Mini UPS for WiFi Routers

By Team ECLIPSE

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1.Project Description

Our project aims to develop a mini-uninterruptible power supply (UPS) specifically designed for WiFi routers. This mini UPS will ensure uninterrupted internet connectivity during power outages by providing backup power to the router. Additionally, it will include features such as battery level indication and a charging indicator.

Main features

- **Backup Power for WiFi Routers:** The mini UPS will provide backup power to WiFi routers during power outages, ensuring uninterrupted internet connectivity up to 6 hours.
- **Battery Level Indication:** A built-in battery level indicator will display the remaining battery capacity, allowing users to monitor the UPS's status and plan accordingly.
- **LED Indicator:** The UPS will include LED indicators to notify users whether the output is connected to main power or battery power.

2.Technical Feasibility

Input Voltage

- 12V DC

Output Voltage

- 9V / 12V DC

Voltage Regulation

- **Buck Converter:** Reduces input voltage to 8.5 V for battery charging.
- **Boost Converter:** Steps up voltage to 12V output.
- **Additional Buck Converter:** Provides 9V output.

Charging Functionality

- Utilizes buck converter to regulate input voltage to 8.5 V for charging the battery pack.
- Utilizes a BMS board to ensure safety of battery pack.

Battery Pack

- **Capacity:** 6400 mAh 7.4 V
- **Configuration:** 2 series 2 parallel (3200 mAh 3.7 V each)
- **Charging Method:** Constant voltage charging with current limiting

Components specification

- **IRF9530 power MOSFET:** Fast swithcing action
- **1N5822 diodes :** Over voltage protection(Peak Reverse voltage 40 V) , Low forward voltage drop (0.525 V) , High frequency operation , Low power loss

Conversion Efficiency

- Greater than 90%

Protection Features

- Overvoltage Protection
- Overcurrent Protection
- Reverse Polarity Protection

Dimensions

- 12cm x 9cm x 6cm [Length x Width x Height]

Enclosure Material

- PLA

Indicator LEDs

- AC Power mode indicator
- Battery mode indicator
- Battery level indicator

Connectors

- **Input:** DC female barrel jack (5.5 x 2.5 mm)
- **Output:** 2 x DC female barrel jack (5.5 x 2.5 mm)

3.Product Architecture

Input

- Would be taken from the 12V adapter.
- Is directly connected to the buck converter that steps down the voltage to 8.5V.

Output

- Depending on the user's requirement, output can be taken as either 9V or 12V.
- Would be taken from the Buck-Boost converter.
- **12V** - From the Boost converter.
- **9V** - Above 12V will be further stepped down and taken from the Buck converter.

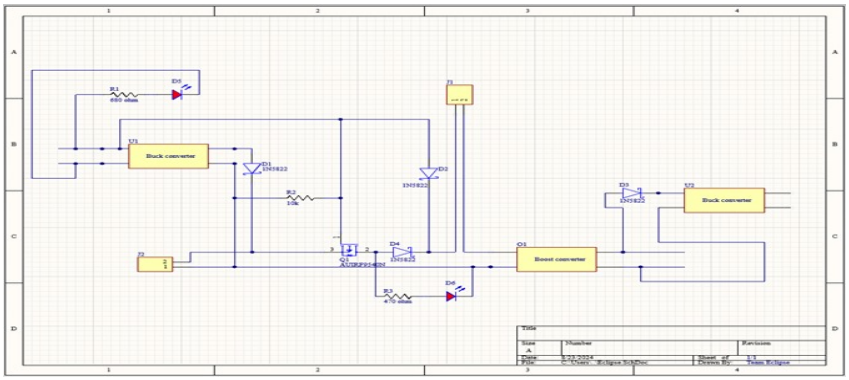
Indicators

- Two LEDs - Indicate the mode the UPS is working on (Direct mode or using the battery).
- LED screen - Indicates the battery level of the UPS.

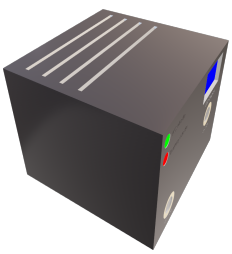
How to Work with this UPS

- **Powering the UPS:**
  - Use the adapter that comes with your WiFi router.
  - Plug the adapter into the input of the UPS.
  - Use the male-to-male DC cable provided to connect the output of the UPS to your router.
- **Dual Router Setup:**
  - If you need to power two routers simultaneously, use a separate adapter that provides at least 3A of current as the input to the UPS.
- **Front Panel Indicators:**
  - The green LED indicates that the UPS is in battery mode.
  - The red LED indicates that the UPS is in mains power mode.
  - The LED screen displays the current battery level.
- **Switches:**
  - The switch located at the bottom of the LED screen allows you to turn the screen on and off.
  - The main switch controls the power output of the UPS, turning it on or off as needed.

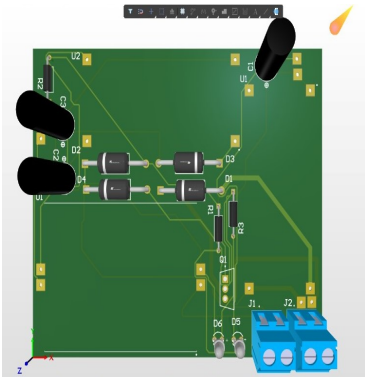
4.Schematic

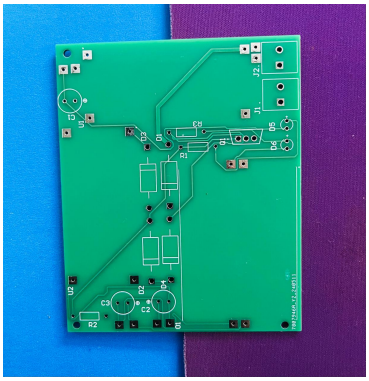


5.Sketches of the Product Enclosure

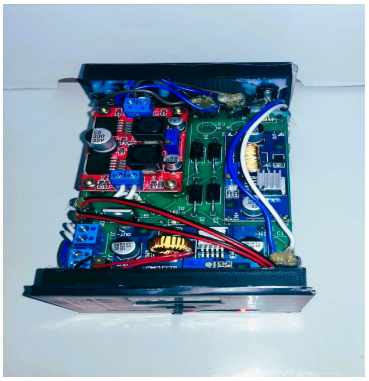


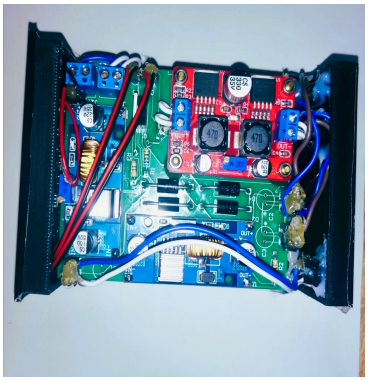
6.PCB Design





7.Final Product





8.Project Budget

Component	Description	Unit price	Price
Buck converter * 2	Xl4015	Rs.320.00	Rs.640.00
Boost converter	LM2596 LM2577	Rs.1120.00	Rs.1120.00
BMS module	2s,5A	Rs.230.00	Rs.230.00
Batteries * 4	3.7V , 3200mAh	Rs.600.00	Rs.2400.00
Other components	diodes, MOSFET, Resistors, LEDs		Rs.600.00
Enclosure			Rs.3280.00
PCB			Rs.770.00

Total Product Cost: Rs.9040.00
Profit margin: 4.8%
Price of the Product: Rs.9500.00

9.Marketing, Sales, and After Sales

Marketing Approach

Our marketing approach focuses on three key strategies:

- **Finding Partners**: We will collaborate with internet service providers (ISPs) and electronics retailers to bundle the mini UPS with new router installations. This partnership strategy aims to expand our market reach and ensure that our product reaches customers who need it the most.
- **Targeted Messaging**: We will craft tailored marketing messages that emphasize the mini UPS's ability to keep WiFi routers running during power outages. Our communication will address specific pain points such as lost productivity, interrupted online learning, or disrupted streaming services, ensuring our message resonates with our target audience.
- **Omnichannel Approach**: To maximize product visibility and accessibility, we will leverage a mix of online and offline sales channels. This includes e-commerce platforms, social media campaigns, and partnerships with electronics stores. Additionally, we will offer online demos and tutorials to highlight the product's benefits and ease of use.

Sales Strategy

Our sales strategy will be centered around building a strong presence in both online and offline markets. We will offer competitive pricing and work closely with our partners to ensure our mini UPS is available where customers are most likely to purchase WiFi routers.

After Sales Support

We are committed to providing excellent after-sales support, including a comprehensive warranty, easy access to customer service, and a clear return policy. We will also offer technical support to assist customers with installation and troubleshooting, ensuring a positive user experience and long-term customer satisfaction.

10.Task Allocation and Our Team

- **Bandara I.W.T.N 220061H**:
  - Circuit Design and PCB Layout
  - Assembly and Testing
- **Senaweera S.A.H.D 220596C**:
  - Enclosure Design and 3D Printing
  - Assembly and Testing
- **Fernando D.S 220163X**:
  - PCB design (Altium)
  - Documentation and Report Writing
- **Wijenayaka M.B.T.I 220711D**:
  - Marketing and Sales Strategy
  - Enclosure Design and 3D Printing