Design of Isolation Transformer

Power output, Po = 1W

Required Specifications are:

2 Primary & 2 Secondary Windings

Input Voltage V_{in} = 24V; Output Voltage V_o = 20V

Efficiency, η = 0.8

Winding factor, K_w = 0.2 (Multiple secondary)

Max Flux density, B_m = (Ferrite core)

Current density, J = 3A/mm^2 (Copper)

Switching frequency ,f_s = 10kHz

Using Area product method for Design:

Area Product

$$A_p = A_c.A_w = \frac{P_0 \times (1 + \frac{1}{\eta})}{\sqrt{2} \times J \times K_w \times f_s \times B_m}$$,A_c = Core Area

,A_w = Window Area

Substituting values we get:

A_p = 13.258 x 10^4 mm^2

We have selected EE42/21/15 based on area product from the standard core table and availability in market.

Specifications of EE42/21/15 are:

A_c = 182 mm^2

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No. of Turns ,

V_{in} = 24V ; V_o = 20V

$V_{in} = 2.N_p.A_c.B_m.f_s$

$V_o = 2.N_s.A_c.B_m.f_s$

Substituting values we get :

$N_p = 32.96 \approx 33$ turns

$N_s = 27.47 \approx 28$ turns

Gauge of Wire ,

Primary Gauge , $\alpha_p = \frac{I_p}{J} = \frac{0.735}{3} = 0.245\ mm^2$

SWG based on value of $0.245\ mm^2$ is SWG 24

Secondary Gauge , $\alpha_s = \frac{I_s}{J} = \frac{0.333}{3} = 0.111\ mm^2$

SWG based on value of $0.245\ mm^2$ is SWG 28

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