Fundamentals of Power Electronics
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Lecture - 60
Octave mfile for design

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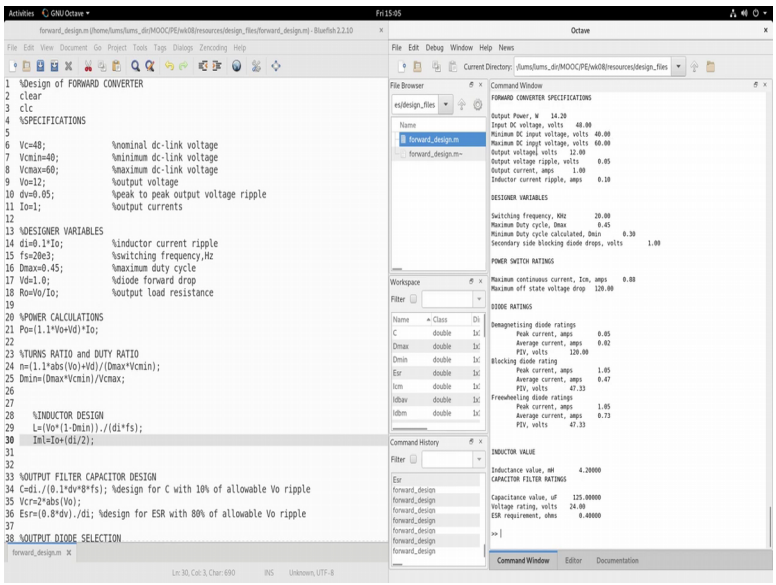

I have here on the screen on the left side, a text editor and on the right side I am having the octave workspace screen. You could either use octave or MATLAB both are compatible and on this text editor, I have here m file, forward design dot m file. This is basically an m file a text ASCII file, where I am trying to summarize, the equations in to make some kind of a semblance for design.

Now, designer first I am using clearing the screen and clearing the variables. in a systematic way let us first make the specifications. So, the input voltage specification, 48 volts nominal, DC link voltage we call that , the input VI can take a minimum value or a maximum value, you should design for worst case. So, this example takes care of variations, you have a minimum value of the DC input and the maximum value of the DC input.

V naught, let us say you want it for 12 volts. There is a delta V, there is output voltage ripple peak to peak ripple of 0.05 times 0.05 and I naught is 1 amp, this is the output current. So, designer variables delta I is 10 percent of I naught fs is 20 kilohertz, Dmax

do not go beyond 0.544 you do not go beyond 0.5. So, to be on the safer side I have kept it at 0.45 and you can calculate R0

Now, power calculation P naught is V naught 1.1 to account for winding losses plus the Vd diode drop will be the output, on the secondary side the voltage into I naught. The turns ratio, you can calculate the turns ratio, I will use D max value and Vcmin when D max occurs, input voltage is minimum and when the input voltage is maximum D is minimum. So, D minimum you can calculate using that v v i min into D max is equal to v i max into Dmin and find out the value.

Inductor design like we discussed, I have here the equation and I naught plus delta i by 2 will be the peak inductor current.

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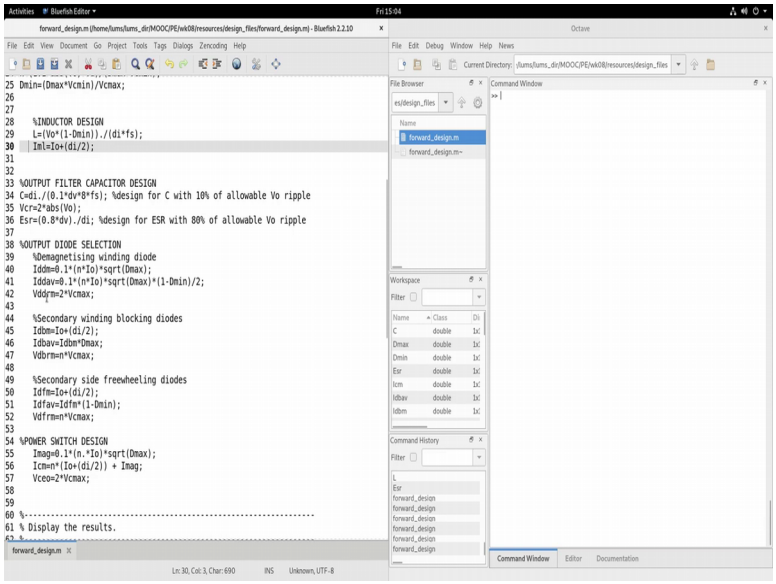

Likewise, you can design the output capacitor C the voltage across the capacitor voltage rating and the Esr values also. Output, the diode selections the currents through the demagnetizing diode, average current, peak current and the voltage peak inverse voltage. Likewise the blocking diodes, peak current, average current, peak inverse voltage. As we discussed put in the formulas there and the power switch rating also can be selected in this fashion putting the equations have a look at it.

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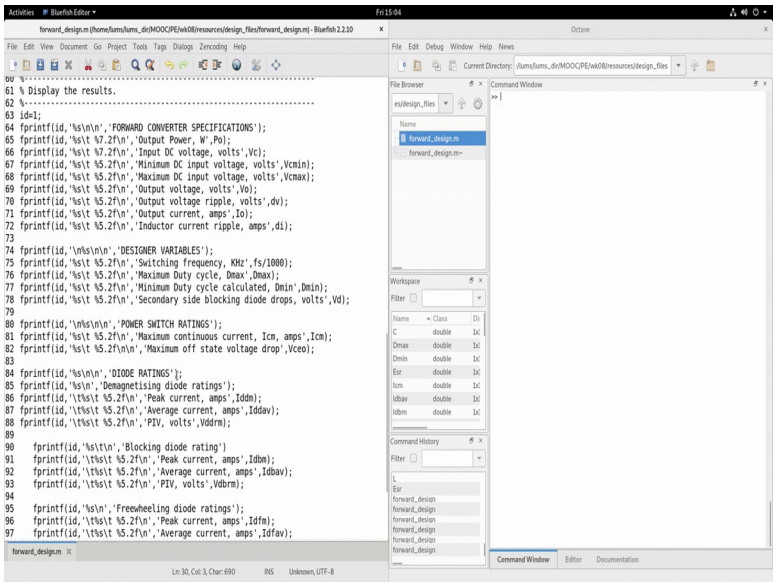

After the equations we need to have one more important program section, which is the display of the results. So, I am using f print f, both MATLAB octave will permit that.

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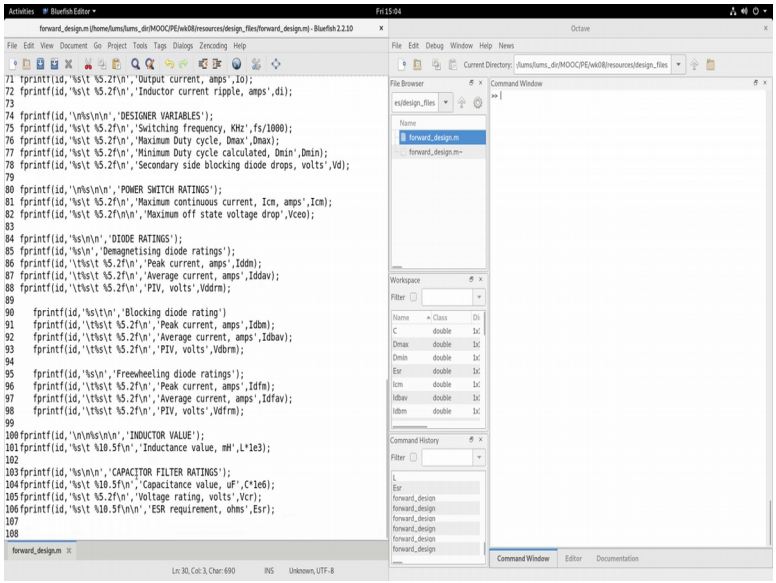

So, FARWARD CONVERTER SPECIFICATIONS, start printing the spec, designer variables, then the switch ratings, diode ratings, blocking diode ratings, inductor value and the capacitor value use the variables and then give meaningful statements.

Now, this if you run executed, it will design the values for these set of specifications. Now, let us run that and see I am already in that resource file, resource folder. You can

see that in octave workspace forward design, let me run that. So, on typing forward design do not put dot m just without the dot m. So, you execute it, you will see that the, all the commands are executed, you get the specs, the designer variables and then the power switcher ratings, diode ratings, all are calculated and you get the entire design of the forward convertor.

We have not include the transformer here, because we have not studied the transformer. Once, we do the study of the transformer and inductor magnetics, which I will do in the next session, then you will be able to use the magnetics portion of the design also and then we will update this file to include the magnetics design. I will request that you do a similar such m file for flyback converter also and try it out.