### Core

The core is selected as 00K3515E090 [1]. Our converter has high frequency with a small number of turns, which means the core losses are expected to be the dominant power dissipation component. E cores are better at radiating the core losses than toroid cores albeit worse at radiating the copper losses. Therefore, an E core with the smallest size in the stock is selected.

### Turns Ratio and Magnetizing Inductance

If the duty cycle is assumed to be 0.4, switching frequency 100 kHz and efficiency 0.85, then

If turns are taken as , :

At which point,

In order to stay in CCM:

### Wire Selection

Primary RMS current is calculated as,

Accordingly, the primary wire is selected as 18 AWG and the secondary 20 AWG. In this case, primary current density is and secondary current density is . Fill factor is calculated as:

which is much smaller than 1.

DC resistance of the primary wire:

Core losses per volume per 100mT at 100kHz is given as .

As was expected, at such a high frequency, core losses are larger than copper losses and need E core to dissipate its heat. However, the optimum point of operation, where copper losses are equal to the core losses, can be achieved by decreasing the frequency.S

### Test Results

Once the transformer is wound according to the proposed parameters, it is no-load and short-circuit tested from both sides and the results are the following:

Primary no-load test:

Primary short-circuit test:

Secondary no-load test:

Secondary short-circuit test:

Accordingly, transformer parameters are calculated as follows:

Apparently, leakage inductances are around 10% of the magnetizing inductance, which is acceptable if a suitable snubber is selected. Resistances are also measured to be much higher than calculated. The reason might be the proximity effect which is effective in high frequencies, or due to the neglected core resistance.