Full – Bridge Power Switching Converter

4 diode rectifier arrangement

Component values: L = 50uH, C = 22uF, fs = 50 kHz, Rload = 2 Ohms, DC supply = 24 V

1st simulation: D = 0.2, initial condition L = 0A, C = 0V



For a full bridge converter, the voltage output of an ideal converter can be calculated by Vout = (2VinD)/n. In our simulation, the turn ratio is 1 in our simulation. Vout we predict is 9.6V. The current output should be 9.6V/2ohms = 4.8A. Here is our simulation result.



By the graph, we observe the voltage output is 7.6V and the current output is 3.8A. This is cause by the diode voltage drop of the output part of the circuit. Each diode has around 1V of voltage drop. On the on period of switch T1 and T3, the output current flows throw diode DS1 and DS3. On the on period of switch T2 and T4, the output current flows throw diode DS2 and DS4. That means the output current will always flow throw 2 diode and that will cause a voltage drop of 2V in total. That explains why the output voltage is 2V lower that the calculated value.

The current across the switch 1 and 2:



In this simulation, the duty cycle of the switch is 0.2. Switch 1 switch on for 4ms and there is a deadtime for 6ms, then the switch 2 switch on for 4ms then 6ms deadtime again. 40% off the left hand side circuit is conducting for a duty cycle of 0.2. The current increase when the switch in on due to the inductor from the right hand side circuit.

The current across the Diode 1 and 4 on the left hand side circuit:



The current across the diode 1 is around 3.8A when the switch 1 is on, and then the current is halved at the deadtime between two switches. Current across diode 4 behave same, as diode 1 except it is 1800 out of phase. The peek current waveform is same as switch current waveform when the switch is on. The current is then halved because on the deadtime of the switches, the inductor current can pass through both diode, no current flow through the secondary winding of the transformer. The sum of the diode current would be the inductor current.

Voltage across switch 1 and 2:



The voltage across