

Pre-Lab 6:

Diodes

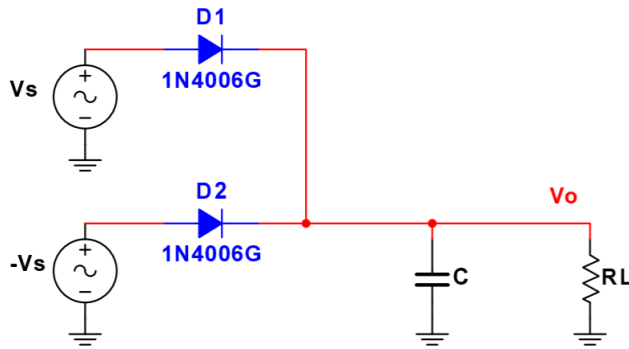
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Calculation



$$V_o = 3V \quad V_s = 250 \text{ Hz}$$

$$I_L = 3 \text{ mA} \quad \text{Ripple max} = 10\%$$

1N4006G has 1V forward voltage drop.

$$R_L = \frac{3V}{3 \text{ mA}} = 1000 \Omega = \boxed{1 \text{ k}\Omega}$$

$$V_r = 10\% \cdot 3V = 0.3V$$

$$\text{Peak output voltage} = 3V + 0.3V = 3.3V$$

$$\text{Peak supply voltage} = 3.3V + 1V = \boxed{4.3V}$$

$$C = \frac{1}{2f R_L k_r} = \frac{1}{2 \cdot 250 \cdot 1 \text{ k} \cdot 0.1} = \boxed{20 \mu\text{F}}$$

Simulations

(1)

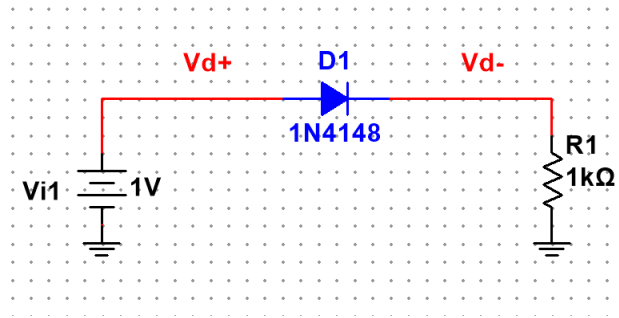


Figure 1: Schematic for Fig. 2(a) ▲

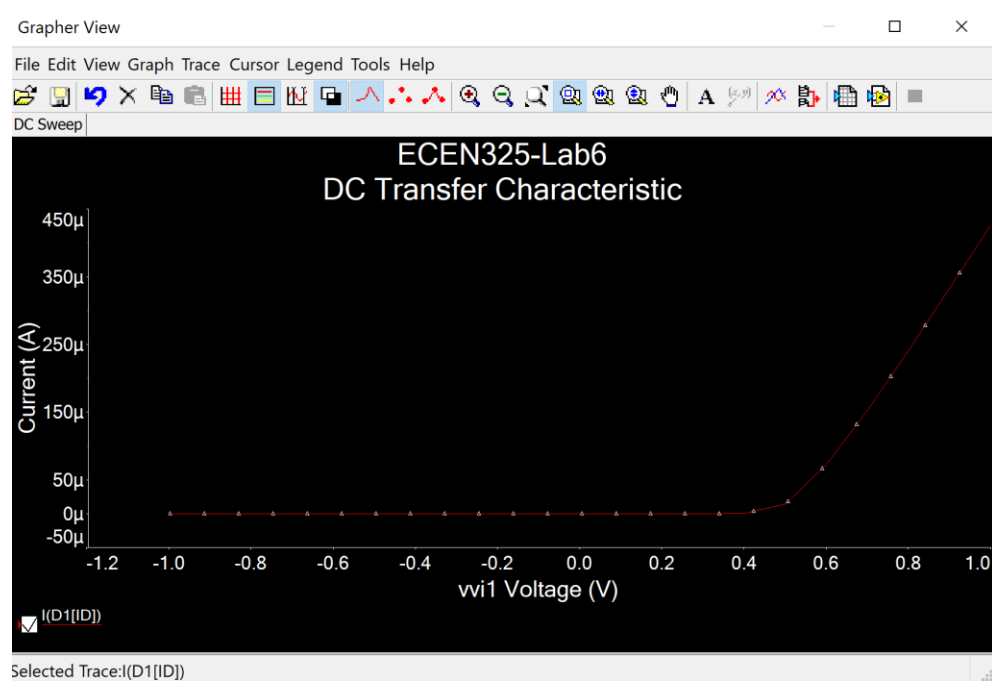


Figure 2: DC sweep simulation plot for Fig. 2(a) where $V_{step} = 0.1$ from -1 V to 1 V ▲

	A	B	C
1	X--Trace 1:	Y--Trace 1::	[I(D1[ID])]
2	-1	-1.1E-12	
3	-0.9	-1E-12	
4	-0.8	-9E-13	
5	-0.7	-8E-13	
6	-0.6	-7E-13	
7	-0.5	-6E-13	
8	-0.4	-5E-13	
9	-0.3	-4E-13	
10	-0.2	-3E-13	
11	-0.1	-2E-13	
12	-1.4E-16	-6.7E-28	
13	0.1	4.78E-12	
14	0.2	2.28E-10	
15	0.3	1.09E-08	
16	0.4	5.1E-07	
17	0.5	1.43E-05	
18	0.6	7.23E-05	
19	0.7	0.000153	
20	0.8	0.000241	
21	0.9	0.000332	
22	1	0.000426	

Figure 3: Simulation data for Fig. 2(a) ▲

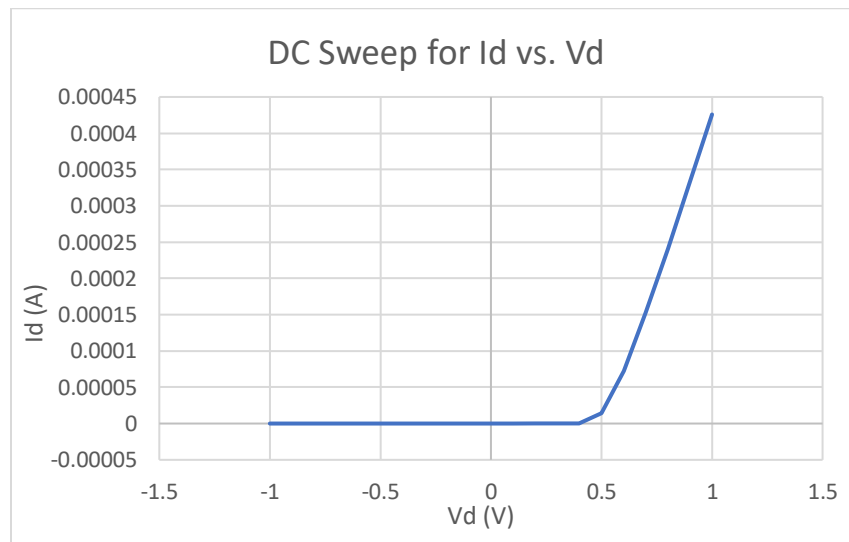


Figure 4: Excel data plot for Fig. 2(a) where Vstep = 0.1 from -1 V to 1 V ▲

(2)

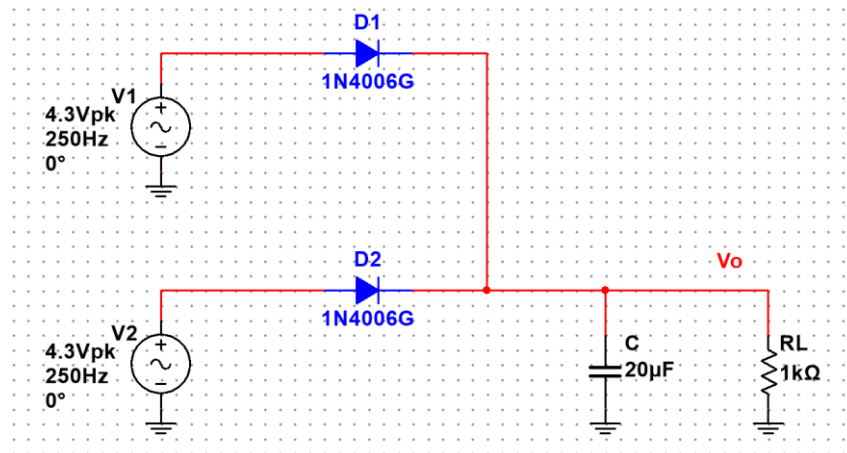


Figure 5: Schematic for Fig. 5 with calculated values ▲

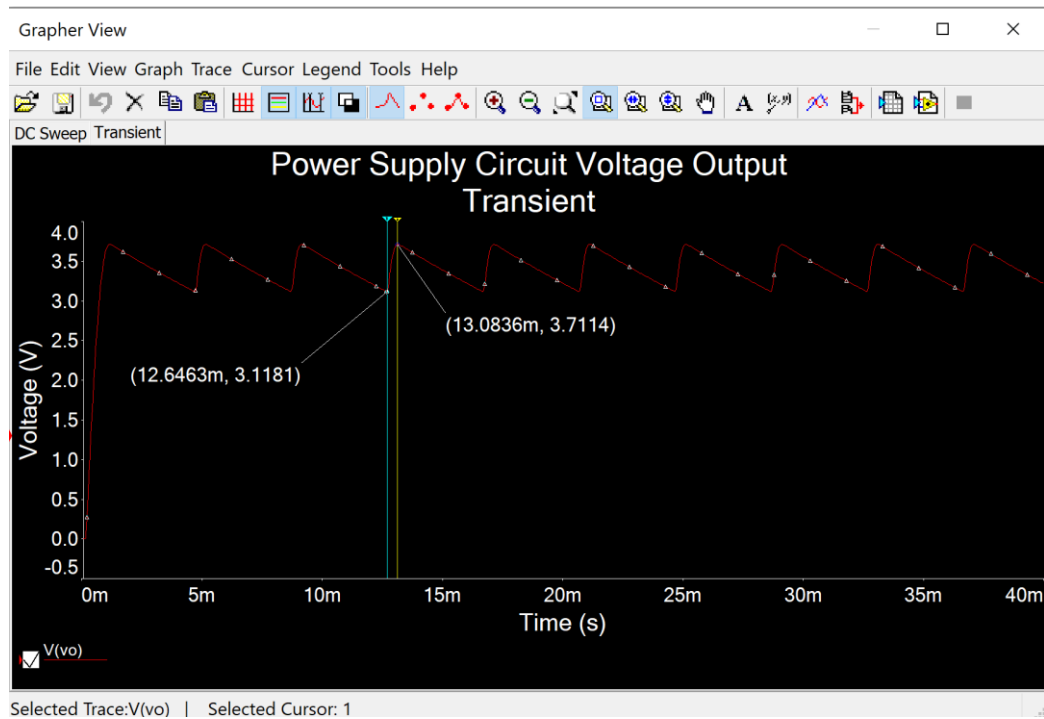


Figure 6: Power supply circuit transient simulation for voltage output ▲

Voltage high peak = 3.7114 V, Voltage low peak = 3.1181 V, Max ripple = 0.5933 V

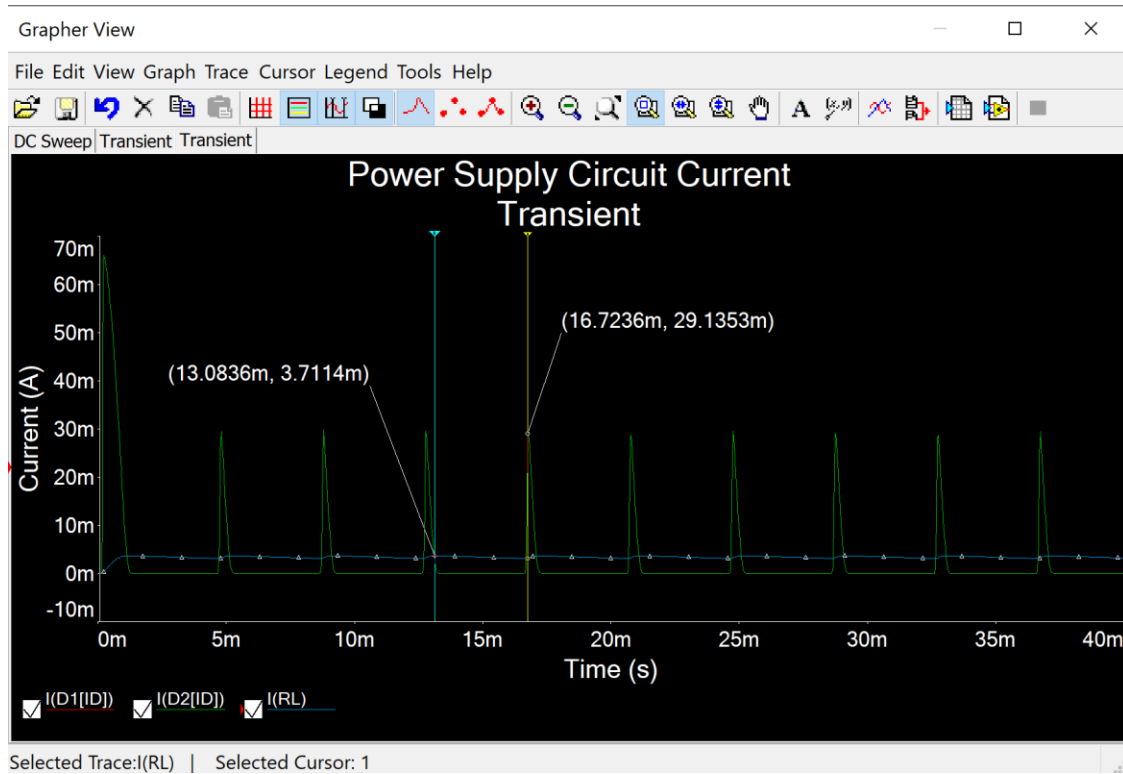


Figure 7: Power supply circuit transient simulation for currents ▲

Peak current on diodes = 29.1353 mA for both D1 and D2

Peak current on load resistor = 3.7114 mA