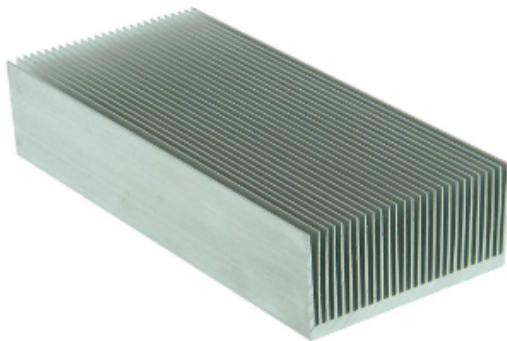


Hardware

Introduction

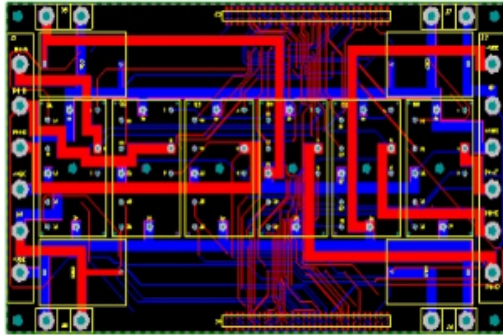
The team implemented a prototype converter for high power applications. At the same time, test the converter to use the model predictive control. For design our product, the team first stage is to design PCB, then we will simulate and test. The team design PCB to consist of 8 stacks. The stacks mainly include ground stack and others seven PCB stacks. Stacks will be on top of each other. For size of stacks parameters, the width is 132.30 mm, and the length is 228.60 mm. The team stack which can reduce weight, height and size of the converter. Each stacks can be reused for other power conversion applications. The voltage and current sensors as shows in the figure PCB stacks will be connected using a built in 60 pins connector simplifying the design by reducing wiring.

Hetsink



Heat sink is used in electronic circuit to disperse heat from the component to the surrounding medium and help them to improve their performance, reliability and avoid premature failure of the components. Heat sink work on the principle of conduction, convection and radiation. It helps to cool all the components in electronic circuit and plays very vital role in high power applications.

NPC Power Board (SK 50 MLI 066)



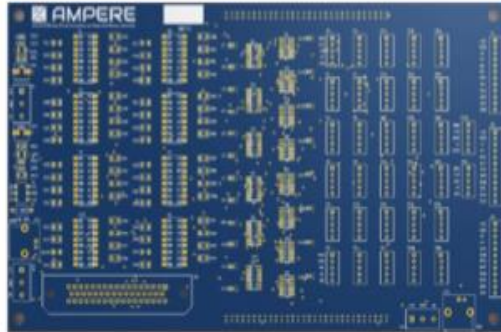
NPC power board convert three phase power into DC using three “SK20MLI066” switches devices every device has 4 IGBTs models. Furthermore, the NPC power board will be reused for three main high power applications.

Gate Drivers (SKHI 22B R)



Gate drivers are used in high power applications such as wind power systems, photovoltaic systems, and motor drives. NPC power converters are based on the concept of switch mode power electronics. Power switching devices are typically MOSFET's or IGBT's. For the grid-connected converters, IGBT's are used as switches. Converters use a controlling unit that access these switching devices to control switching frequencies. The team is planning to use dSPACE device as a controlling unit. The output voltage of our controlling unit is 5v. On the other hand, the voltage going through the switching devices is around 400v. The low voltage output of the digital controlling unit is not adequate to properly turn on and off switches. Therefore, connecting the controlling unit and the switching devices using gate drivers enables the controller unit to control switches. A gate driver will take the low voltage input from dSPACE. Then, it will provide enough voltage to turn on or off the connected switch. Hence, the first function of a gate driver is that it is the muscle that helps the controlling unit to properly control switches. In addition, using gate drivers is important due to its electrical isolation features. The cost of the dSPACE is around \$15,000. Connecting a 5v digital device to a 400v converter directly puts us in a risk of burning an expensive controlling unit. The ability of gate drivers to help in protecting the dSPACE from being destroyed is enough reason of having such subsystem. Possible solutions

dSPACE Interface Board (DS 1103)



dSPACE Interface Board is used for real time implementation of model predictive control. This will Convert TTL logic signals from the dSPACE DS1103-based to CMOS logic (MC14504 component).

Voltage Sensors



Voltage sensor can convert measured power parameters into DC current, DC voltage and isolated output analog signal or digital signal. The voltage sensor is used to measure the voltage or current signal with more serious waveform distortion in the power network.

Current Sensors



Current sensor is a detection device that can sense the current information, and can detect the sensing of the information, according to a certain law into a certain standard of electrical signals or other forms of information required to meet the output information transmission, processing, storage, display, recording and control requirements.