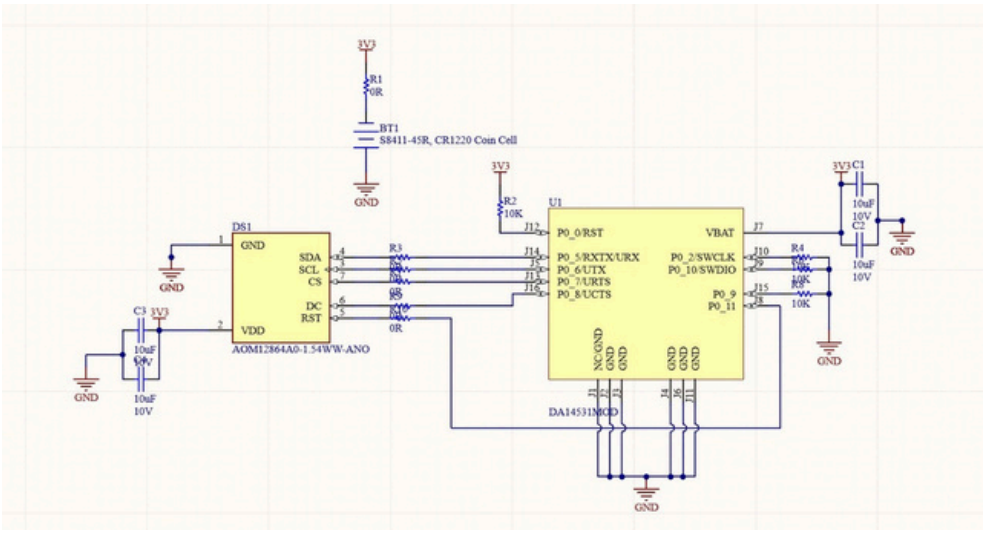
COMPONENT	VALUE / MODEL	PURPOSE
DA14531	MCU	Main controller
OLED Display	SSD1306 128x64	SPI-based display
Level Shifter	AOM12864A0-1.54WW-ANO	Voltage level translation
R1-R9	10 kΩ	Pull-up resistors
C1-C5	10 µF	Decoupling capacitors

Schematic

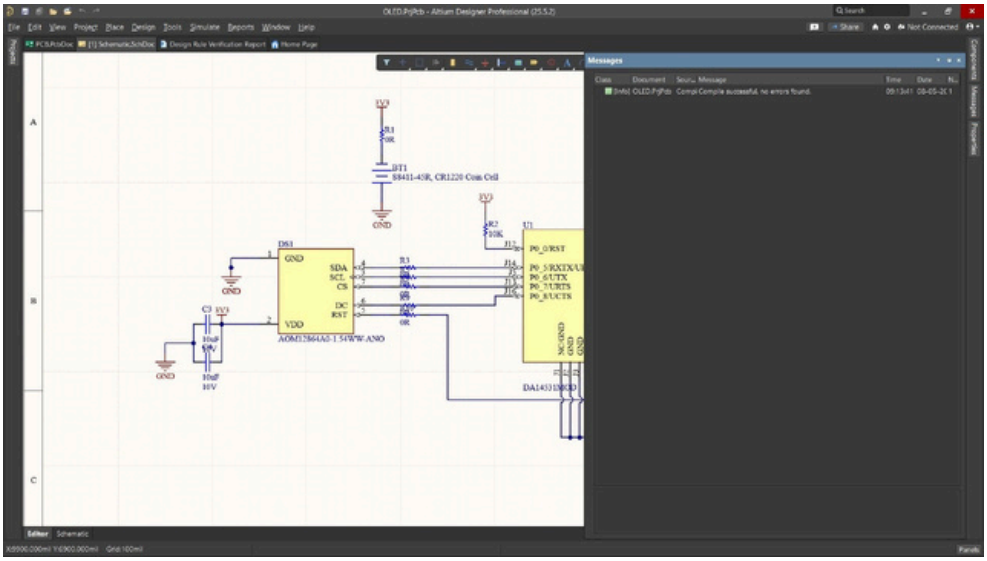
The schematic includes:

- Power Supply :
  - 3V coin cell (CR1220) with filtering capacitors (C1, C2).
- SPI Interface :
  - DA14531 GPIO pins connected to the OLED display via the level shifter.
  - SPI signals: SCLK, MOSI, CS, and RST.
- Decoupling Capacitors :
  - Placed near power pins of the MCU and OLED display to reduce noise.
- Pull-Up Resistors :
  - Used on SPI lines (SCLK, MOSI, CS) to ensure stable high levels.

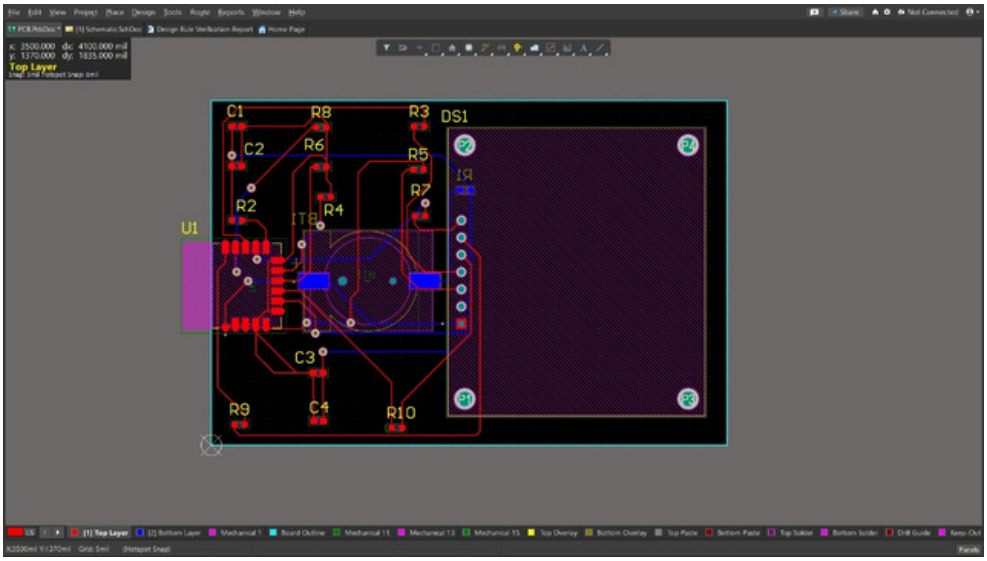
Schematic



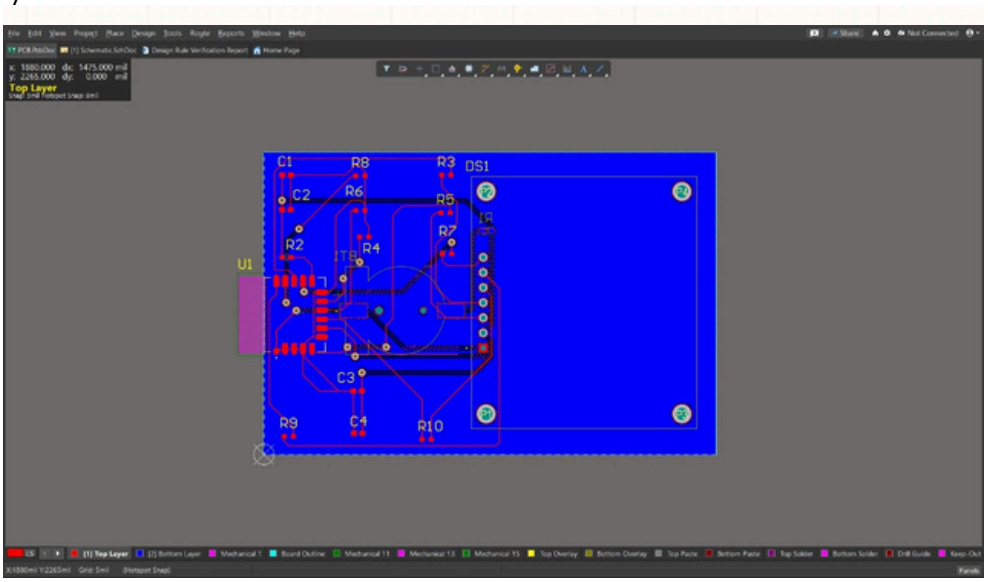
- Schematic rules check



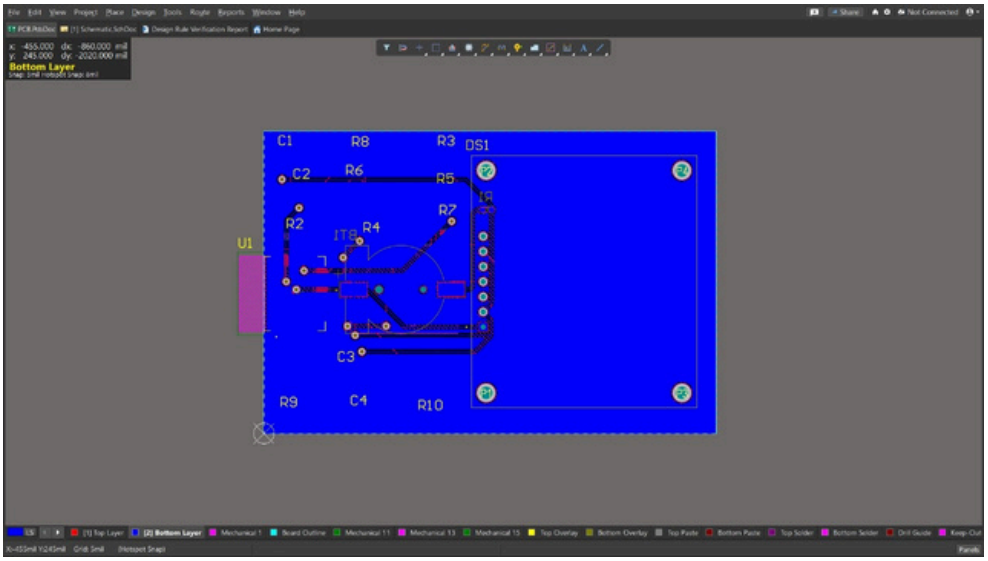
PCB design



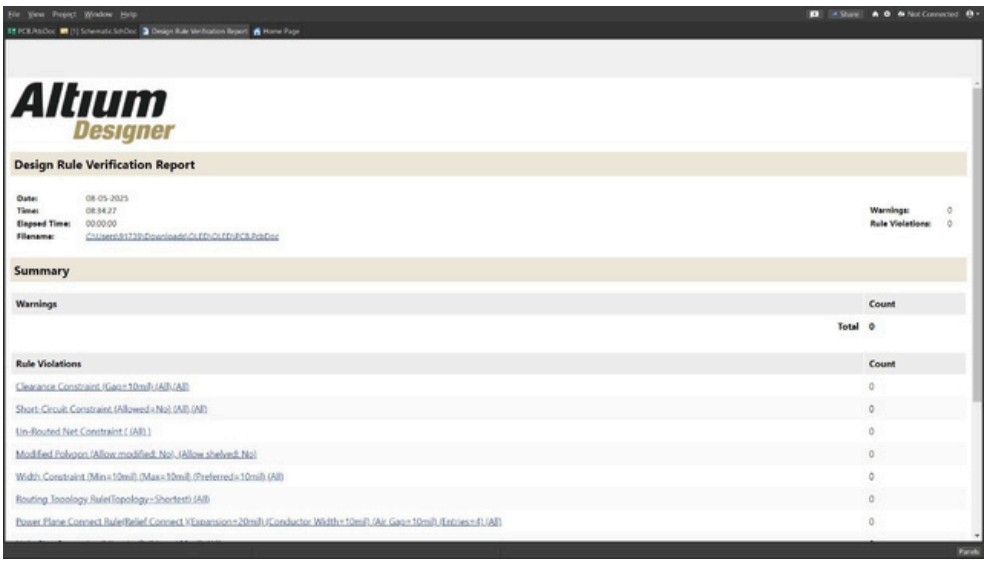
- Top layer



- Bottom layer



- Design rules check



Button Interface Expansion for DA14531 Dev Board

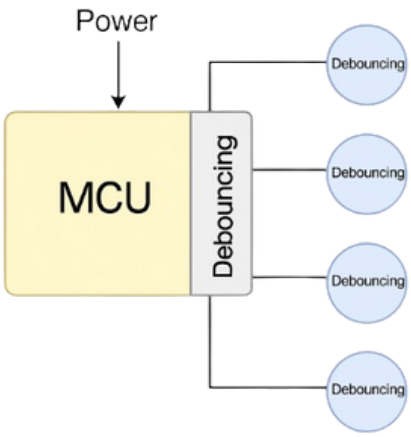
The objective of this question is to modify the existing DA14531 development board design to include four tactile buttons with proper debouncing circuits. The buttons are connected to GPIO pins that support interrupt functionality, ensuring reliable detection of button presses.

Design Process

Device selection

- Microcontroller : DA14531 (supports interrupts on GPIO pins).
- Buttons : Tactile momentary switches (SW1, SW2, SW3, SW4).
- Debouncing Components : Pull-up resistors and capacitors for each button.

Block Diagram



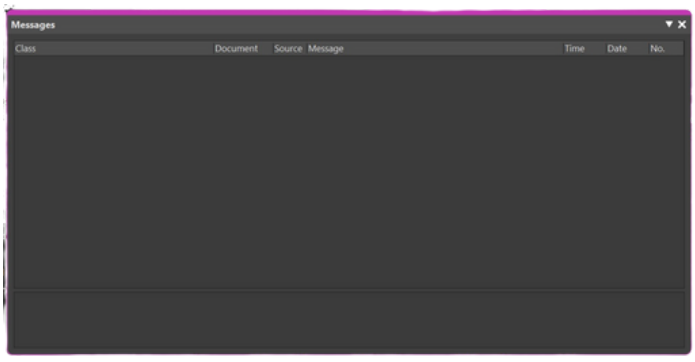
Component Selection

COMPONENT	VALUE / MODEL	PURPOSE
DA14531	MCU	Main controller
SW1-SW4	Tactile Momentary Switches	User input
R1-R8	10 kΩ	Pull-up resistors
C1-C5	10 µF	Debouncing capacitors

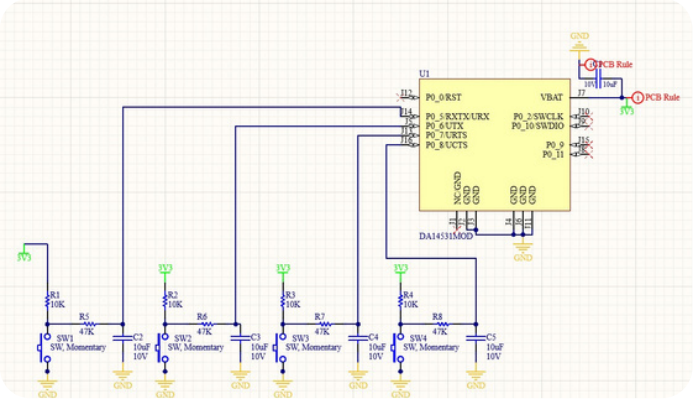
Schematic

Each button is connected as follows:

- One side of the switch connects to a GPIO pin.
- The other side connects to GND through a pull-down resistor.
- A capacitor is placed between the GPIO pin and GND to debounce the signal.



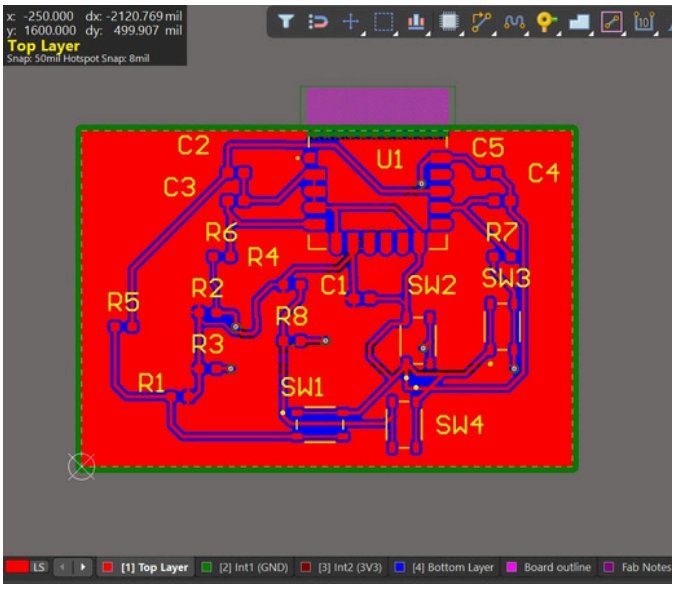
schematic rules check



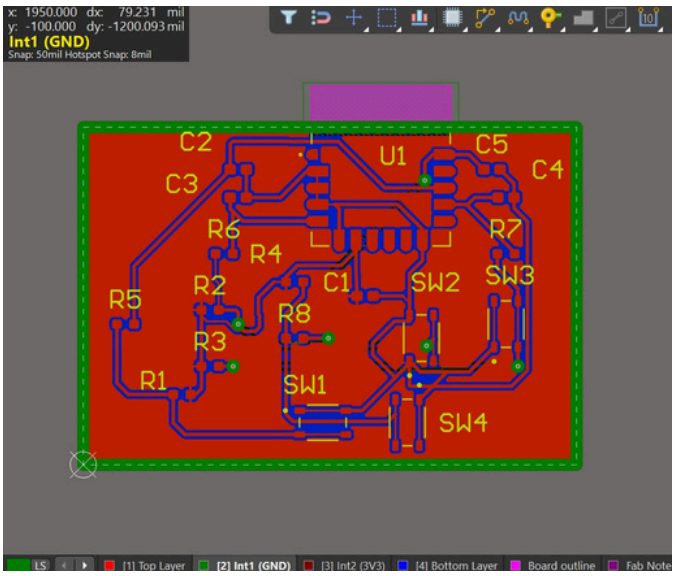
schematic

PCB design

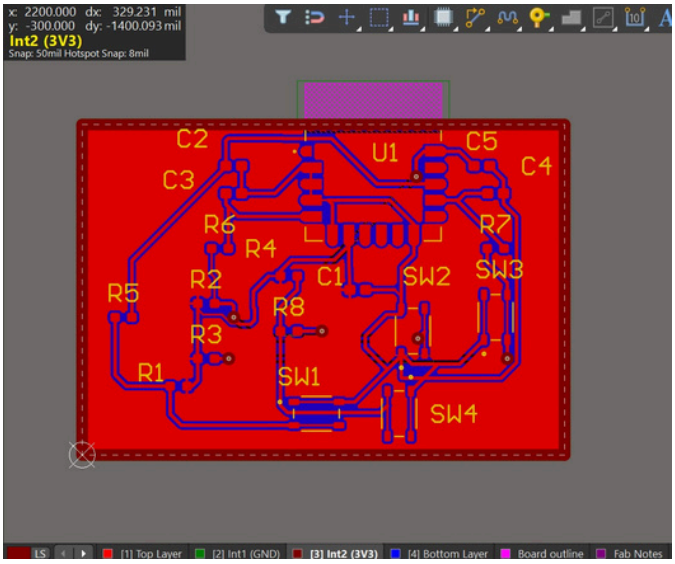
- Top layer



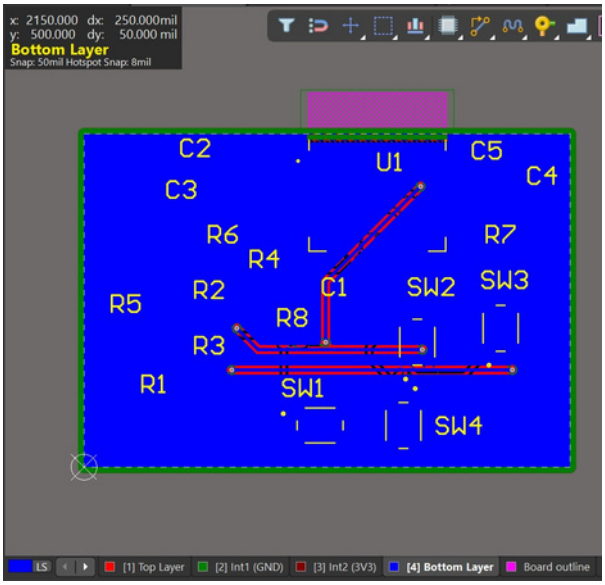
- Int 1 (GND)



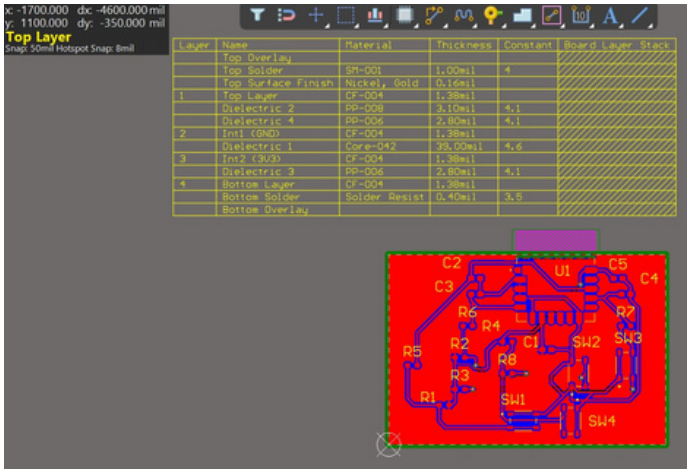
- Int 2 (3V3)

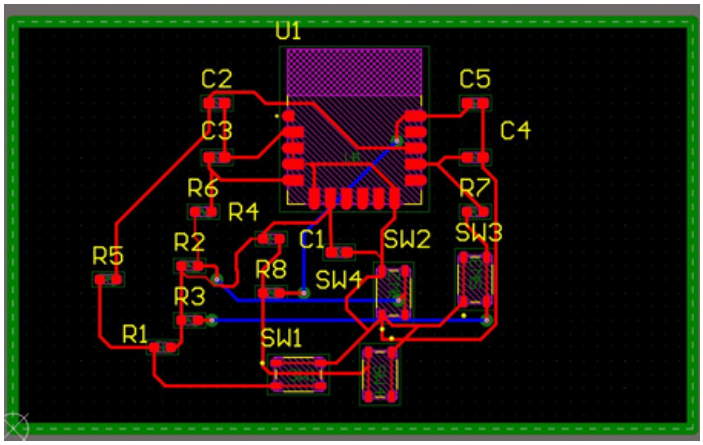


- Bottom layer



- Layers and thickness





Design rules check

Altium Designer

Design Rule Verification Report

Date:	08-05-2025	**Warnings:**	0
Time:	17:41:06	**Rule Violations:**	0
Elapsed Time:	00:00:00		
Filename:	E:\button\button\button.PcbDoc		

Summary

Warnings	Count
Total	0

Rule Violations	Count
Clearance Constraint (Gap=15mil) (All),(All)	0
Clearance Constraint (Gap=6mil) (All),(All)	0

Temperature Monitoring Circuit Design Using DA14531 MCU and TMP102

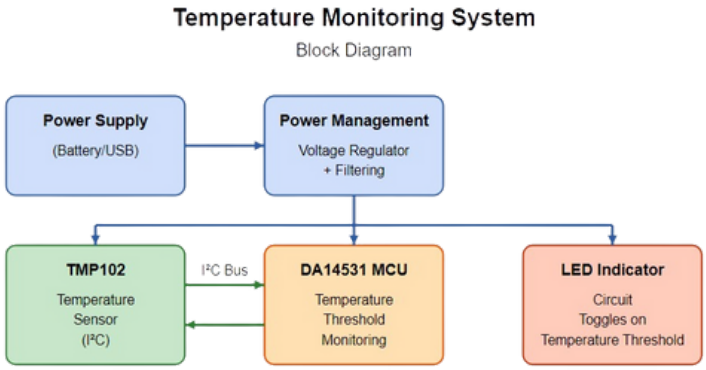
TThe objective of this project is to design a temperature monitoring circuit using the DA14531 microcontroller (MCU) and an I2C temperature sensor (TMP102). The circuit includes proper power supply filtering, decoupling capacitors, I2C pull-up resistors, and an LED indicator that toggles when the temperature exceeds a predefined threshold.

Design Process

Device selection

- MCU : DA14531 (low-power, I2C support, BLE optional)
- Sensor : TMP102 (I2C digital temperature sensor)
- LED : Standard red LED
- Passives : Resistors, capacitors for filtering, pull-ups.

Block Diagram



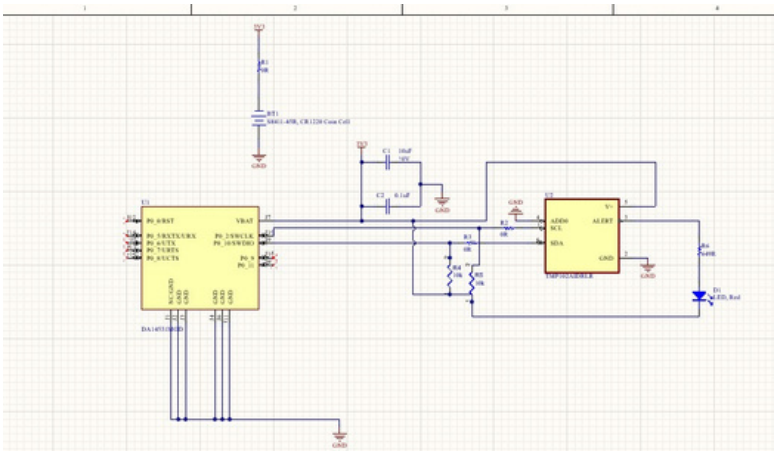
Component Selection

COMPONENT	VALUE / MODEL	PURPOSE
DA14531	MCU	Main controller & I2C interface
TMP102	Digital Temp Sensor	Measure temperature
R1	10 Ω	Power filtering
C1, C2	0.1 µF, 10 µF	Decoupling capacitors
R2, R3	4.7 kΩ	I2C pull-up resistors
LED	Red LED	Over-temp indicator
R4	490 Ω	LED current limiting
CR1220	3V Coin Cell	Power supply

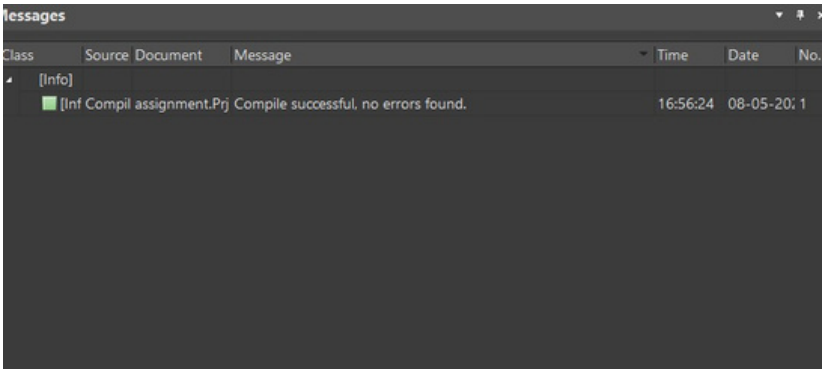
Schematic

the basics schematic includes:

- Power supply connected to VDD of both DA14531 and TMP102.
- Decoupling capacitors placed near each VDD pin.
- I2C lines (SDA, SCL) with pull-up resistors.
- TMP102 connected to I2C bus.
- LED connected to a GPIO pin through a resistor.

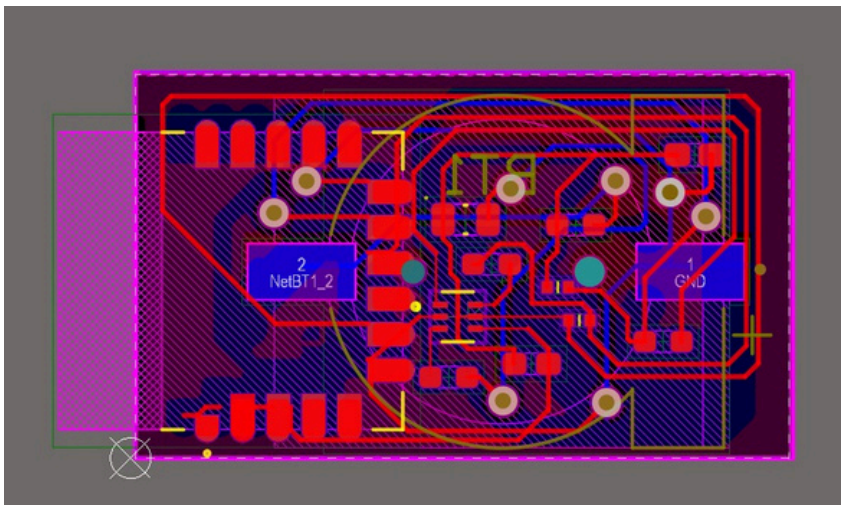


schematic

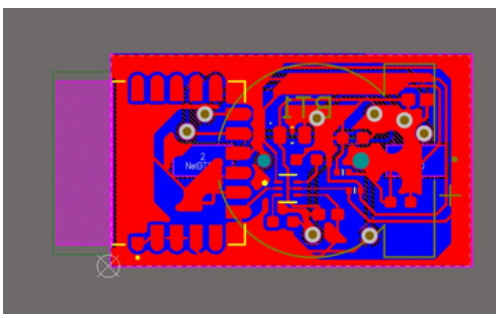


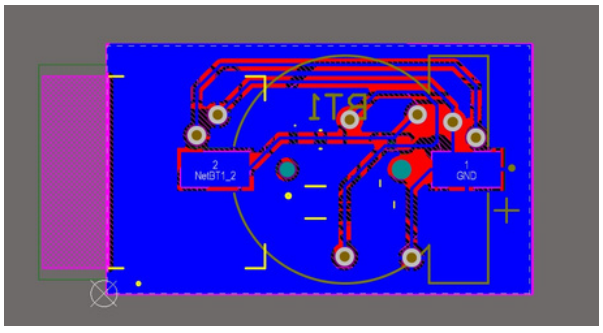
schematic rules check

PCB design



- layers





Altium Designer

Design Rule Verification Report

Date: 08-05-2025
Time: 18:40:01
Elapsed Time: 00:00:00
Filename: C:\Users\VINAY\Desktop\Altium\assignment\emgmonitoring.PcbDoc

Warnings: 0
Rule Violations: 0
PCB Health Issues: 0

Summary

Warnings	Count
Total	0

Rule Violations	Count
Un-Routed Net Constraint ((All))	0
Routing Topology Rule(Topology=Shortest) (All)	0
SMD Neck-Down Constraint (Percent=50%) (All)	0
Power Plane Connect Rule(Relief Connect)(Expansion=20mil) (Conductor Width=10mil) (Air Gap=10mil) (Entries=4) (All)	0
Total	0

Design rules check