ECE 5472 Power Electronics

BOISE STATE UNIVERSITY

Lecture 16

Oct. 1, 2010

Harmonics

triAC

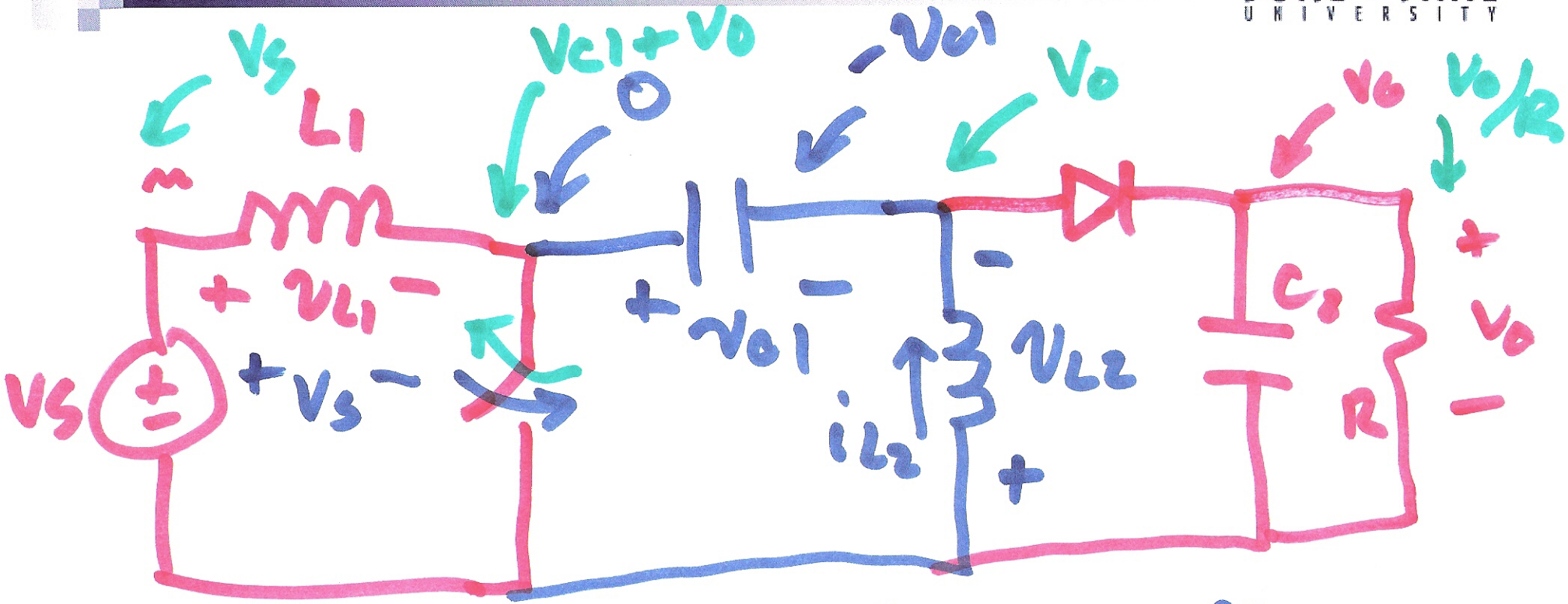
Single-ended Primary Inductance converter (SEPIC)

Diac

thyristor

1)

SEPIC



switch closed

$DT = t_{on}$

$-v_{C1} = -v_{L2}$

$v_{C1} = v_{L2}$

* $v_{L1} = v_s = L_1 \cdot \dfrac{\Delta i_{L1}}{DT}$ $\quad = L_2 \cdot \dfrac{\Delta i_{L2}}{DT}$ *

2)

switch off

$t_{off} = (1-D)T$

$$* \; v_{L1} = V_S - V_{C1} - V_O = L_1 \frac{\Delta i_{L1,off}}{(1-D)T}$$

$$* \; v_{L2} = -V_O = L_2 \cdot \frac{\Delta i_{L2,off}}{(1-D)T}$$

$$V_S - \cancel{V_{L1}}^{0} - V_{C1} - V_O = 0$$

$$V_S = V_O - V_{C1}$$

3)

$$V_s - \cancel{v_{L1}}^{0} - v_{c1} + v_{L2} = 0$$

$$V_s = v_{c1}$$

When switch is closed

$$v_{L1} = V_s$$

switch is open

$$v_{L1} = -V_0$$

$$(v_{L1,\text{switched}})DT + (v_{L1,\text{switch open}})(1-D)T$$

V_s ↑ $-V_0$ ↗ $=0$

4)

$$V_0 = V_S\left(\frac{D}{1-D}\right)$$

$$V_S \cdot I_S = V_0 \cdot I_0$$

$$V_S \cdot I_{L1} = V_0 \cdot I_0 \rightarrow \frac{V_0}{R}$$

$$I_{L1} = I_S = \frac{V_0 I_0}{V_S} = \frac{V_0^2}{V_S \cdot R}$$

$$V_{L1} = V_S = \left(\frac{di_{L1}}{dt}\right) = L_1\left(\frac{\Delta i_{L1}}{\Delta t}\right)$$

$$= L_1\left(\frac{\Delta i_{L1}}{DT}\right)$$