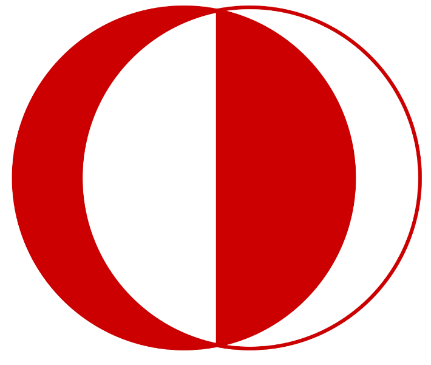
**EE 464**

**Hardware Project**

**Simulation Report**



**Team 5**

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# **Introduction**

In this report, we will make a design decision and select a topology to produce an isolated DC-DC converter. Also, we will analyse this circuit in the simulations and obtain some results. Then, we will select some components according to simulation. Lastly, we will look at the preliminary results of transformer and inductor that we build.

# **Topology Selection**

There are many topologies to design an isolated DC-DC converter such as flyback, forward, push pull etc. Each of them has some advantages and disadvantages. So, we want to select the topology as different from the other hardware project. As a result, we decided to design a “Push Pull Converter”.

**Advantages**

* Good transformer core utilization
* Easier to base drive (low side switching)
* Small Filter and Transformer
* Interleaved Structure

**Disadvantages**

* Voltage stress on the FET’s is twice the input voltage
* Asymmetric switch signals cause a flux walking in the core
* Number of the semiconductors are larger than the other topologies

# **Transformer Design**

In order to determine the turn ratio of the transformer, we can look at the push pull converter voltage equation.

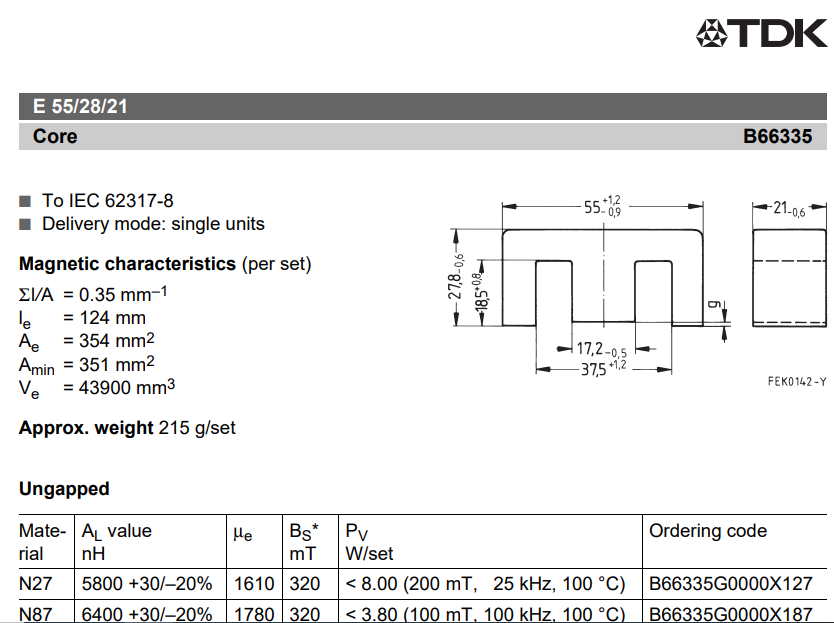
In the design requirements, we know that input voltage varies between the 24V and 48V. Also, push pull converter requires duty cycle which is smaller than the 0.5.

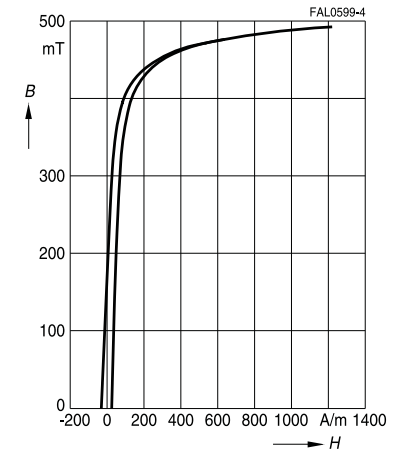
If we put a range for duty cycle such as 0.2 < D <0.4, we can find the necessary turn ratio

To make the number of turn as integer, we can select the

Minimum number of turns can be determined as the flux density in the core cannot reach the saturation. So, minimum number of turns can be calculated as following formula.

Then, we can use the effective area of the core. Our first core decision is the TDK Electronics B66335G0000X187 magnetic core. Its effective cross-sectional area is 354 mm2 .





Maximum flux density varies depends on the material of the core. For a safety, we can select as maximum 0.2 T.

So, number of turns 6 and 8 is sufficient.

In the simulation, maximum current is 2.2 A for input, 3.3 A for the output. Also, our core has more window area. So, we decided to use directly a litz cable which has 0.3 mm^2 area. Then, when we calculate the fill factor, we obtained the following calculation

# **Inductor Design**

# **Preliminary Results**

# **Simulation Results**

# **Component Selection**