ADESH PARTAP SINGH

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LinkedIn | GitHub | Website - Portfolio | Altium

EDUCATION

University of Waterloo **September 2021 - April 2026**
Bachelor's, Mechatronics Engineering

- **Relevant Courses:** Power Electronics, Microprocessors Systems and Interfacing for Mechatronics Engineers, Sensors and Instrumentation, Introduction to Microprocessor and Digital Logic, Systems and Signals
- **Certifications:** Embedded Systems Software and Development Environments, Digital Transformations, Diploma in Advanced Web Development and Digital Marketing.

Sacred Heart Convent School **April 2018- April 2020**
Pre – Engineering, High School *Grade: 96%*

PROFESSIONAL EXPERIENCE

Accelerated Systems Inc **Waterloo, ON, Canada**
PCB Hardware Designer *September 2023 – December 2023*

- Proficient in Altium, designed a number of multi-layered boards like High Voltage Buck Convertors (using **LT8316 chip**), MotorController Board (ASIs **BAC 8000** series), Seakeeper Gyro Stabilizer Board and optimizing many other PCB layouts for enhanced performance.
- Efficiently simulated analog circuits using **LTspice** and Matlab **Simulink** and tested motors on company-specific software (BACDoor), analyzed results, and provided actionable insights for performance improvements.
- Conducted comprehensive testing on different boards using **DMMs, E-Loads, Oscilloscopes,** and **Hot Air Stations**, ensuring rigorous board validation and functionality in line with their datasheets.
- Suggested several improvements and then restructured the company's component library to enhance efficiency by over **90%** resulting in a highly streamlined and user-friendly navigation experience.

Waterloop **Waterloo, ON, Canada**
Electrical Team Lead *April 2022 - Present*

- Spearheaded key projects such as the Levitating pod, Battery Management System (BMS), and Motor Control Unit.
- Optimized the old version of Power Supply by enhancing energy storage and distribution within the pod, while our motor controller design showcased efficient motor control and precision.
- Bought in funding worth **$3000** by pitching our ideas and needs to the University of Waterloo Finance Association.
- Prepared **Schematics** and **PCB files**, managed **project libraries**, documented and conducted Hardware tutorials/knowledge sharesfor new members and enforced deadlines for manufacturing all the boards.

University of Waterloo **Waterloo, ON, Canada**
Professors Assistant (MTE – 120, Circuits) *January 2023 - April 2023*

- Instructed and mentored engineering students in the University's Circuits Theory course. Taught topics like DC & AC circuit analysis, first-order transient response, Diodes, Transistors, Op-amps, electromagnetic theory, Digital Logic and more.
- Delivered tutorials, labs and help sessions, instructing engineering students on the proper use and application of various laboratory equipment including multimeters, oscilloscopes, electronic loads and logic analyzers.

PROJECTS & OUTSIDE EXPERIENCE

8-BIT Computer from Scratch

- Designed and constructed an 8-bit computer from scratch, encompassing critical elements including **System Clock, Registers, Arithmetic Logic Unit (ALU), RAM Module, Program Counter, CPU Control Logic**, and other vital components.
- Implemented a comprehensive understanding of digital electronics and **Machine level C** programming to bring this project to fruition.
- Successfully demonstrated the ability to engineer complex systems and troubleshoot hardware and software challenges in an independent, hands-on project.

Built an STM32 Board

- Independently designed and fabricated a **custom microcontroller** board utilizing an **STM32** chip with Altium Designer. Integrated essential peripherals, including external timers with crystal oscillators, high-performance ADCs, a Buck Converter for power efficiency, and various passive components and sensors.
- Significantly improved the board's functionality by incorporating SWD, I2C, and USB connectors, enhancing communication capabilities and showcasing proficiency in hardware design and embedded systems development.

SKILLS & INTERESTS

Electronics: Printed Circuit Board (PCB) Design, Altium, Ki CAD, C/C++, Prototyping digital circuits on Arduino, Raspberry Pi, Soldering, Proteus, LTspice, Simulink for electronics, TinkerCAD, Computer Networking and Communication.

Others: SolidWorks, AutoCAD, Linux, Open CV using Python, JavaScript, HTML, CSS, WordPress, 3D Printing.

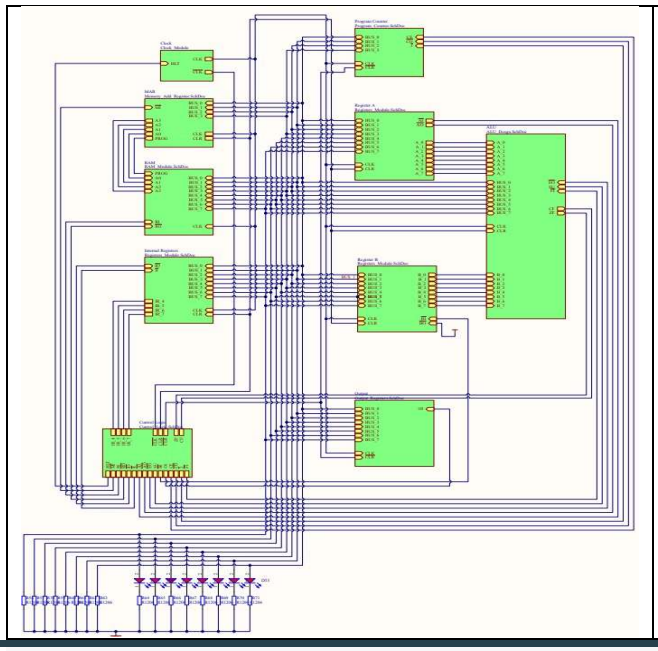
Languages: English, Punjabi, Hindi

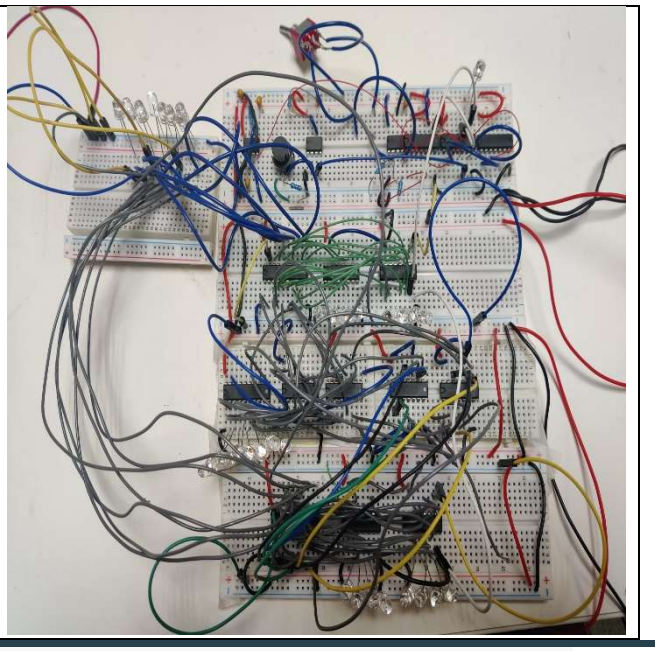
PORTFOLIO

LOOKING FOR SUMMER
2024 INTERNSHIPS

ADESH PARTAP SINGH
ELECTRONICS ENGINEER

8-BIT COMPUTER





Building an 8-Bit Computer from Scratch

The primary objective of this project was to create a fully functional 8-bit computer system using a hands-on approach, combining principles from digital electronics and low-level programming. The project aimed to demonstrate the integration of various components to form a cohesive computing system

Key Components and Features:

System Clock: A meticulously designed clock system designed using *LM 555 chip* that ensures synchronized operations across all components of the 8-bit computer, providing the necessary timing for accurate execution. Follows two modes of operation, and frequency could be controlled by changing the value of Resistance or capacitance of the circuit.

Registers: The project incorporates registers for data storage, enabling the manipulation and transfer of information within the computer. I used the four - *74LS173*, a 4-bit register chip and connected them make two 8-bit registers. These registers play a crucial role in the execution of instructions and data processing.

Arithmetic Logic Unit (ALU): The ALU is responsible for performing arithmetic and logic operations. It includes two 4-bit binary adders (*74LS283s*), and an XOR gate (*75LS86*), which performs subtraction. Its design and integration contribute to the computer's ability to execute complex tasks and calculations.

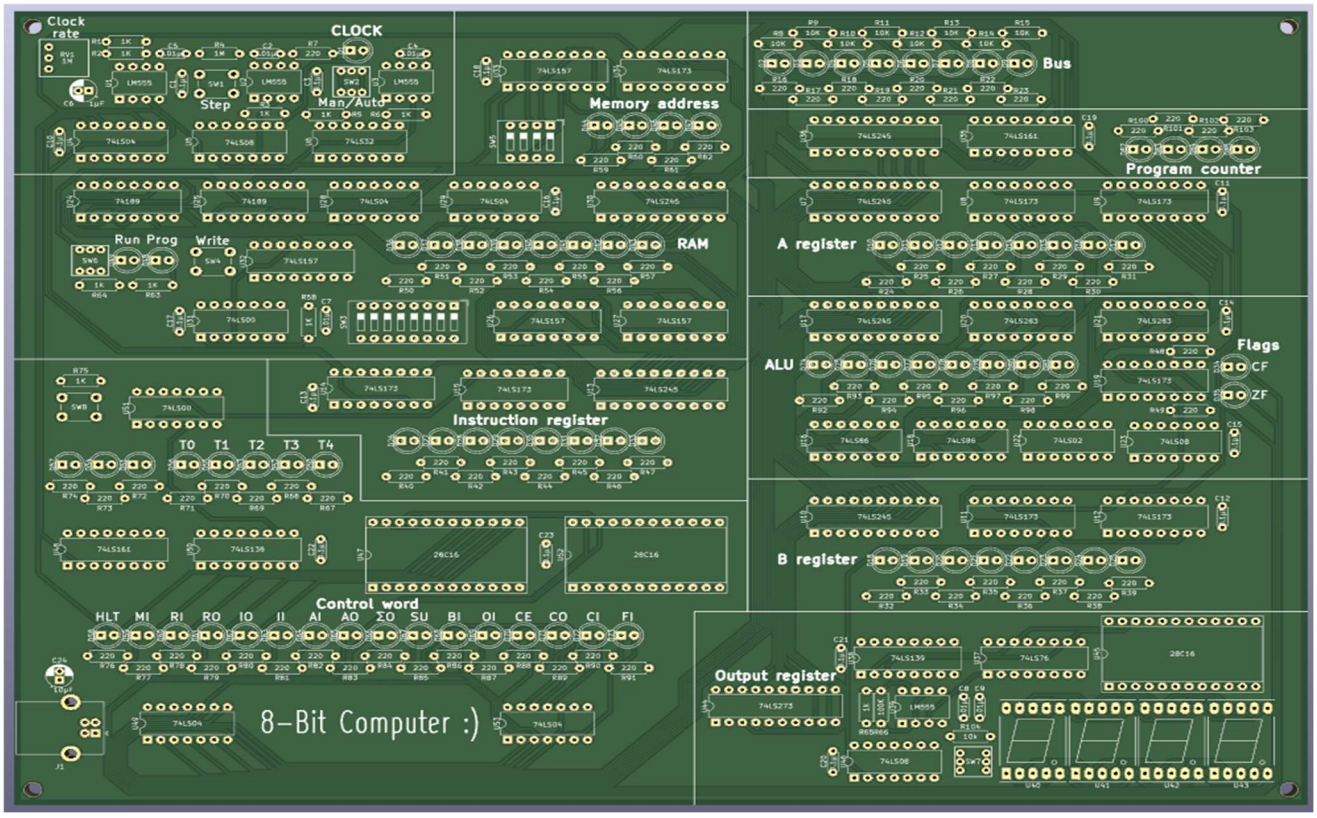
RAM Module: A dedicated RAM module provides data memory for the computer, allowing for the storage and retrieval of information during program execution. The integration of a RAM module enhances the overall functionality of the system.

Program Counter: The inclusion of a Program Counter is essential for tracking the execution of instructions, ensuring the computer follows the correct sequence of operations.

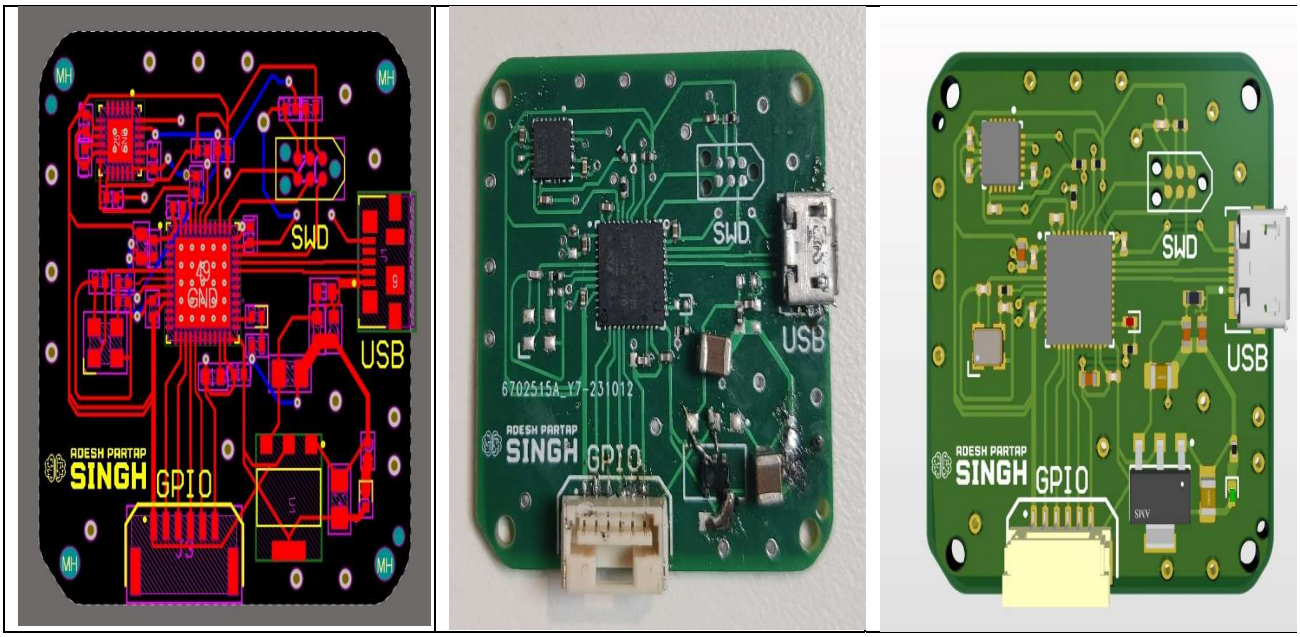
CPU Control Logic: The project encompasses CPU control logic, a critical element that orchestrates the functioning of various components within the system, facilitating the smooth execution of instructions.

Development Process: The project followed a systematic development process, starting with the conceptualization of the computer's architecture. The design phase involved individual component design, with an emphasis on functionality and interconnection. The subsequent construction phase saw the physical implementation of these components on a breadboard, bringing the conceptualized architecture to life. Machine-level C programming was then employed to create an interface between the user and the computer, enabling the execution of instructions and manipulation of data. The integration of hardware and software components was a meticulous process, requiring thorough testing and debugging to ensure seamless functionality.

In summary, the System Clock in the 8-bit computer project serves as the temporal conductor, orchestrating the synchronized dance of digital operations. Its design involves careful consideration of frequency, distribution, synchronization with external components, and testing to guarantee reliable and precise timing throughout the computer system.



STM 32 MICROCONTROLLER



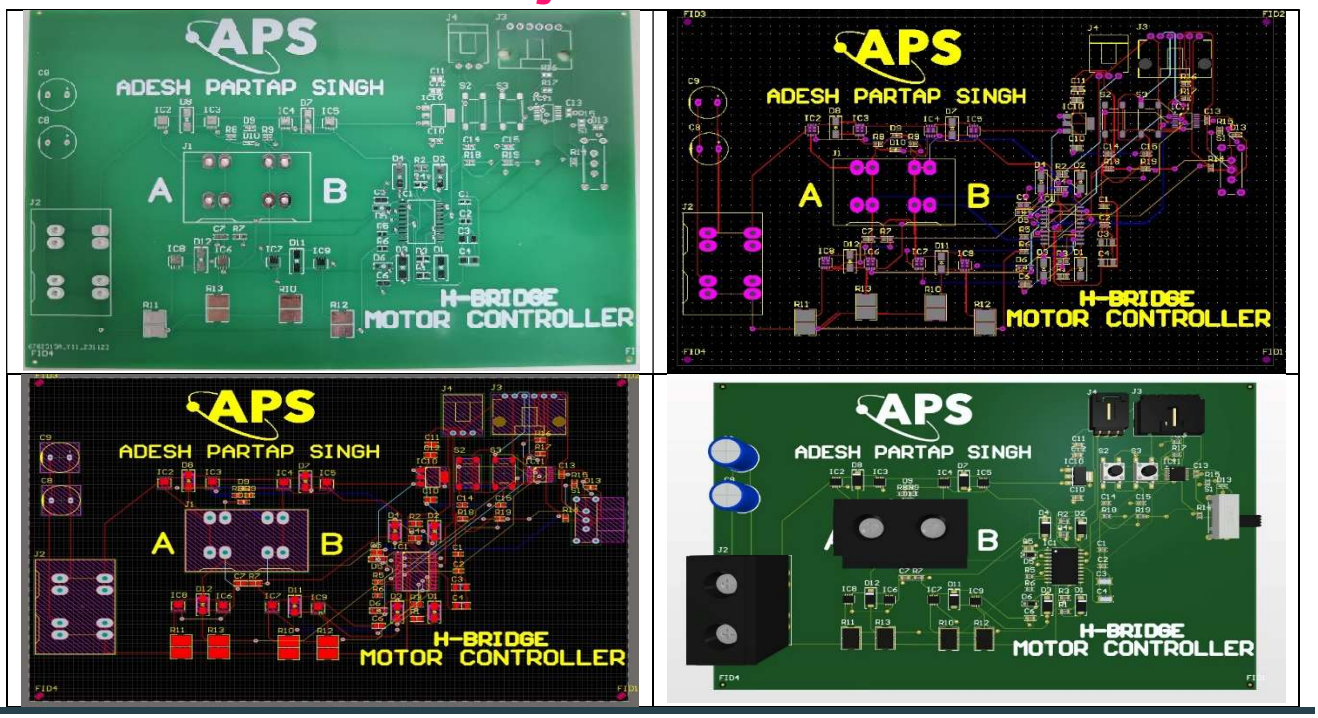
Description

In this project, I designed a sophisticated STM32 microcontroller board using Altium, incorporating an array of advanced features and capabilities. The core focus was on achieving seamless integration with various peripherals and ensuring optimal performance. The board is equipped with a USB interface, enabling versatile connectivity options, and hosts a range of built-in sensors.

It utilizes the STM32F411CEU6 chip, a very powerful and versatile component known for its efficiency and flexibility in embedded systems. Integrated accelerometers to detect and measure motion, enabling applications like orientation detection and movement tracking and depending on project requirements, various other sensors can be added, such as temperature sensors, gyroscopes, or magnetometers, enhancing the board's sensing capabilities.

Crafted using Altium, ensuring a robust and well-optimized printed circuit board (PCB) design for reliability and performance. Provides the flexibility for custom firmware development, allowing tailoring to specific applications and requirements. Incorporates a modular design approach, enabling scalability and adaptability for future enhancements and modifications. Designed to cater to a wide range of applications, including IoT devices, wearable technology, robotics, and other embedded systems where precise control and data processing are essential. This project showcases my proficiency in electronic design and development, encompassing hardware and firmware aspects. The integrated USB interface and a suite of sensors significantly expand the versatility and potential applications of the STM32 microcontroller board, making it a valuable addition to my portfolio.

Motor Controller Project



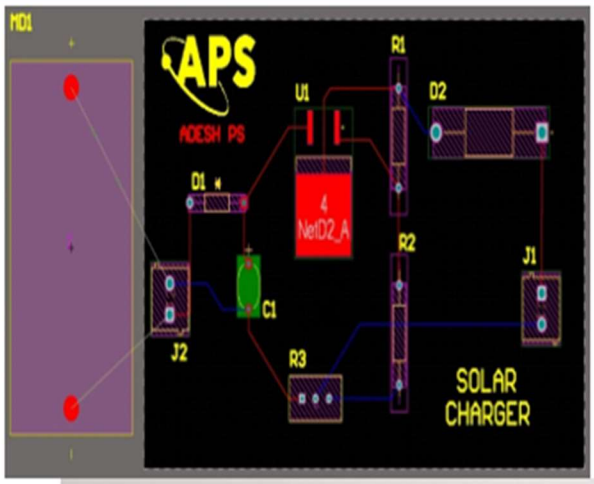
100A 12V H-Bridge Project

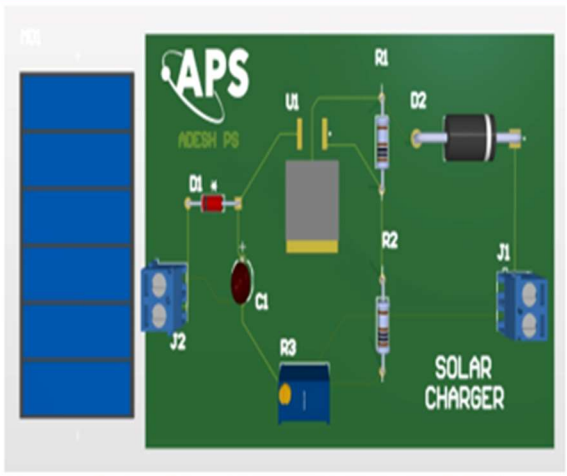
In designing the 100A 12V H-Bridge motor controller project on Altium, the primary focus was on integrating the Renesas HIP4081A high-frequency full-bridge FET driver for optimal performance and efficiency. The HIP4081A was chosen for its robust features, including a high peak output current of 2A, fast switching speeds, and a wide input voltage range suitable for the 12V application. The Altium Designer software facilitated the schematic capture and subsequent layout of the PCB, allowing for precise placement and routing of components to ensure minimal signal interference and optimal thermal management. Careful consideration was given to power trace thickness and layout to accommodate the high current requirements of the motor controller. The design also incorporated protection mechanisms such as overcurrent and overtemperature detection to safeguard the system. The Altium platform's simulation capabilities were leveraged to validate the circuit's performance, ensuring that the H-Bridge motor controller met the project's specifications and could reliably handle the demanding 100A load while maintaining stability and efficiency. The final design, implemented on the Altium platform, demonstrated a synergistic integration of the Renesas HIP4081A and the associated circuitry, resulting in a robust and reliable 100A 12V H-Bridge motor controller.

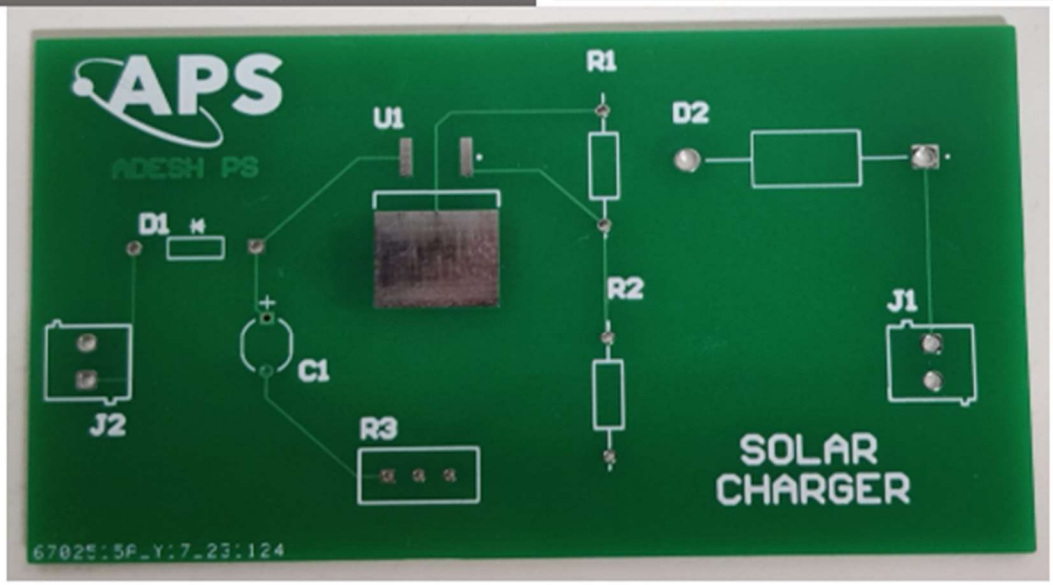
Solar Charger Project

In my Solar Charger project, I designed a sustainable energy solution utilizing a 17V solar panel as the primary power source. The heart of the system is the LM317 voltage regulator, a versatile component capable of maintaining a stable output voltage despite fluctuations in the input. This regulator ensures that the energy harvested from the solar panel is efficiently and safely utilized. To enhance the overall performance and reliability of the system, I integrated various passive components such as capacitors, resistors, and diodes.

Capacitors were strategically placed to smooth out voltage fluctuations and reduce noise in the circuit. Resistors played a crucial role in setting the desired output voltage of the LM317 regulator, while diodes were employed for reverse polarity protection, preventing potential damage to the components in case of accidental connections. This solar charger project represents a sustainable and eco-friendly approach to harnessing solar energy for powering electronic devices, promoting renewable energy use in everyday applications.





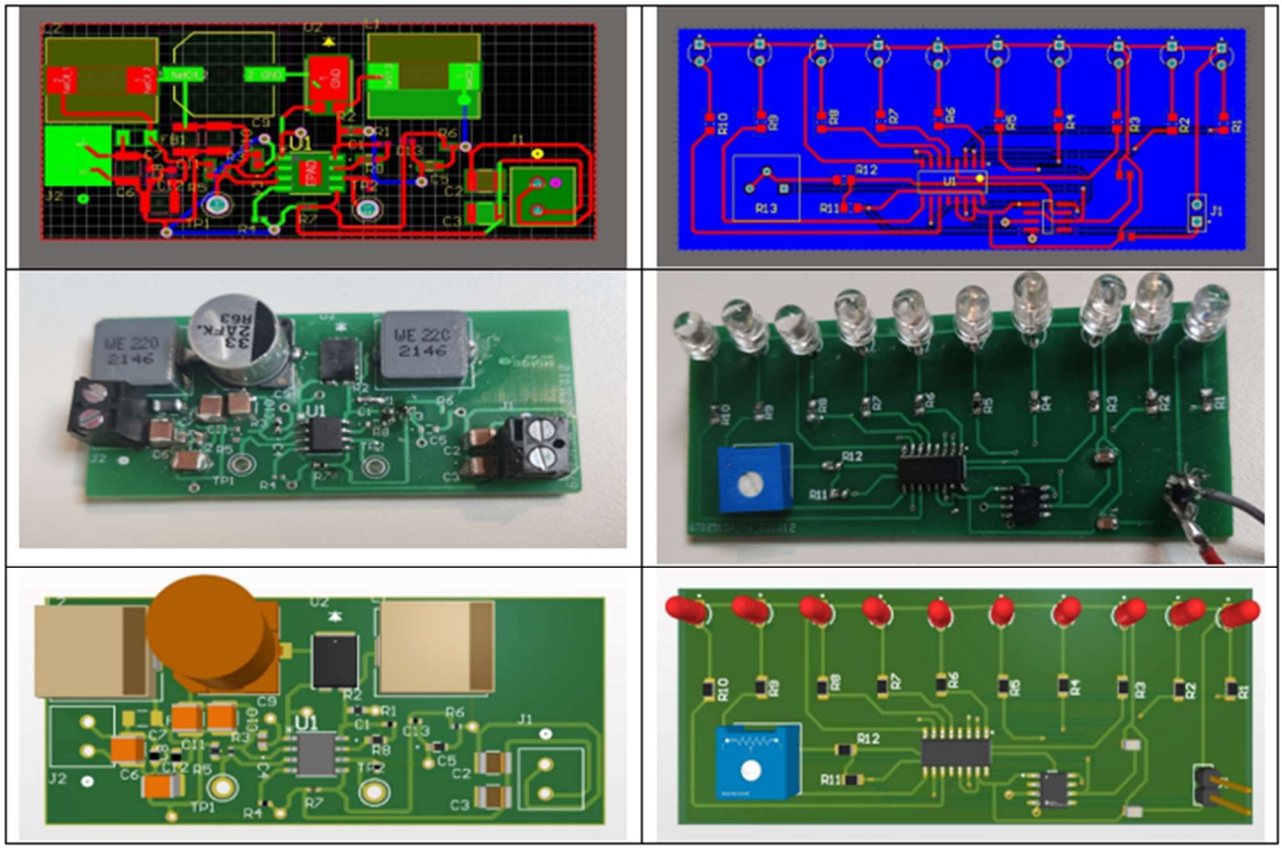


BUCK CONVERTER

In this project, I engineered a high-efficiency buck converter using the LM5013 chip, capable of efficiently transforming input voltages of up to 40V to a stable 12V output with a maximum load current of 3.5A meeting the requirements of demanding applications. The design incorporated meticulous consideration for stability, efficiency, and reliability, through careful component selection while ensuring a smooth input and output through the integration of an input filter. Designed for a compact form factor, making it suitable for space-constrained applications The buck converter was later integrated to the Motor Controller Board which is currently being mass manufactured by my previous company.

LED SEQUENCER

In my spare time, I undertook a creative LED sequencer project employing a NE555 timer and CD4017BM decade counter to craft a captivating light display. The LED sequencer was initially intended for a signage application, where the LEDs were choreographed to create an eye-catching aesthetic sequence. Later, I repurposed this project for our hyperloop team's G6 capsule, I employed the LED sequencer to create a rhythmic blinking pattern, serving as effective blinkers for the hyperloop pod, enhancing safety during operations. Also incorporated efficient power management to ensure optimal usage of power, extending the operational life of the LEDs while maintaining consistent performance.



More Projects on my Website >>

Thank you for taking the time to review my Resume. I look forward to hearing from you.

As you review my resume, please recognize that I selectively apply to opportunities and have chosen your company based on my genuine interest and career goals alignment. I am eagerly looking forward to the potential of discussing in detail how my skills and unwavering dedication can augment your team's efforts. Your consideration is of immense value to me, and am brimming with excitement about the prospect of an interview from you and showcasing my abilities in-person.