# **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 choise is the TDK Electronics B66335G0000X187 magnetic core. Its effective cross-sectional area is 354 mm^2 .

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