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PROJECT TITTLE : 0.22V-29.7V Variable Power Supply.

DATE : 04/25/25

SOFTWARE USED: PROTEUS 8.9

Variable Power Supply Project Report

1. Title

Design, Simulation, and Construction of a Variable DC Power Supply (0–30V)

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2. Objective

The objective of this project is to design, simulate, and implement a regulated DC power supply capable of providing an adjustable output voltage ranging from approximately 0V to 30V. This project aims to develop practical skills in power electronics, circuit simulation, and hardware construction.

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3. Introduction

Power supplies are fundamental to any electronic system, providing the necessary operating voltages for circuits and devices. A variable DC power supply allows the user to adjust the output voltage depending on the application requirements. In this project, a power supply based on the LM317 adjustable voltage regulator, supplemented with external power transistors for higher current capacity, is designed and simulated using Proteus 8 Professional.

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4. Circuit Description

The circuit consists of the following major sections:

4.1 AC Input and Step-Down Transformer

- The input to the system is a standard **230V AC** supply.

- A **transformer** (TR1) steps down the voltage to a lower AC voltage suitable for rectification.

4.2 Bridge Rectifier and Filtering

- A **GBPC35005** bridge rectifier (BR1) converts the AC voltage into pulsating DC.
- A large **electrolytic capacitor** (C1, 4700µF) smoothens the ripples and provides a relatively stable DC voltage.

4.3 Voltage Regulation (LM317 Stage)

- The **LM317** adjustable voltage regulator (U1) provides a stable output voltage.
- The output voltage is controlled via a potentiometer (**RV1**).
- A small capacitor (C2, 0.1µF) across the output improves transient response and stability.

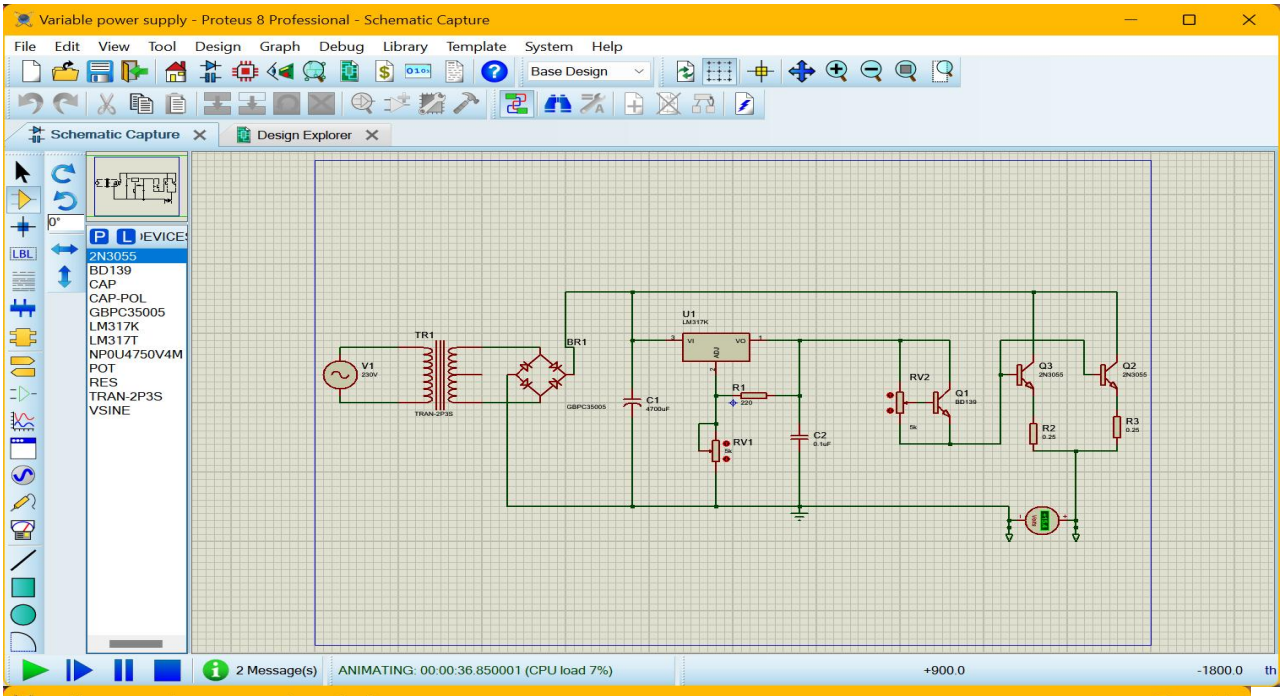
4.4 Current Boosting Stage

- A **BD139** transistor (Q1) acts as a driver for the high-current stage.
- Two **2N3055** power transistors (Q2 and Q3) are connected in parallel to handle higher load currents.
- Small-value emitter resistors (R2 and R3, 0.25Ω) ensure current sharing between the transistors.

4.5 Output

- The final output voltage is variable between approximately **0.22V to 29.7V**, depending on the RV1 setting.
- The output is suitable for powering various DC loads with relatively high current demands.

SCHEMATIC DIAGRAMS


Variable power supply - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Base Design
Schematic Capture
Design Explorer
2N3055
BD139
CAP
CAP-POL
GBPC35005
LM317K
LM317T
NP0U4750V4M
POT
RES
TRAN-2P3S
VSINE
TR1
BR1
U1
LM317K
V1
C1
R1
RV1
C2
RV2
Q1
Q2
Q3
R2
R3
2 Message(s)
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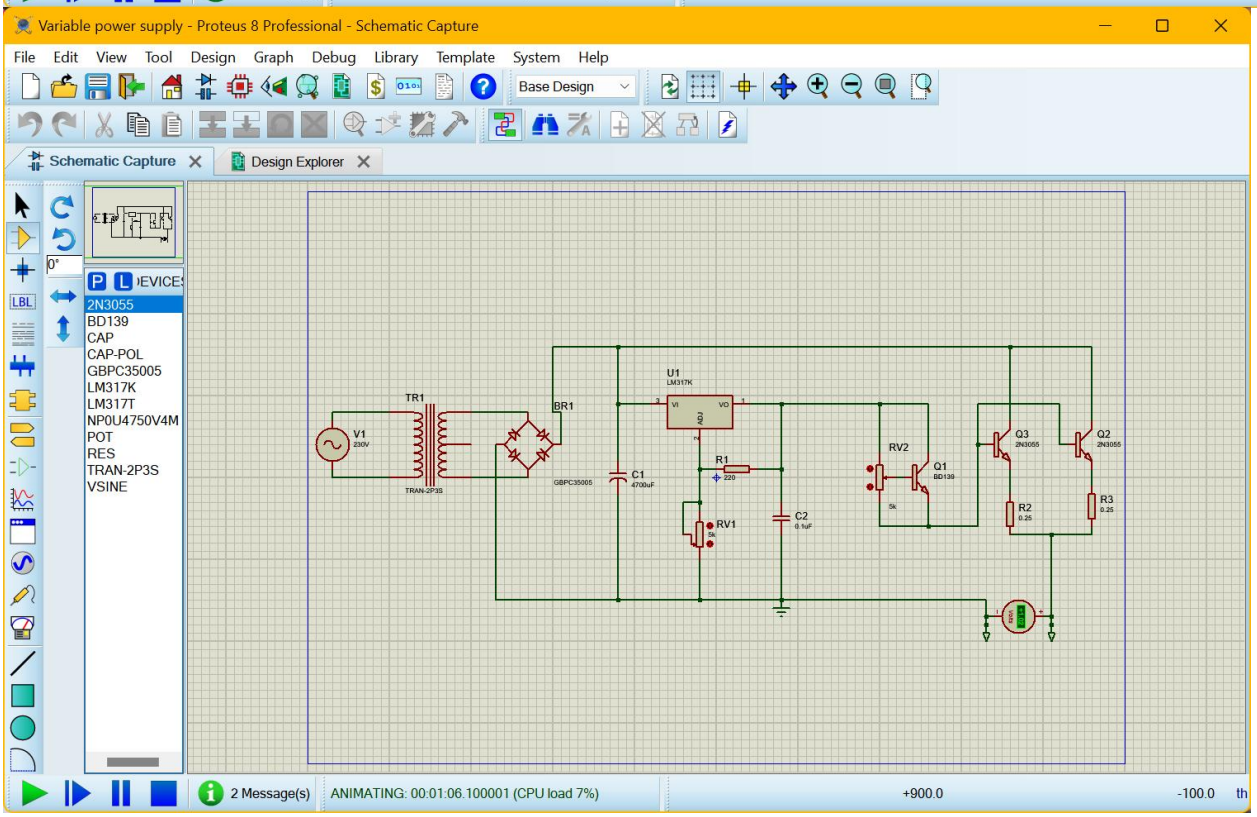
Variable power supply - Proteus 8 Professional - Schematic Capture
File Edit View Tool Design Graph Debug Library Template System Help
Base Design
Schematic Capture
Design Explorer
2N3055
BD139
CAP
CAP-POL
GBPC35005
LM317K
LM317T
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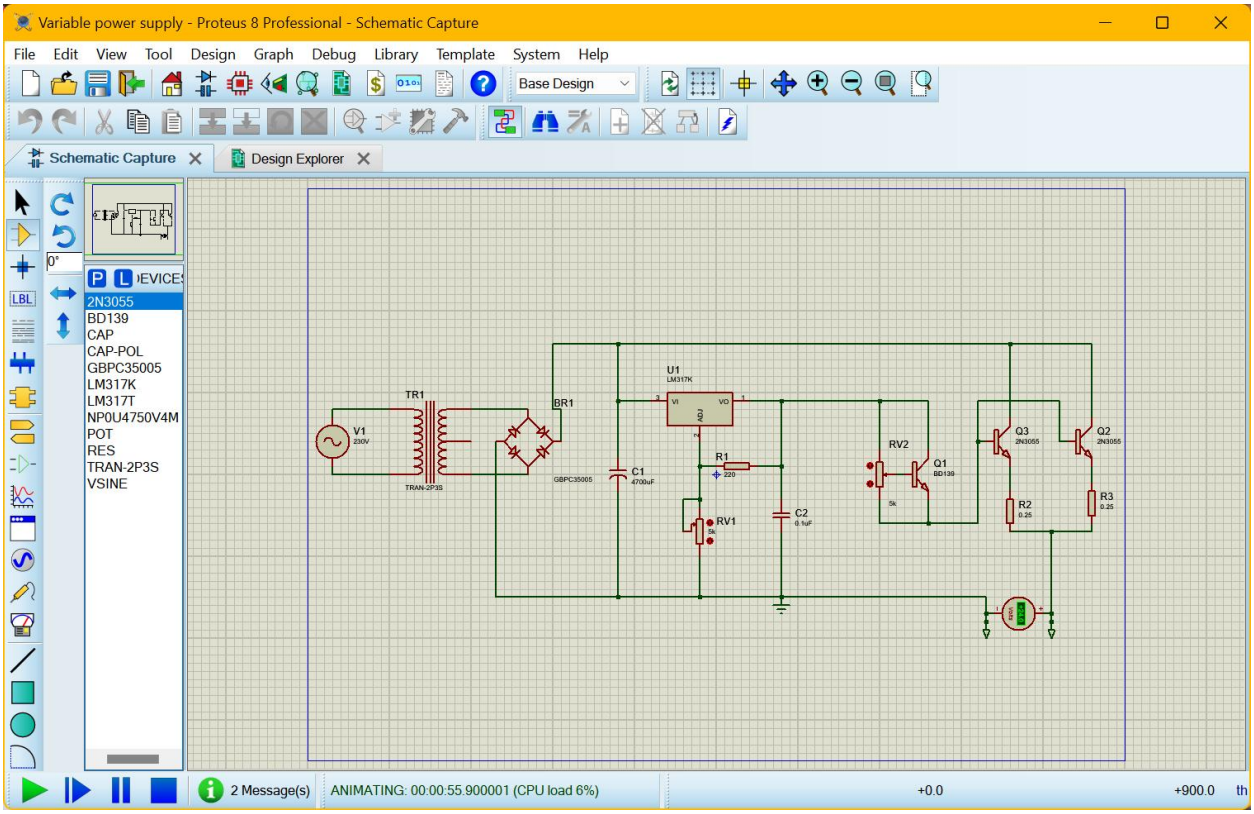
POT
RES
TRAN-2P3S
VSINE
TR1
BR1
U1
LM317K
V1
C1
R1
RV1
C2
RV2
Q1
Q2
Q3
R2
R3
2 Message(s)
ANIMATING: 00:01:06.100001 (CPU load 7%)
+900.0
-100.0



5. Bill of Materials (BOM)

Component	Value/Type	Quantity
Transformer	230V/24V AC, 3A	1
Bridge Rectifier	GBPC35005	1
Capacitor C1	4700µF, 50V	1

Component	Value/Type	Quantity
Capacitor C2	0.1µF, 50V	1
Voltage Regulator	LM317T	1
Potentiometer RV1	5kΩ	1
Driver Transistor	BD139	1
Power Transistor	2N3055	2
Resistors R1	220Ω, 1W	1
Resistors R2, R3	0.25Ω, 5W	2
Miscellaneous	PCB board, Wires, Heat sinks for 2N3055	

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6. Simulation Results

- The circuit was simulated in Proteus 8 Professional.
- Output voltage varied from **0.22V** to **29.7V** by adjusting **RV1** during simulation.
- No abnormal behavior was observed during simulation.
- Load simulation showed stable voltage regulation up to maximum designed limits.

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7. Conclusion

The designed variable DC power supply meets the objectives of providing a smooth and adjustable DC output voltage between 0V and 30V. Simulation results confirm the correct operation of the circuit, and hardware construction is feasible using standard electronic components. This project strengthens understanding of AC-DC conversion, voltage regulation, transistor current boosting, and circuit simulation techniques.

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8. Future Improvements

- Add digital voltage and current display (LCD/LED meter).
- Implement current limiting protection.

- Add over-temperature protection for power transistors.