Control Circuit for the Switching Power Supply

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3/15/2011

Contents

1 The Differential Equation

Here I will place the set of two differential equations for the currents in the two loops of the buck converter circuit. This circuit consists of of an inductor, a diode considered on for this cycle, a load resistor and a capacitor. The solutions require initial conditions, which are determined only when the circuit reaches stability after many many cycles.

2 The Laplace Transform

Here I will place a solution for one cycle of the buck converter circuit using the Laplace Transform.

3 The Buck Converter

See the documents:

http://en.wikipedia.org/wiki/Buck_converter
c:\je\pdf\buckconverter.pdf
http://www.ecircuitcenter.com/Circuits/smps_buck/smps_buck.htm
c:\je\pdf\buckconverterecircuitcenter.pdf

Schematic:
http://www.stem2.org/je/buck.pdf

Spice example for buck converter

```
BUCK_BASIC.CIR - BASIC BUCK CONVERTER
*
* SWITCH DRIVER
VCTRL 10 0 PULSE(0V 5V 0 0.01US 0.01US 5US 20US)
R10 10 0 1MEG
*
* INPUT VOLTAGE
VIN 1 0 DC 20
*
* CONVERTER
SW1 1 2 10 0 SW
D1 0 2 DSCH
L1 2 3 50UH
C1 3 0 25UF
*
* LOAD
RL 3 0 5
**
.MODEL SW VSWITCH(VON=5V VOFF=0V RON=0.01 ROFF=1MEG)
.MODEL DSCH D( IS=0.0002 RS=0.05 CJO=5e-10 )
*
* ANALYSIS
.TRAN 1US 800US
*.TRAN 0.1US 840US 800US 0.1US
*
* VIEW RESULTS
.PLOT TRAN V(2) V(3)
.PROBE
.END
```