# Power calculation

Specifications of project are

Vin(min) =220 V,

Vin(max) =400V,

Pout =100W,

Vout=12V

We have to decide some values for calculation and to get smaller transformer and ripples we decide switch frequency as 100khz. Our system will operate in Discontinuous conduction mode and we decide dwell time as one over ten period time. Also, maximum duty ratio as taken 0.2. Our secondary side diode will operate at high current so we can’t just assume its on voltage as zero volt, before deciding diode we take diode on voltage as 1V. Transformer won’t operate at 100% efficiency and before designing that we assume efficiency as 90%. So decided values are as given.

fs = 100kHz

Ddwell = 0.1

Dmax= 0.2 at 220V and Dmin = 0.11 at 400V

Vdiode = 1 V

ɳtransformer = 0.9

Primary and Secondary powers

Iout(avg)= = 8.33 A

Pdiode = Vdiode x Iout(avg) = 8.33 W

Psecondary = Pdiode + Pout = 108.33 W

Pprimary = Psecondary / ɳtransformer = 120.37 W

Primary side peak current:

For 220 volt source voltage:

Iin(avg) = Pprimary / Vin(min) = 0.55 A

Iin(peak) = 2 x ( Iin(avg) / Dmax) = 5.47 A

For 400 volt source voltage:

Iin(avg) = Pprimary / Vin(max) = 0.55 A = 0.30 A

I in(peak) = 2 x ( Iin(avg) / Dmin) = 5.47 A

Secondary side peak current:

Isecondary(peak) = 2 x (Iout(avg) / (1 - Dmax - Ddwell)) = 23. 80 A

limit of materials

At magnetic design Turn ratio find as 6.

Nturn = 6

For Mosfet:

VDS(max) = Vin(max) + (Vout x Nturn) = 472 V

IDS(peak) = Iin(peak) = 5.47 A

For Diode:

VD(max) = Vout(max) + (Vin(max) / Nturn) = 78.67 V

ID(max) = Isecondary(peak) = 23.80 A