# Topology Selection

In the scope of this project, there are three main topologies come forward that are Flyback Converter, Forward Converter and Push-Pull Converter. All these topologies can be used between the high and low voltage batteries of Tesla Model S with an isolation mechanism. Also, all of these converter topologies give chance to adjust the output voltage with another parameter, turns ratio. Flyback Converter topology is created from the buck-boost converter topology with a transformer that helps to store the energy. The Flyback is the most common and most studied on topology. Therefore, there are lots of source and application notes for this choice. Although it is preferable for low power applications, the topology can supply the output current up to 10 A safely which is lower than the given specs of the project. Forward converter is created from the buck converter topology with a transformer. Like Flyback, Forward Converters are preferable for low power applications. In the magnetic design a gapless core can be used for Forward Converter design and this increase the Lm value which means less ripple at the output; however, due to extra inductor and diode cost could be higher than the Flyback converter. Also, in DCM mode gain changes dramatically. Moreover, MOSFET should withstand higher voltages which increases the size of the design. Forward Converters works stable even the exceeding 15 Amperes limit. Due to these crucial disadvantages, Forward Converter is not the selected topology. Push-Pull Converter is a kind of Forward Converter with two primary windings to create a dual drive winding. Utilization of the magnetic core is better compared the two other topologies, since in this topology the magnetic core can operate both 1st and 3rd quadrants of the B-H curve. On the other hand, switching control mechanism is harder than the other ones because as known both switches never should be activated at the same time. Moreover, Push-Pull Converters are better choice for very high-power applications. Considering the above criteria Flyback Converter topology is the best choice for this project. Furthermore, the engineers of Martian Power Solutions had some experience on designing Flyback Converter circuit and using these experiences results a better solution for this project.