# THERMAL ANALYSIS

Since, our design consists switch and diodes, we need to consider thermal properties of these components. In this section, the thermal analysis are explained. After the calculations, the required heatsink is determined.

## IGBT

Conduction and switching losses can be calculated for IGBT as follows:

In order to calculate these losses, the information of component datasheet is used [1]. For , is given 0.40 mJ and is given 0.30 mJ. The switching frequency can be 10kHz at maximum. Then :

For , is given 0.63 mJ and is given 0.50 mJ. The switching frequency can be 10kHz at maximum. Therefore:

In order to find conduction losses, we need to know voltage and current values when rated load case (steady state). is average current that passes the IGBT calculated by Simulink.

Hence, the conduction loss for IGBT can be calculated as follows:

Therefore,in the worst case scenario the total IGBT losses are :

## Free-Wheeling Diode

For the free-wheeling diode at the end of buck converter, the losses can be calculated as follows:

The required information for the calculations is given in datasheet of the selected diode[2]. In our case, is the maximum voltage on the free-wheeling diode and it is shown in simulations as 220 Volts.

The conduction loss of free-wheeling diode can be calculated as follows:

## Rectifier Diode

We decided to use diode rectifier module, its datasheet can be found [3]. The conduction loss of this module diode can be calculated same as free-wheeling diode. The required information is given in datasheet [3].

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