

EV Inverter

Status:	Filled
Group Members:	Jarod Krane, Mahmoud Kamaleldin, Matthew Mendoza, Junaid Jawed Khan, Andrei Divinagracia
Sponsor(s):	
Supervisor(s):	Jason Wang, PhD, PEng, Associate Professor, Mechatronic Systems Engineering

Project Description

This project will be about the design and construction of a 3-phase inverter to be used in an FSAE electric race car. The project team will design the PCB, mechanical enclosure, heatsink and power delivery system for the 3-phase inverter to be used in an FSAE electric race car. Research will be conducted on different motor control methods. Upon selection of a method, firmware will be written in C for an ARM-architecture based microcontroller that will be controlled by the Vehicular Computer Unit (VCU) over Controlled Area Network (CAN) protocol to adjust the speed of the motor. Thermal simulations will be performed to design the heat sink and to decide between liquid or passive cooling. Research into high power circuit topology and design will be conducted to ensure adequate performance and isolation in the system.

Required Skills:

- Knowledge of Power Electronics.
- Knowledge of Hardware Design.
- Knowledge of Embedded Programming.
- Knowledge of Thermal Management.
- Knowledge of EV and SAE Standards.
Ability to create clear and concise documentation.

Deliverables:

- A design and model of a PCB capable of providing a minimum power of 80KW with a voltage and current rating of 400V and 300A, respectively.
- A design of a real-time embedded system that is able to communicate with the VCU over CAN and control speed of a motor while adhering to safety critical software standards.
- A design of a built-in data logging system for testing and analysis.
- A design and model of a fully realized inverter that is ready to be integrated into an EV.
- A design and model of a Heatsink to ensure adequate cooling for the power system.
A design and model of a housing that will enclose the hardware and act as a protective and structural shell.