

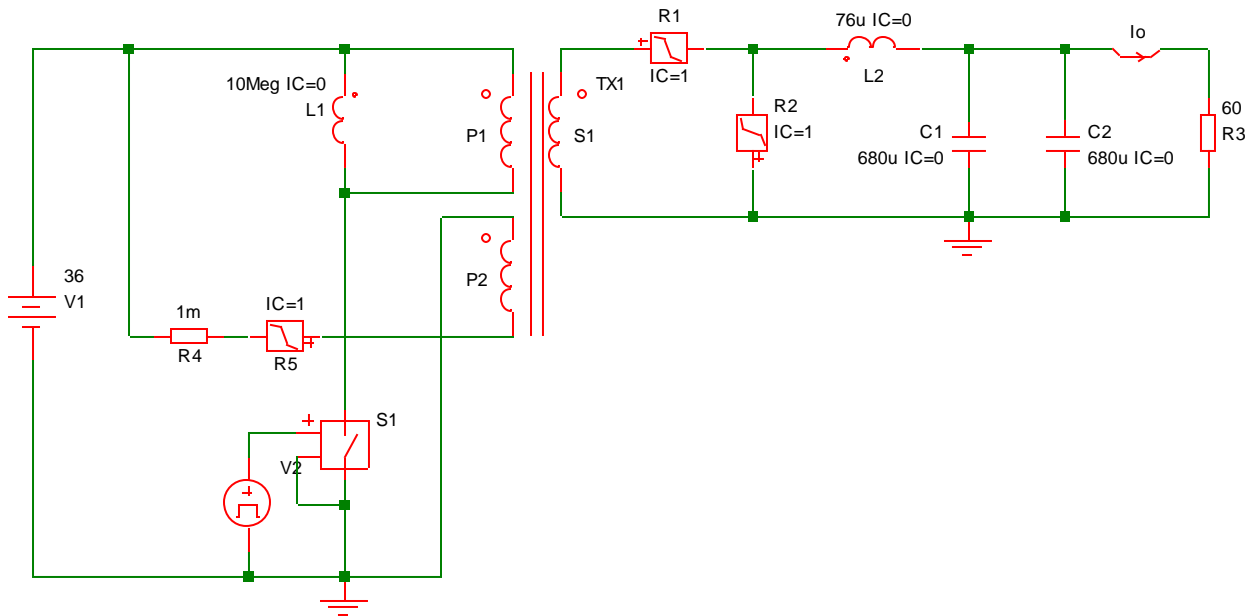
太陽能光伏電子系統理論與應用

順向式轉換器 Forward Converter

實習課上課講義：2013/5/27

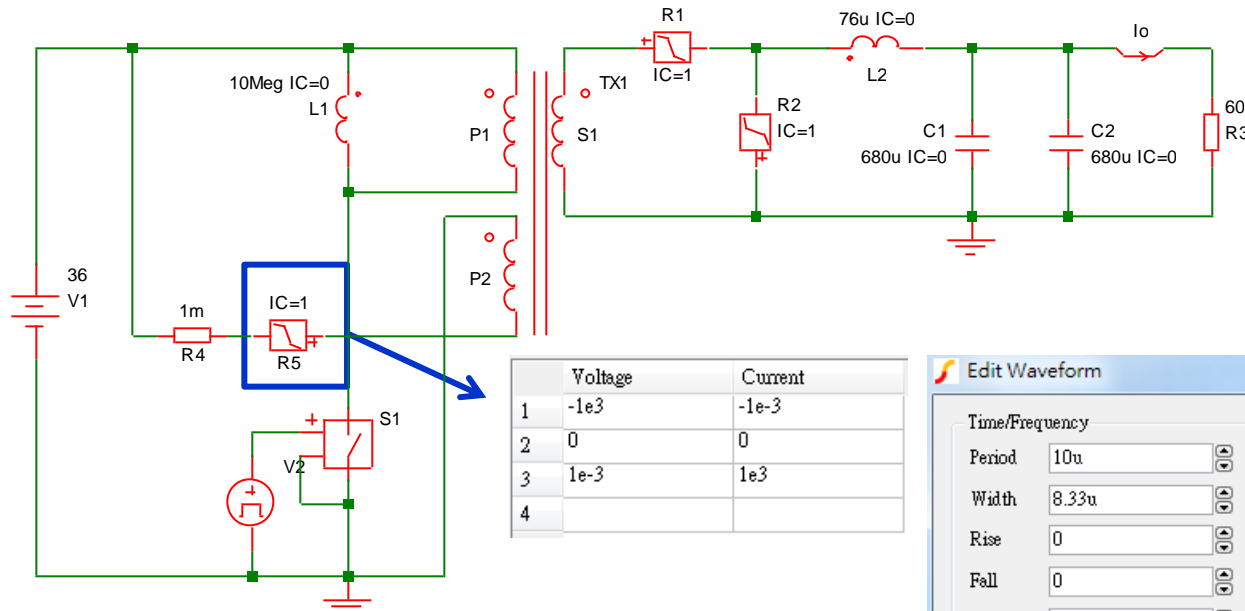
SIMPLIS Simulation

□ Open-Loop Forward Converter



V_{in} (V)	36~56
V_o (V)	12
f_{sw} (Hz)	100 k
I_o (A)	0.2~3.6
ΔV_o (V)	$< 0.1V_o$

SIMPLIS Simulation



	Voltage	Current
1	-1e3	-1e-3
2	0	0
3	1e-3	1e3
4		

Define Ideal Transformer

Configuration

Primaries: 2

Secondaries: 1

Define windings

Select winding: Prim. 2: 1

Ratio to primary 1: 1

Ok Cancel Help

Configuration

Primaries: 2

Secondaries: 1

Define windings

Select winding: Sec. 1: 0.4

Ratio to primary 1: 400m

Edit Waveform

Time/Frequency

Period: 10u Frequency: 100k

Width: 8.33u Duty/%: 83.3

Rise: 0

Fall: 0

Delay: 0

Damping: 0

☒ Equal rise and fall

☐ Default rise and fall

☒ Use delay

☐ Use phase

Wave shape

☐ Square

☐ Triangle

☐ Sawtooth

☐ Sine

☐ Cosine

☒ Pulse

☐ One pulse

☐ One pulse (exp)

☐ Step

Vertical

Initial: 0 Offset: 2.5

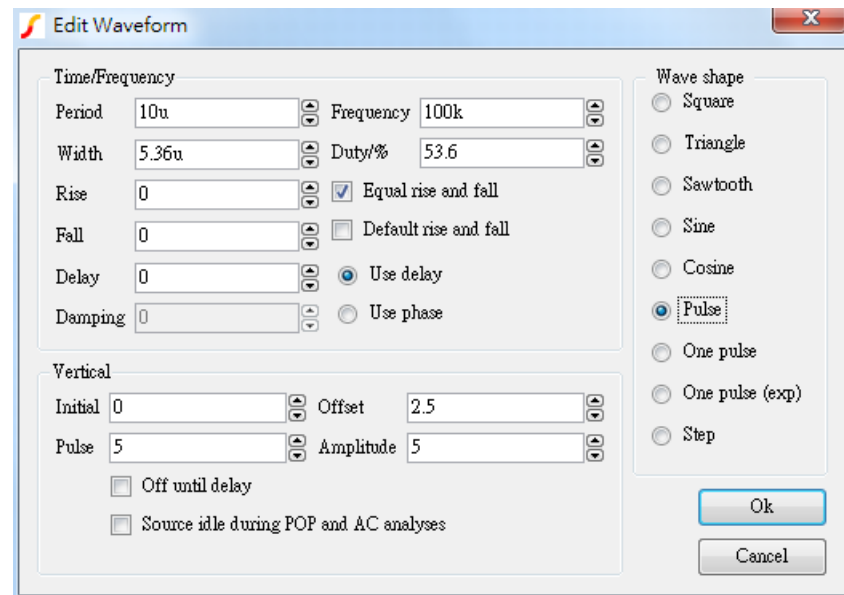
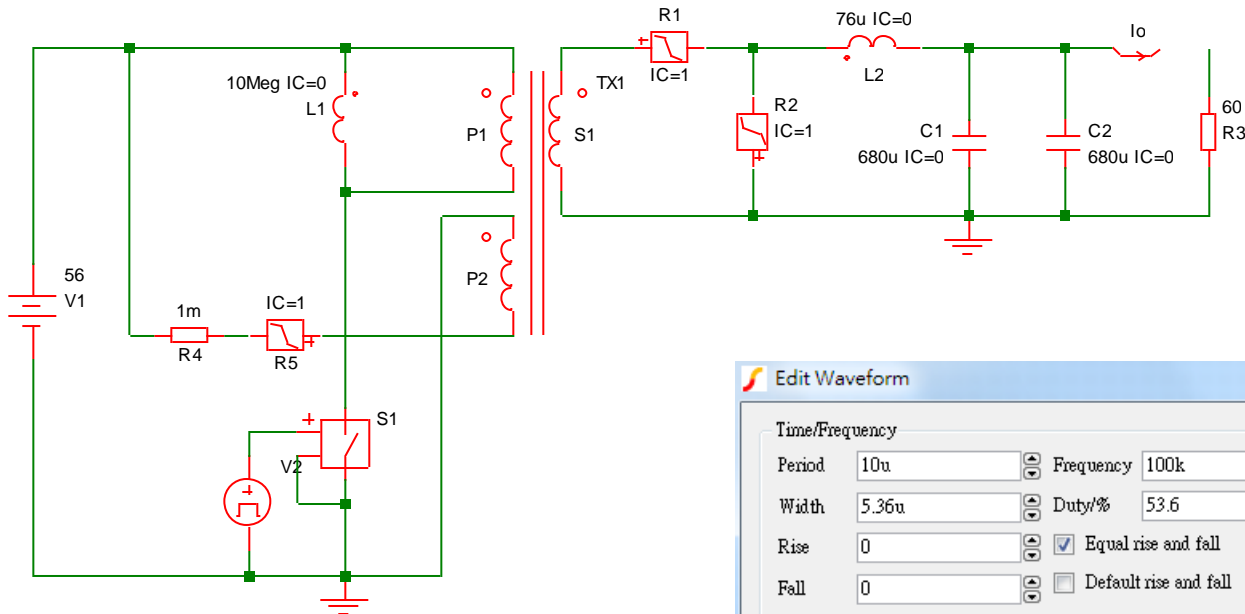
Pulse: 5 Amplitude: 5

☐ Off until delay

☐ Source idle during POP and AC analyses

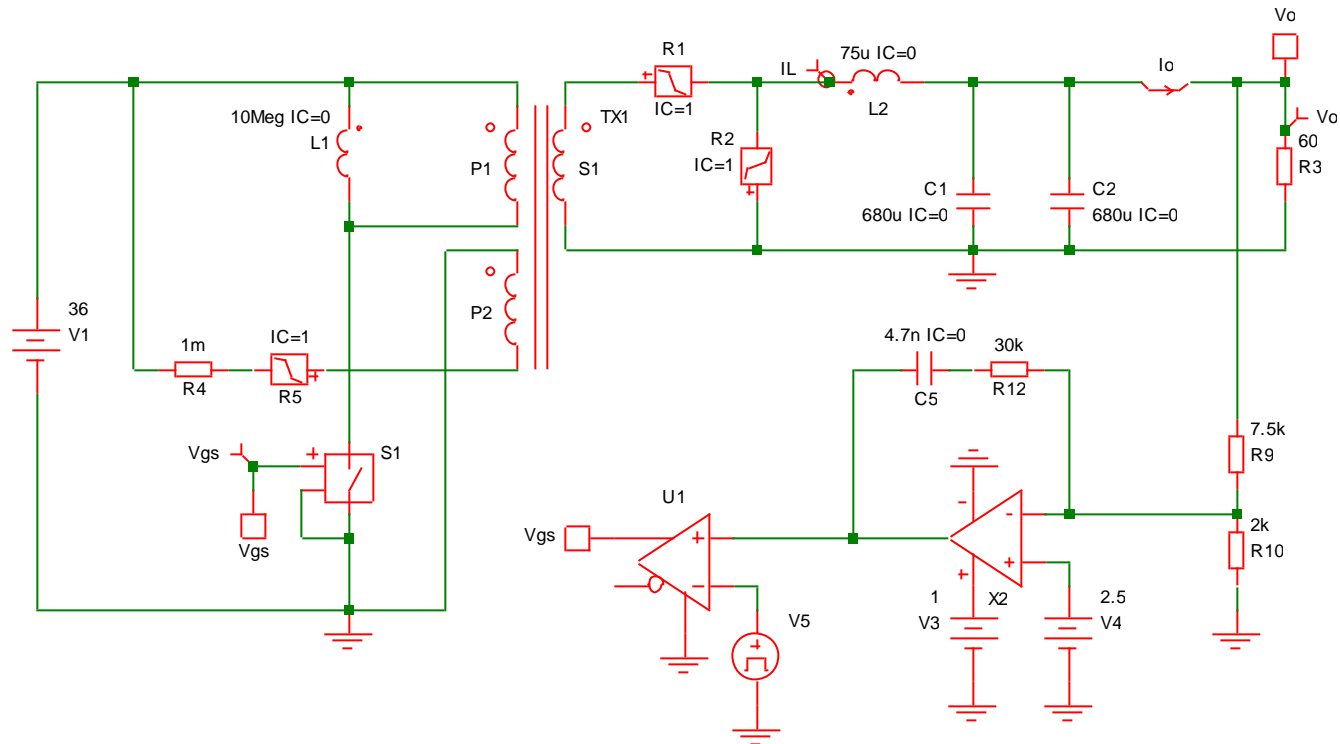
Ok Cancel

SIMPLIS Simulation



SIMPLIS Simulation

□ Close-Loop Forward Converter



SIMPLIS Simulation



V5



Edit Waveform

Time/Frequency

Period: 10u Frequency: 100k

Width: 5u Duty/%: 50

Rise: 0 ☒ Equal rise and fall

Fall: 0 ☐ Default rise and fall

Delay: 0 ☒ Use delay

Damping: 0 ☐ Use phase

Wave shape

☐ Square

☐ Triangle

☒ Sawtooth

☐ Sine

☐ Cosine

☐ Pulse

☐ One pulse

☐ One pulse (exp)

☐ Step

Vertical

Initial: 0 Offset: 500m

Pulse: 1 Amplitude: 1

☐ Off until delay

☐ Source idle during POP and AC analyses

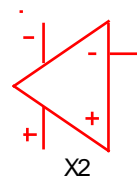
Ok Cancel

Edit Device Parameters

Model Level: 2	Offset Voltage: 0	Bias Current: 100n
Offset Current: 1n	Open-loop Gain in V/V: 100k	Gain-bandwidth in Hz (Level 2): 1Meg
Pos. Slew Rate in V/s (Level 2): 1Meg	Neg. Slew Rate in V/s (Level 2): 1Meg	CMRR: 100k
PSRR: 100k	Input Resistance: 1Meg	Max. Output Source Current (Level 2): 5m
Max. Output Sink Current (Level 2): 5m	Output Resistance: 100	Output AC Resistance: 50
Power Diss.: 1m	Headroom Pos. (Level 2): 0	Headroom Neg. (Level 2): 0

☒ Use back-annotated info. for init. cond. if available

Ok Cancel Help



X2

Homework

□ 設計一 Open-Loop Forward Converter

V_{in} (V)	19~28
V_o (V)	5
f_{sw} (Hz)	100 k
I_o (A)	0.2~1
ΔV_o (V)	$< 0.1V_o$

□ Hint

$$L_o > L_{oB} = \frac{V_o}{2I_{oB}} (1 - D)T_s$$

$$C_o = \frac{T_s^2 V_o}{8L_o \Delta V_o} (1 - D)$$