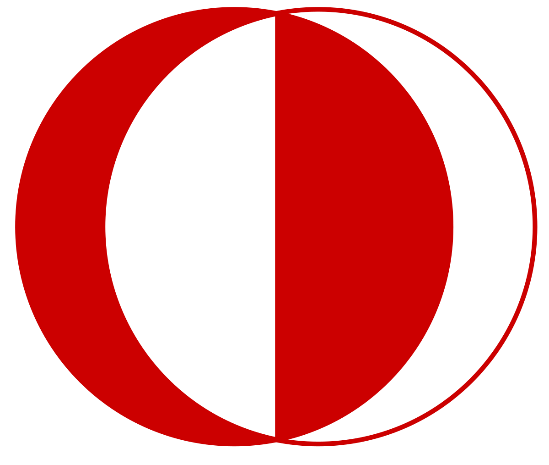
# **EE463 STATIC POWER CONVERSION-I**

# **TERM PROJECT SIMULATION REPORT**



Musa Ulusoy 2305555

Muhammet Samet Yakut 2305647

Berna Corak

# **Thermal Calculations**

## **Switching Losses and Conduction Losses:**

Our design consists of 7 diodes and 1 IGBT as semiconductors. 6 of the diodes is in the three-phase rectifier module, 1 of them is used as a freewheeling diode buck converter and also, IGBT is used as a switch in the buck converter.

**-Switching Loss formula (Reverse Recovery Loss):**

**-Conduction Loss Formula**

Three-phase rectifier module VUO36-16NO8 [1] consist of 6 diodes. For these diodes, let’s do the loss calculations:

(Maximum voltage that rectifier diodes will block) (buck converterin duty cycle’I edge’lere yakin olmamasi icin line-line voltage boyle olmali)

(In our case, reverse current will be smaller since Vreverse = 135 V)

(Operation Frequency)

(Not written in the datasheet)

Hence, for these diodes, switching losses can be ignored.

(Maximum current that passes through a diode in our design)

For the freewheeling diode, we are planning to implement DSEP30-06B [2] to the buck converter. For this diode, let’s do the loss calculations:

(Maximum voltage of the motor that diode will block)

(In our case, reverse current will be smaller since Vreverse = 180 V)

(Operation Frequency)

(Written in the datasheet)

We can say that switching loss is very low.

(Maximum current that passes through this diode in our design)

The IGBT used as a switch in the buck converter is IXGH24N60C4D1 [3]. For this IGBT, let’s do the loss calculations:

(Switch on energy of the IGBT)

(Switch off energy of the IGBT)

(Collector-Emitter voltage in saturation)

(Current passes through this IGBT when it is conducting)

The remaining losses comes from the parasitic resistances of the inductor. We are not planning to use capacitor neither in the rectifier side nor in the buck converter side. Also, controller unit is working for logical operations hence, it does not consume significant amount of power. So, inductors cable resistance is enough for the loss calculation.

(Armature winding resistance)

13.6W