## **Transformer Design**

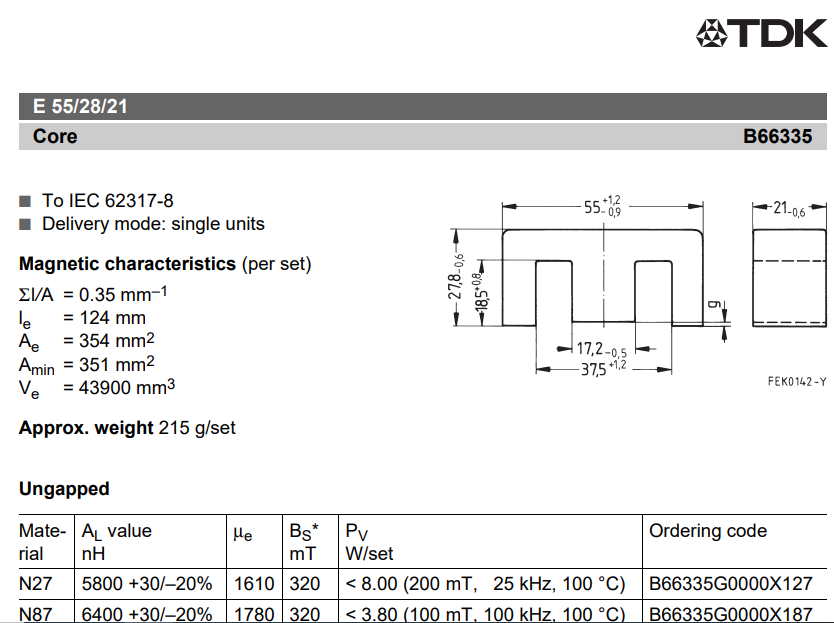
In order to determine the turn ratio of the transformer, we can look at the push pull converter voltage equation.

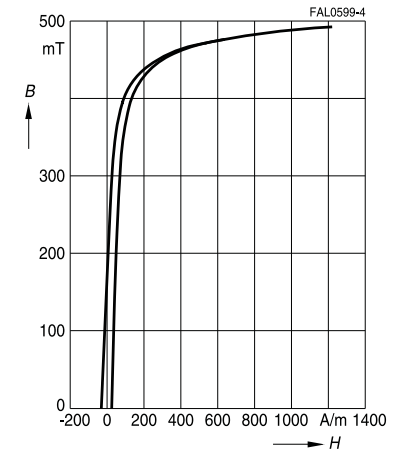
In the design requirements, we know that input voltage varies between the 24V and 48V. Also, push pull converter requires duty cycle which is smaller than the 0.5.

If we put a range for duty cycle such as 0.15 < D <0.3, we can find the necessary turn ratio

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.

In order to put a safety, number of turns can select as 4 turn primary and 4 turn secondary.

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 3.14 mm^2 area which can carry nearly three or four times the expected currents. Then, when we calculate the fill factor, we obtained the following calculation

## **Inductor Design**

In the Push Pull topology, we need an inductor. We assumed that inductor current ripple is around %10 of the maximum output current.

Then, we can write the inductor voltage equation as: