

Forward circuit design

Ac input voltage range:85~132V

Ac input frequency range::47~63HZ

Dc output voltage range:4.5~5.5v

Working frequency 200KHZ

Duty cycle selection 0.42

$T=f/1=4\mu s$

$t_{on}=D*t=2.1\mu s$

transformer 次级电压

$V_2=(V_o+V_1+V_f)T/T_{on}*V_{out}=14.8v$

V_o 为 output voltage v_1 为输出扼流圈二次电压。 V_f output diode voltage 压降

$N=V_2/V_1(\text{初级电压})=14.8/100=0.148$

$N_1=V_{1min}*V_{onmax}/B_m*S*10000$

$N_2=V_{2min}*t_{onmax}/B_m*S*10000=1.83=2 \text{ 匝}$

$B_m=200 \text{ Ae}=85$

$N_1=N_2/N=13.5=14 \text{ 匝}$

为了补偿二次侧所需的电压 V_2 必须足够。故还要对 T_{ONmax} 补偿计算。

$V_{on}=(V_{omax}+V_1+V_f)*t/V_{2min}=5.5+0.2+0.2*5/14.8=2.09$

又因为 $D=t_{on}/t=2.09/5=0.418$

问 N_1 与 N_2 的线经粗细是如何计算?

Dc output filter 计算。

扼流圈电感阻值

(ΔI 取 output current 2%~5%)

$$I = I_o * 0.05 = 20 * 0.05 = 1 \text{ A}$$

$$I = \frac{V_{2\min} - (V_f + V_{\max})}{L} * V_{\max}$$

$$I = \frac{V_{2\min} - (V_f + V_{\max})}{L} * V_{\max} = 18.4 \text{ UH}$$

Dc output capacitor(输出电压取 0.3%~0.5%)

$$I = (0.3 \sim 0.5) * V_o / 100 = 15 \sim 25 \text{ m ohm}$$

$$\text{ESR} = U/i = 15 \sim 25 / 1 = 15 \sim 25 \text{ m ohm}$$