EE 464 SOFTWARE PROJECT-2

Vimin=24 VDC, Vimax=48 VDC, Vo=5 VDC, turn ratio is chosen 3 so as not to Dmax to be higher than 0.5.

Since there will be a voltage drop on transistor around 1 VDC and on diode around 0.7 VDC. Input voltages will be taken into calculations as 23 VDC and 47 VDC while output voltage will be taken as 5.7 VDC.

When a lossless conversion is assumed, input power(Pin) should be equal to the output power (Pout).

In this next step, current ripples will be calculated in primary and secondary sides by applying voltage-second law to magnetizing inductor. Switching frequency is chosen as 32 kHz since basic microcontrollers can generate maximum PWM at 32 kHz.

It is desired to have maximum current ripple 1 A at most.

Since components will be chosen according to worst case, Lm will be set as 400µH. Secondary current can be found since primary current and turn ratio are known.

One important parameter which is needed to calculate is ripple current of capacitor for Δcomponent selection. We will assume that capacitor can deliver a constant 6A to load when primary switch is ON to simplify calculations.

Voltage ripple at the output was assumed as constant before to simplify calculations. Since it is an important design parameter it will be calculated by calculating capacitor voltage which is connected parallel to load.

Table 1. Electrical parameters of the convertor circuit

|  |  |  |
| --- | --- | --- |
|  | 24 VDC | 48 VDC |
| Dmax | 0.424 | 0.265 |
| Iin (A) | 3.5 | 2.65 |
| ΔIin(A) | 0.76 | 1 |
| Iin-max(A) | 3.88 | 3.15 |
| Iin-min(A) | 3.12 | 2.15 |
| Isec (A) | 10.5 | 8.25 |
| ΔIsec(A) | 2.3 | 3 |
| Isec-max(A) | 11.65 | 9.75 |
| Isec-min(A) | 9.35 | 6.75 |
| Icap (A),OFF | 4.5 | 2.25 |
| ΔIcap(A),OFF | 2.3 | 3 |
| Icap-max(A),OFF | 5.65 | 3.75 |
| Icap-min(A),OFF | 3.35 | 0.75 |
| Icap(A),ON | -6 | -6 |
| ΔVout(V) | 0.050 | 0.016 |
| Vrip(%) | 1% | 0.32 % |