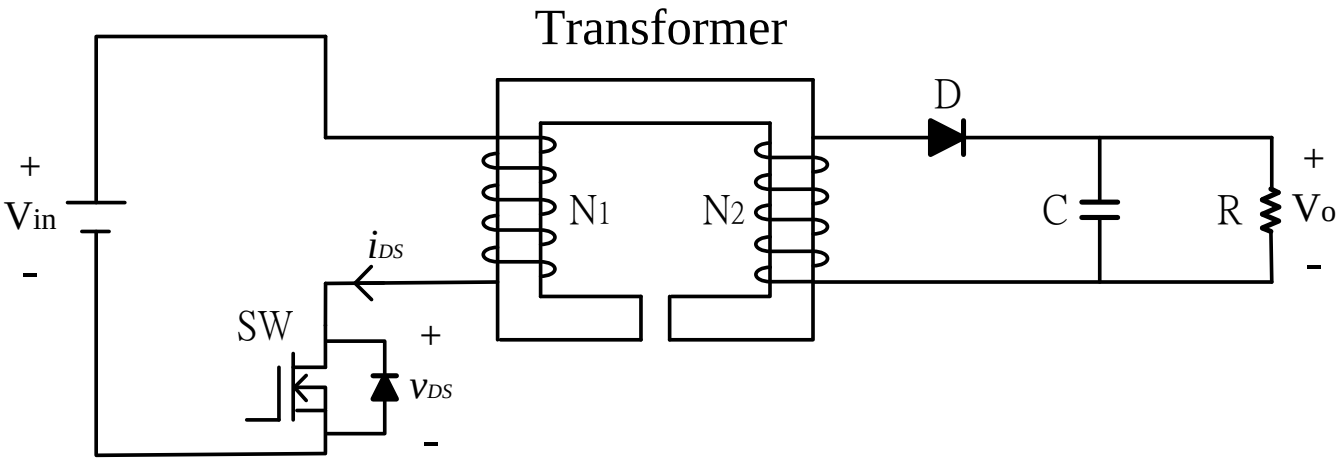
太陽能光伏電子系統理論與應用

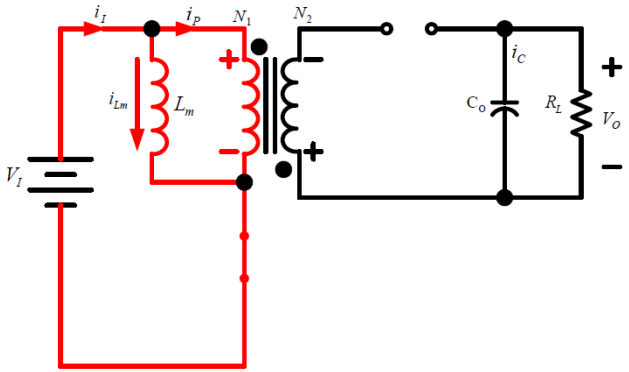
返馳式轉換器
Flyback Converter

實習課上課講義：2013/05/20

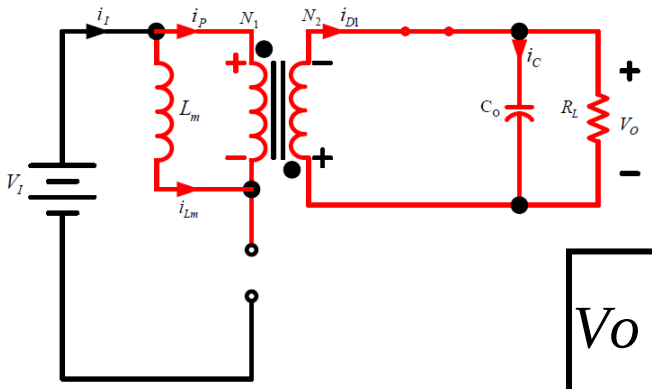
Flyback Converter Operation



Mode 1



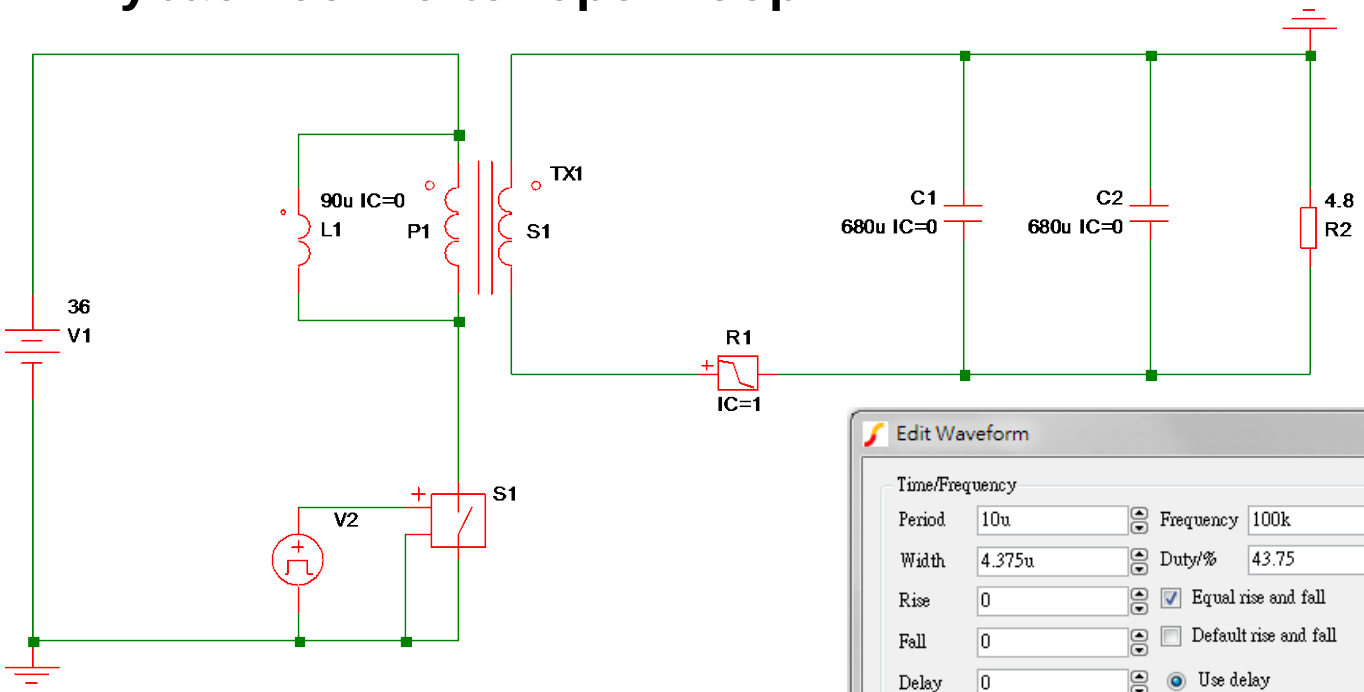
Mode 2

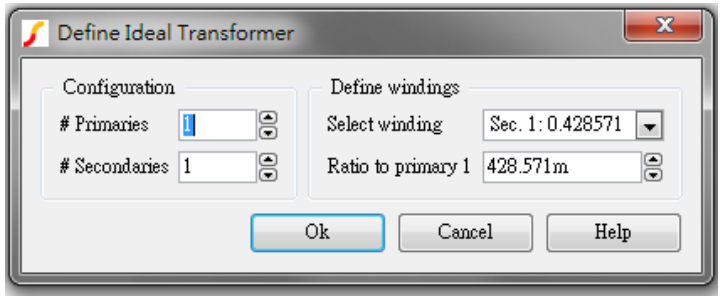


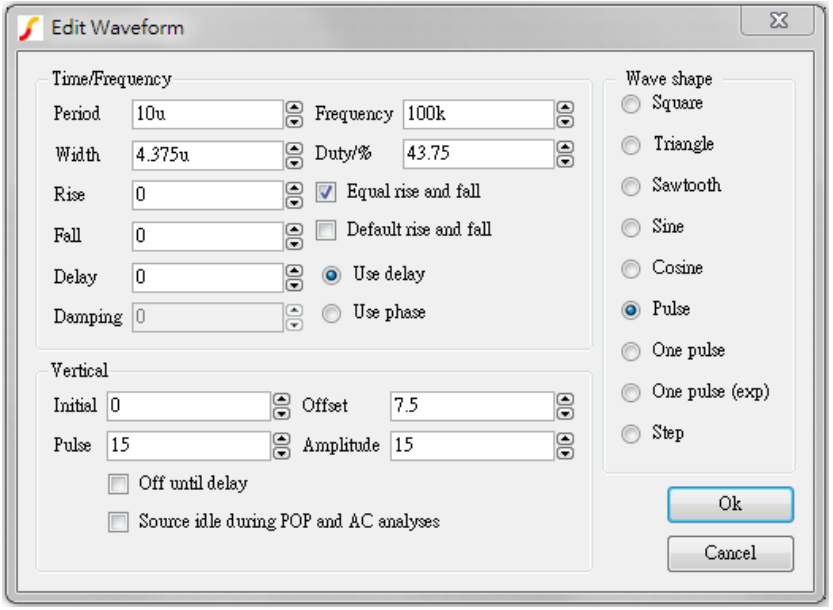
$$Vo = \frac{N_2}{N_1} \times \frac{D}{1-D} \times Vin$$

SIMPLIS Simulation

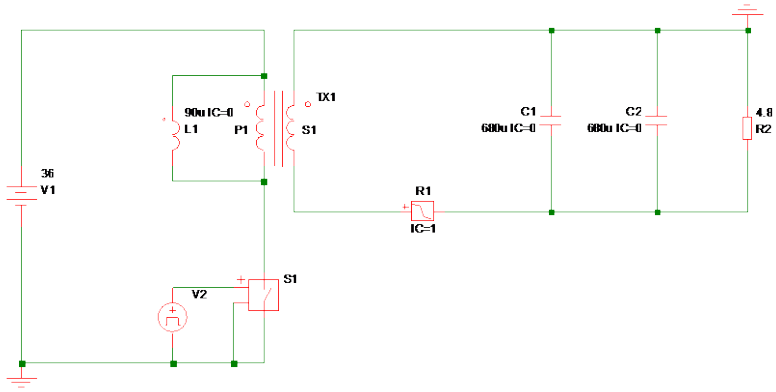
- Flyback converter open-loop

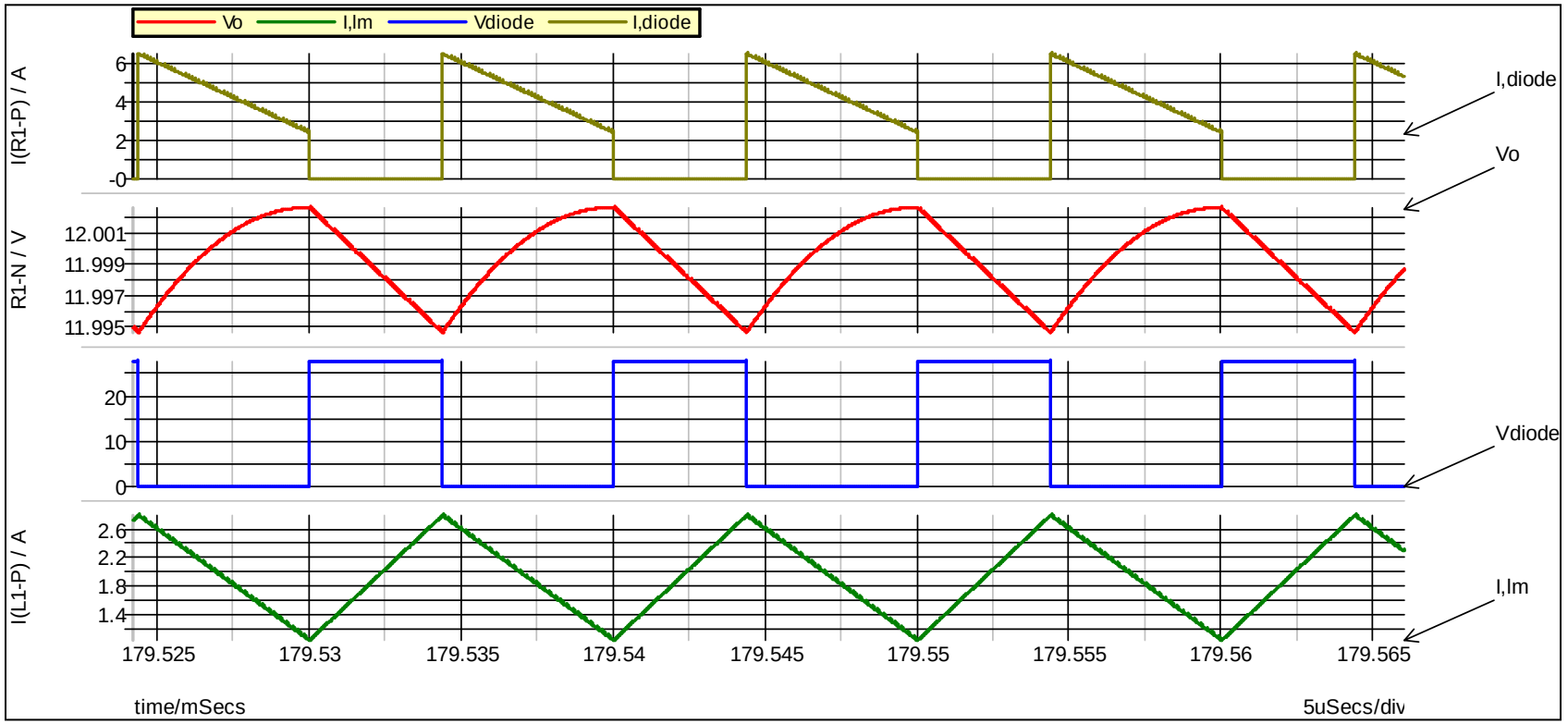




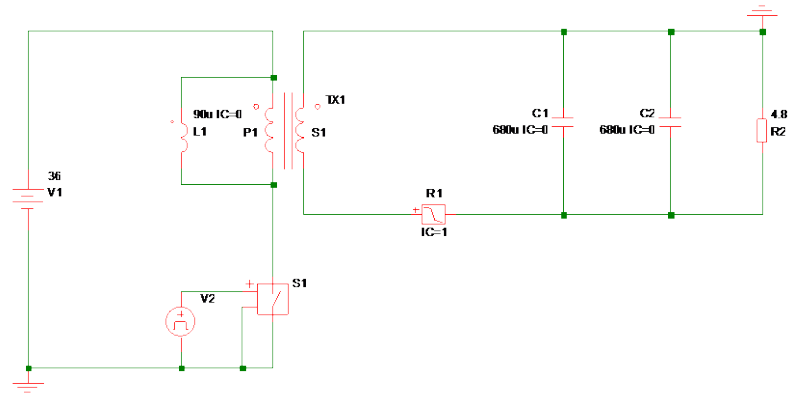


Simulation Result





CCM VS DCM



- Inductor & Capacitor Design

- 參考講義"ch4_太陽光電能之直流直流隔離", page13 , page20

$$L_m > L_{mB} = \frac{V_O}{n^2 I_{OB}}(1-D)T_S \quad \text{for CCM condition} \quad (13)$$

$$\frac{\Delta V_O}{V_O} = \frac{DT_S}{R_L C_O} \times 100\% \quad (20)$$

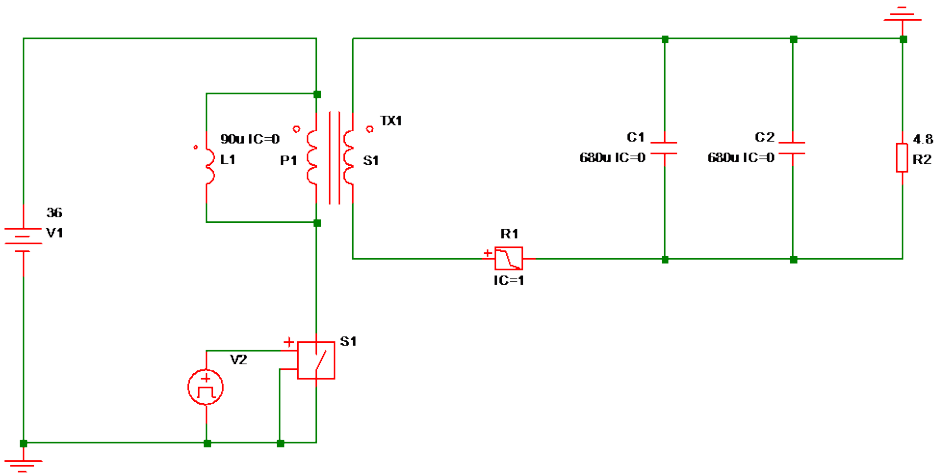
Homework

1. 輸入電壓換成 48V, 56V, 找出正確的duty cycle, 使輸出穩定在12V

2. 承上，輸入電壓48V時，固定duty cycle, 將負載換成 6Ω, 12Ω, 觀察輸出電壓的變化，並加以說明討論

3. *BONUS: 重新設計電感電容值, 使電路在Vin = 56V, Io = 0.2 A的情形下可以操作在CCM，輸出電壓漣波 < 1%*Vo

作業打成PPT報告，含
作業、上課模擬檔
壓縮成一個檔案上傳



Voltage Mode VS Current Mode

Voltage mode

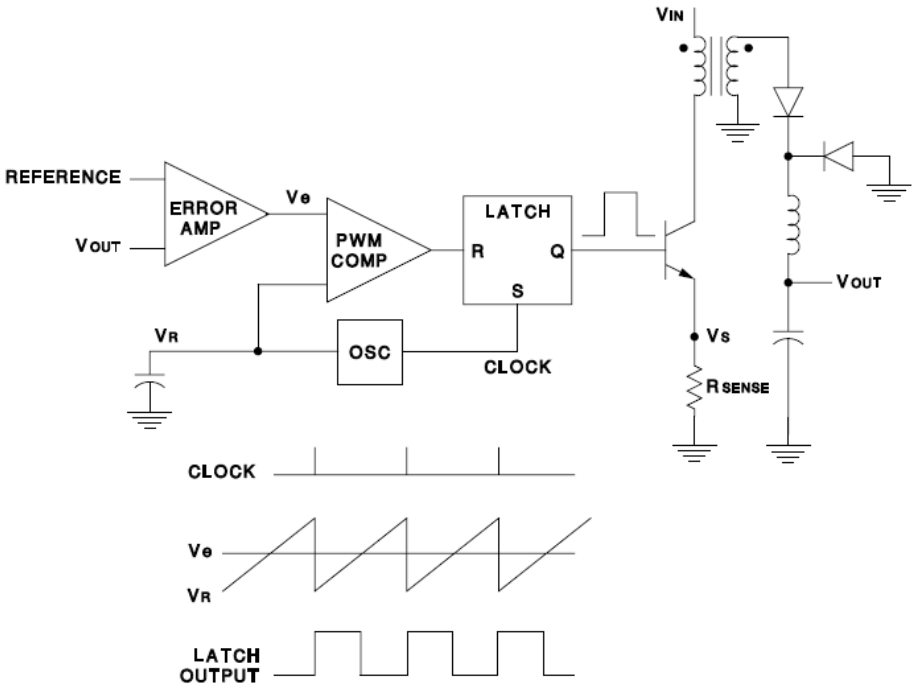


FIGURE 1. VOLTAGE MODE CONTROL

current mode

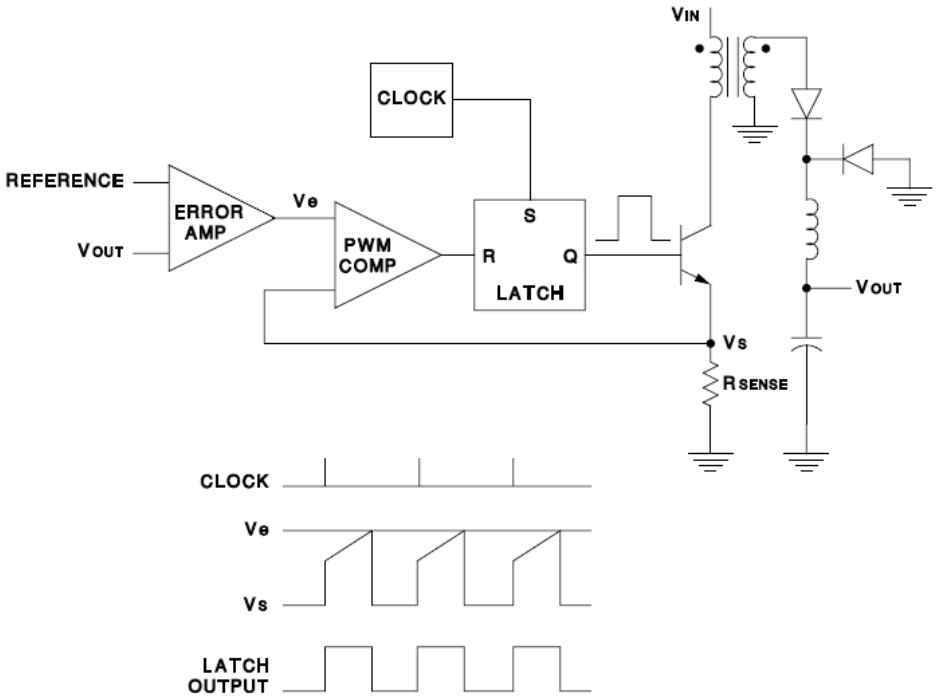
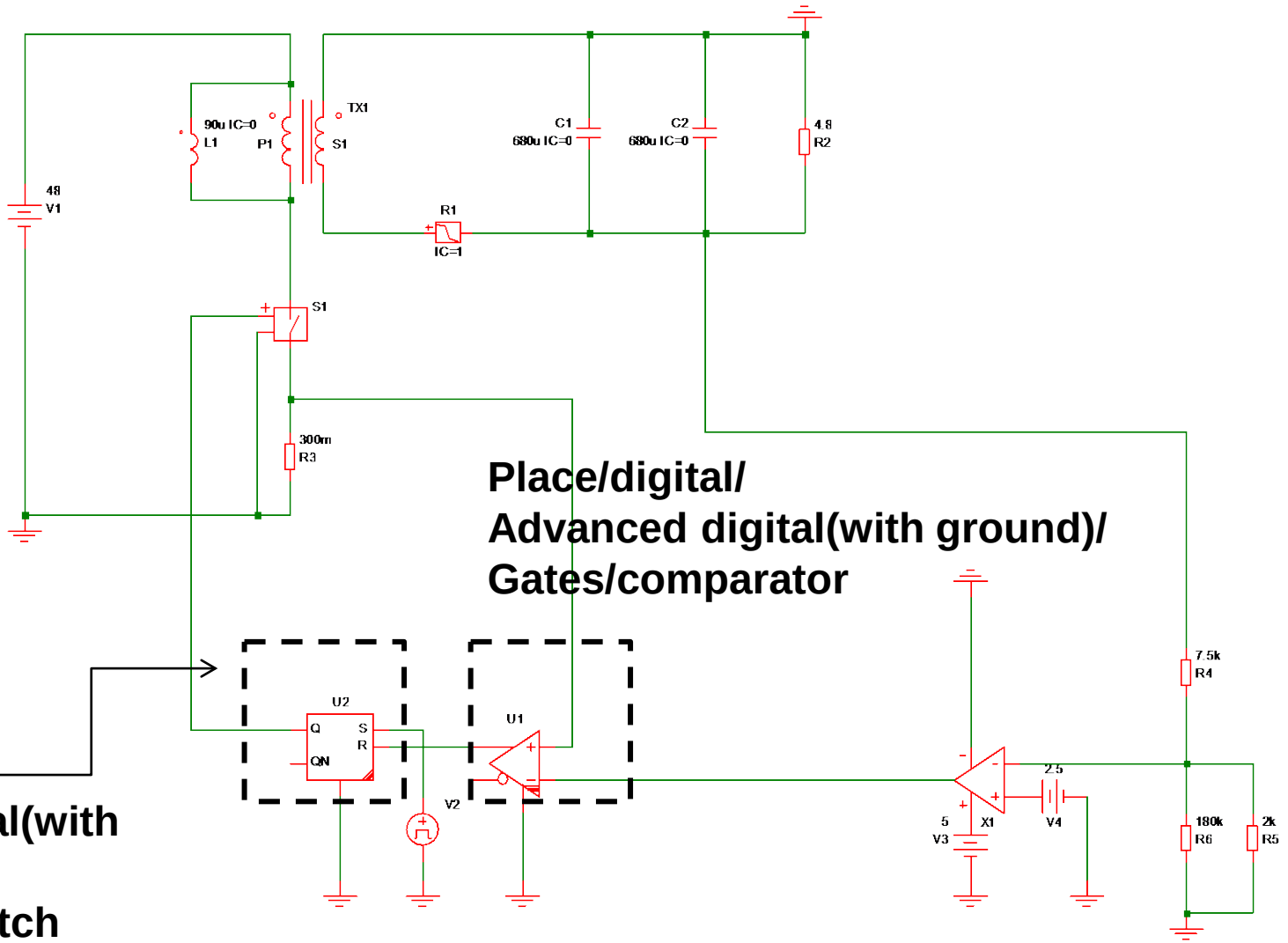


FIGURE 2. CURRENT MODE CONTROL

SIMPLIS Simulation

- Flyback converter closed-loop

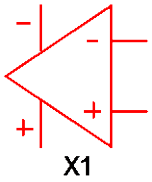


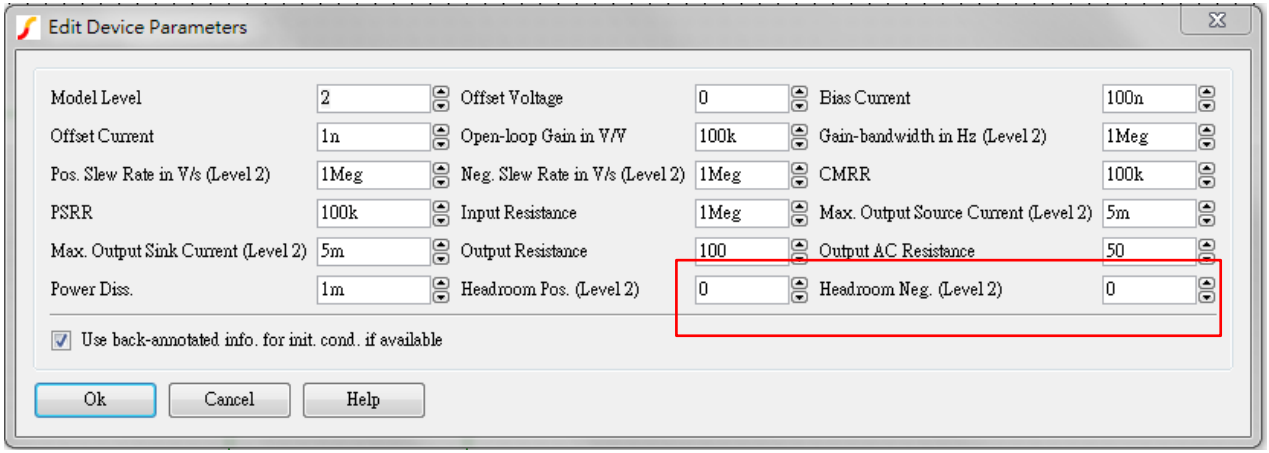
Place/digital/
Advanced digital(with ground)/
Gates/comparator

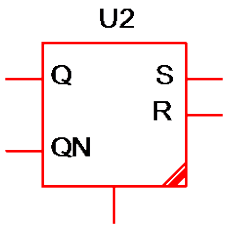
Place/digital/
Advanced digital(with ground)/
Latches/ S/R Latch

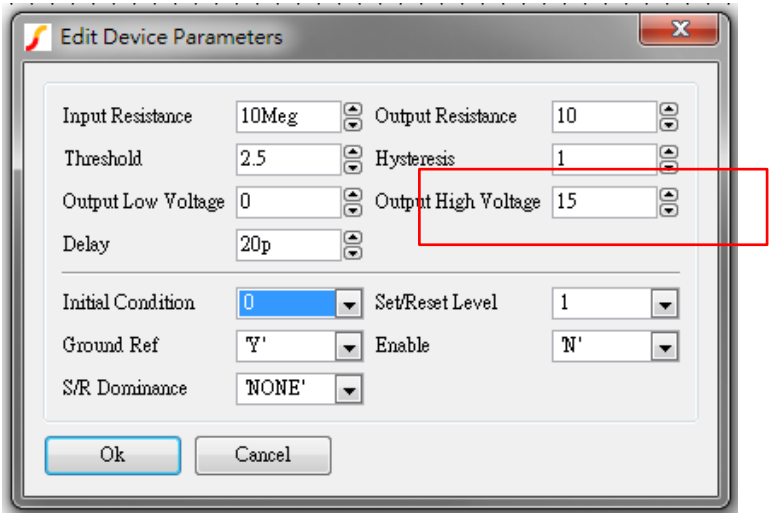
Simulation Setting

OP amplifier



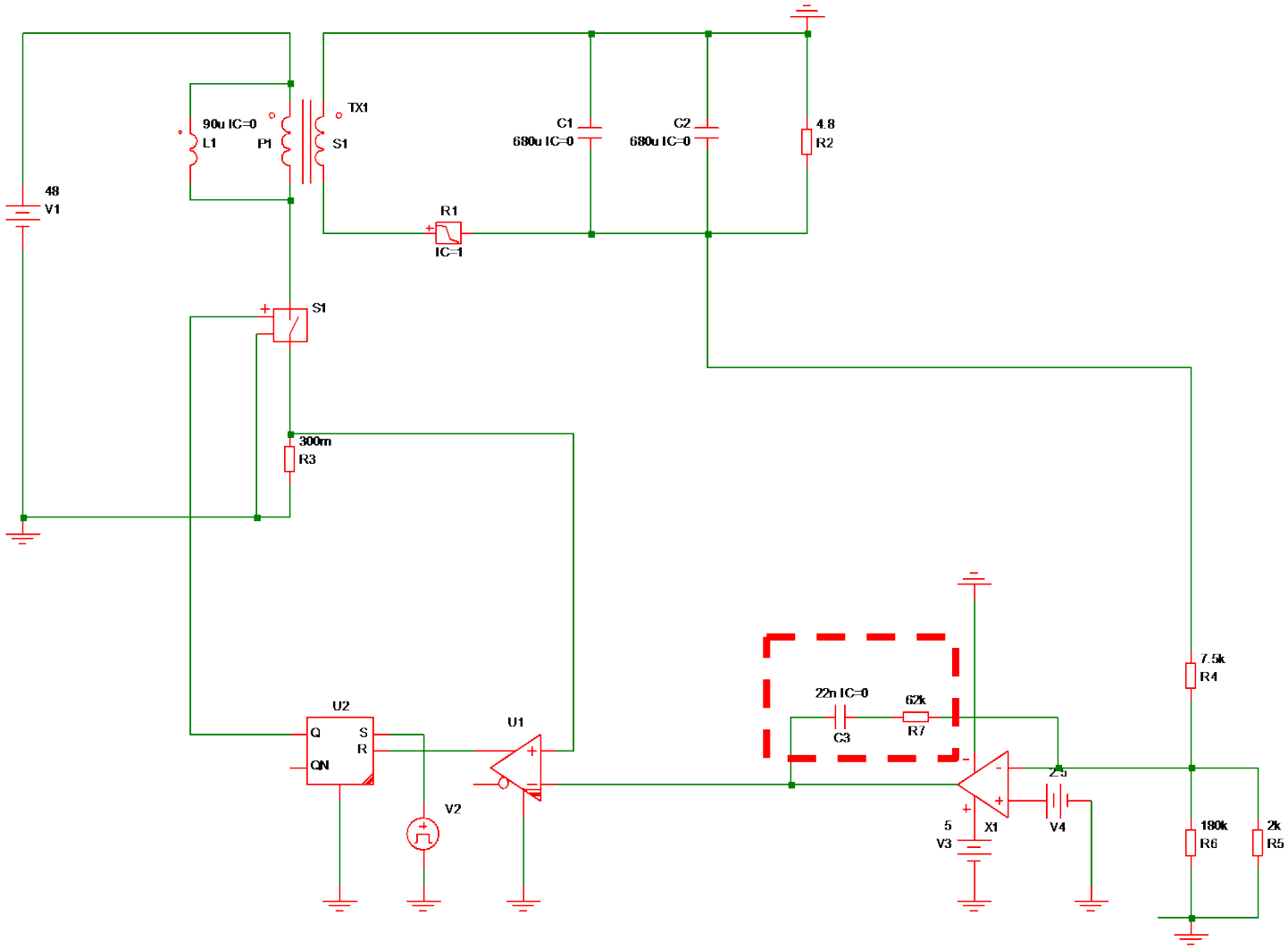






SIMPLIS Simulation

- Flyback converter closed-loop with **compensator**



Flyback converter closed-loop with IC UC3842