# ECEN 4797/5797

Introduction to Power Electronics

Lecture #6

Wednesday, September 4, 2009

Steady State Converter Analysis:

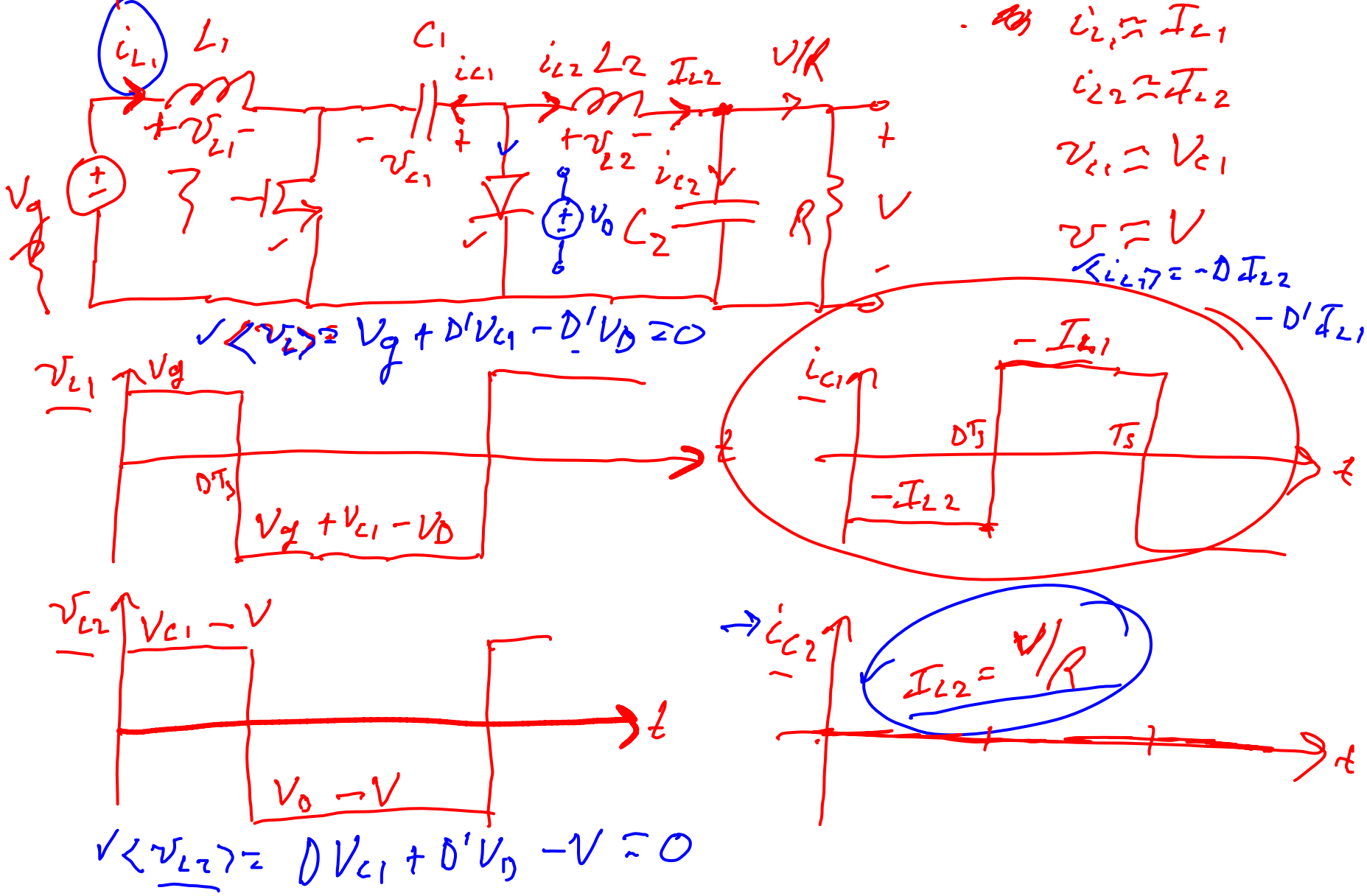
Conduction Losses & Equivalent Circuit Modeling

(Finish examples)

Introduce Chapter 4: Switch Realization

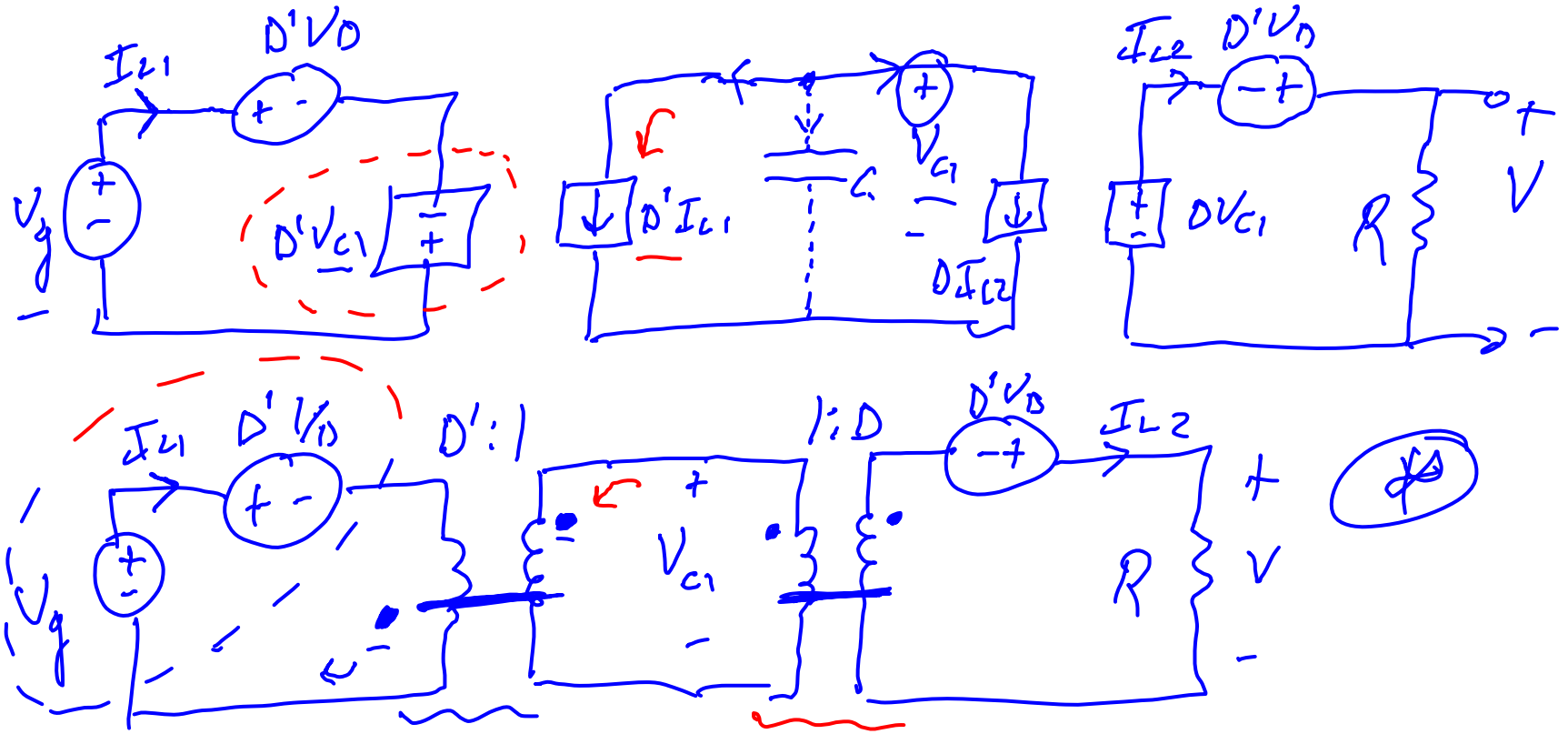
Prof. Regan Zane

# Cuk Converter Example

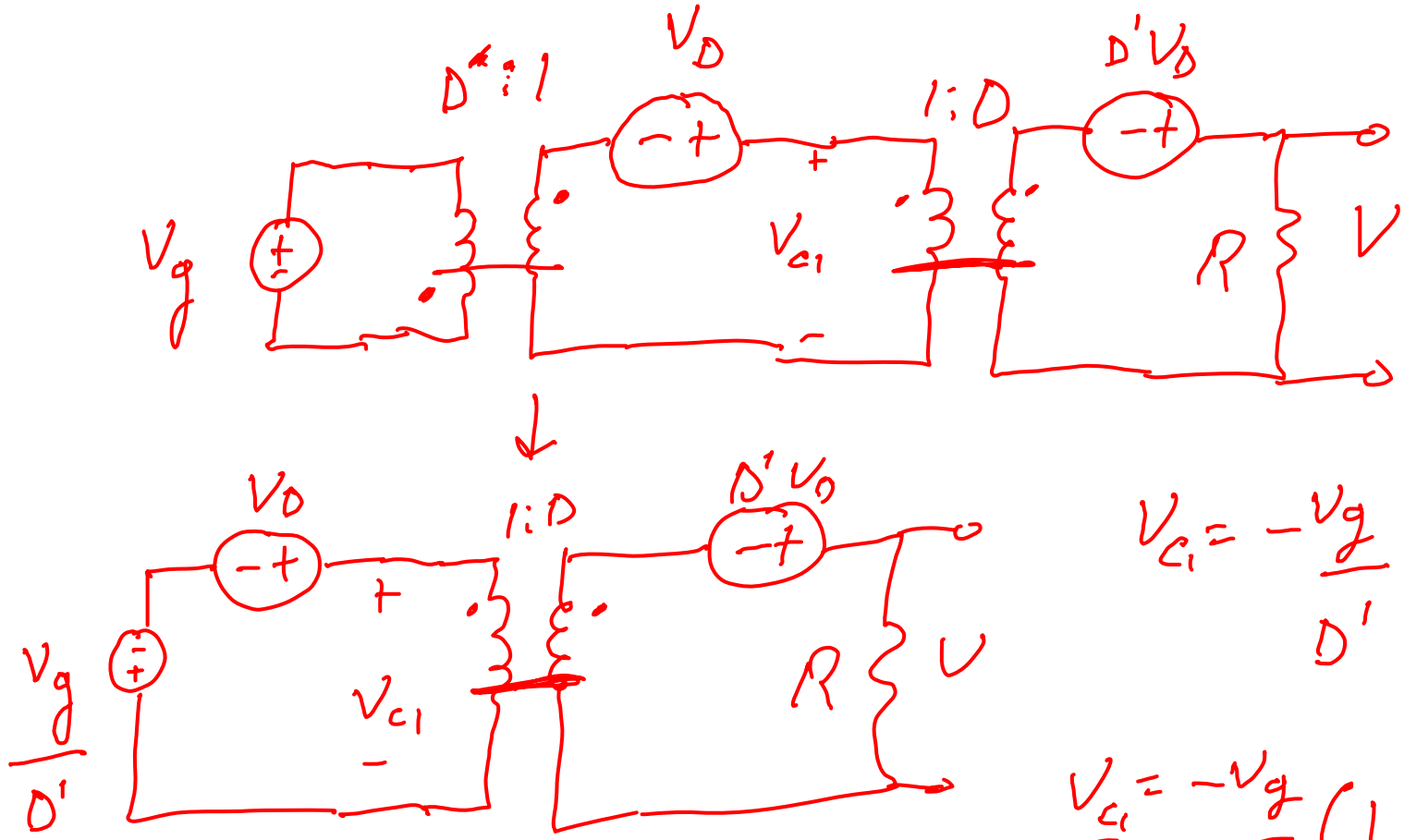


$$\langle v_{L1} \rangle_{T_s} = V_g + D' V_{c1} - D' V_D = 0 \qquad \langle i_{C1} \rangle_{T_s} = -D I_{L2} - D' I_{L1} = 0$$

$$\langle v_{L2} \rangle_{T_s} = D V_{c1} + D' V_D - V = 0 \qquad \langle i_{C2} \rangle_{T_s} = I_{L2} - \frac{V}{R} = 0$$

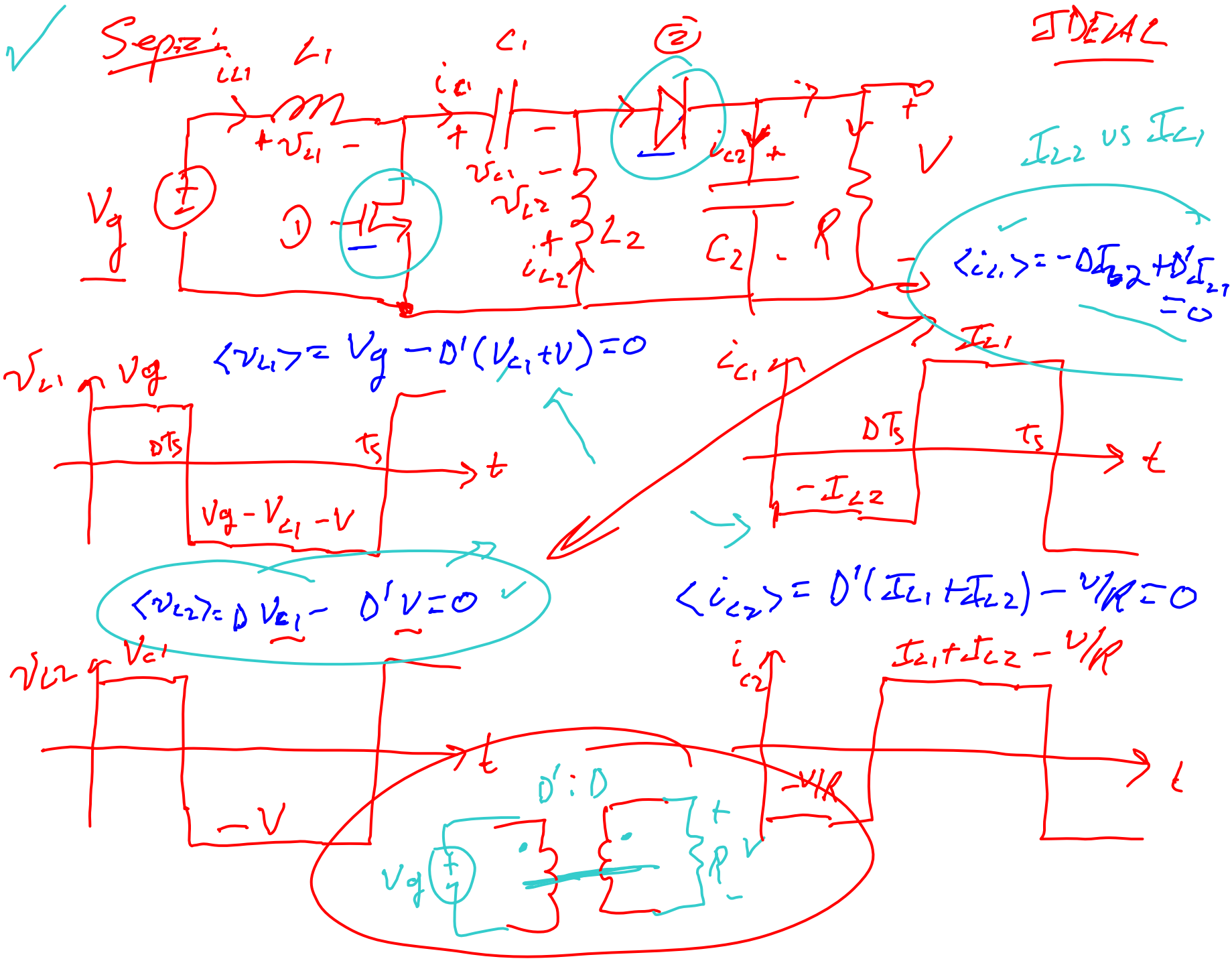



ideal: $V_D \to 0 \Rightarrow \dfrac{V}{V_g} = M(D)_{ideal} = -\dfrac{D}{D'} = -\dfrac{D}{1-D}$




$$V_{c_1} = -\frac{V_g}{D'} + V_D$$

$$V_{c_1} = -\frac{V_g}{D'}\left(1 - D'\frac{V_D}{V_g}\right)$$


Sepic
IDEAL
$L_1$
$C_1$
$L_2$
$C_2$
R
$V_g$
V
$I_{L2}$ vs $I_{L1}$
$\langle i_{L1} \rangle = -DI_{L2} + D'I_{L1} = 0$
$\langle v_{L1} \rangle = V_g - D'(V_{C1} + V) = 0$
$\langle v_{L2} \rangle = DV_{C1} - D'V = 0$
$\langle i_{C2} \rangle = D'(I_{L1} + I_{L2}) - V/R = 0$
DTs
Ts
t
$V_g - V_{C1} - V$
$-I_{L2}$
$I_{L1}$
$V_{C1}$
$-V$
$I_{L1} + I_{L2} - V/R$
D' : D
$-V/R$