# Contents

# No-Compromises Hybrid Go-Kart with Instant Acceleration and Maximum Traction

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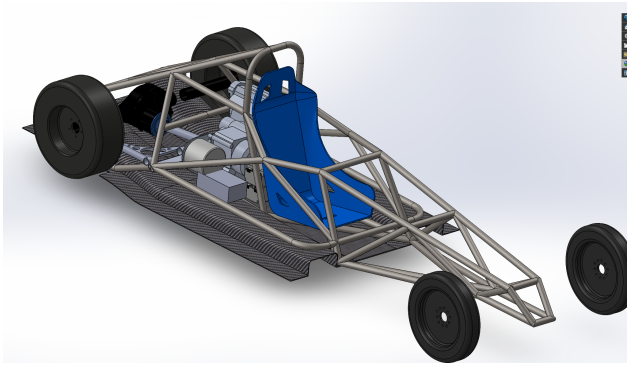


## 1 Abstract

This project proposes the development of a hybrid go-kart system that delivers the instantaneous torque response of an electric vehicle, the sustained power and low cost of a standard combustion engine vehicle, all while using modern aerodynamic technology to maximize traction for instant acceleration. Current go-kart technology that prioritizes electric powertrains suffer from energy density limitations while technology that prioritizes gas-driven powertrains suffer from low power at low speeds, and loss of speed during shifting. Additionally, both solutions rely on software-defined traction control, which limits the power from the drivetrain to the wheel to prevent tire slip. This project aims to solve the tradeoffs of both pure electric and pure combustion drivetrains while maximizing the power output to the wheel through its active aerodynamics, all at a much more affordable cost compared to other hybrid solutions.

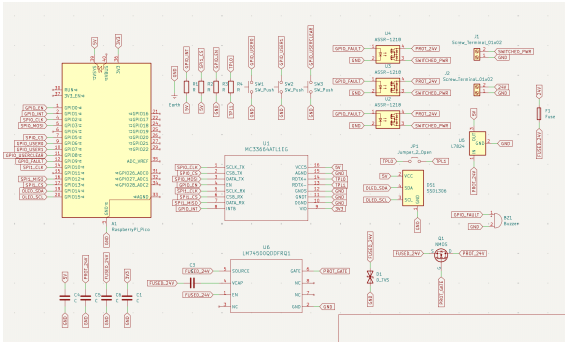
# 2 PCB Documentation

## 2.1 TPL User Interface

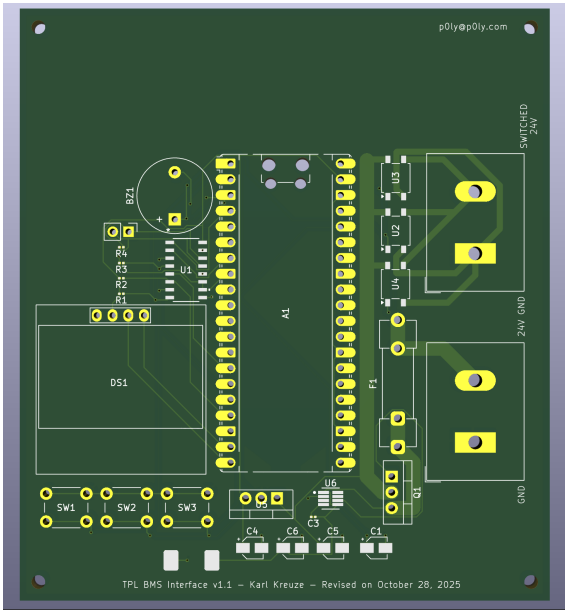
### 2.1.1 Purpose

The Porsche Taycan battery modules provide a 4-pin interface for monitoring and controlling the battery cells. Because these batteries are designed with galvanic isolation for safety, a custom PCB involving NXP's MC33664 TPL transceiver is required. This PCB will provide a user interface to the battery modules for monitoring cell voltages, temperatures, and state of charge, as well as controlling the battery's balancing and fuse circuitry. The user interface is provided by onboard buttons, and an OLED 128x64 display. The user will input hex commands through the buttons, and the MCU will handle the user input, which may include sending commands to the battery modules, or controlling the PCB's charger circuitry. The PCB provides solid state relays to allow for automatic monitored charging of the battery modules, disconnecting the charger when the battery is full, or if a fault is detected.

### 2.1.2 Schematic



(a) Schematic of the TPL User Interface




(b) Routed PCB of the TPL User Interface

Figure 1: TPL User Interface Schematic