Faculty of Engineering and Technology

Electrical and Computer Engineering Department

ENEE2103

Circuits and Electronics Lab

Experiment No.6

Diode Characteristic and Applications

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Section: 2

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Part 1:

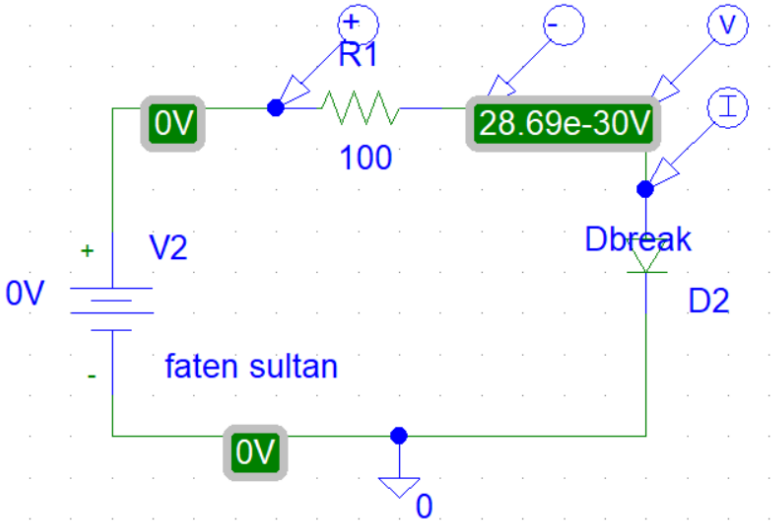


Figure 1: Diode Circuit

Part II:

The voltages around the circuit (VR, VD,) and the current for the range [0, 3] of the voltage source for the circuit are noted in the table below.

V_S	VR	V_D	I_D
0	0.000	0.000	0.000
0.2	0.000	0.200	0.000
0.4	0.000	0.400	0.000
0.6	0.188	0.612	0.000
0.8	0.371	0.629	0.000
1	0.849	0.651	0.001
1.5	1.337	0.663	0.001
2	1.829	0.671	0.002
2.5	2.323	0.677	0.002
3	2.756	0.687	0.002

Figure 2: Table for diode voltage Vs current

The figure below here shown the diode characteristic plot

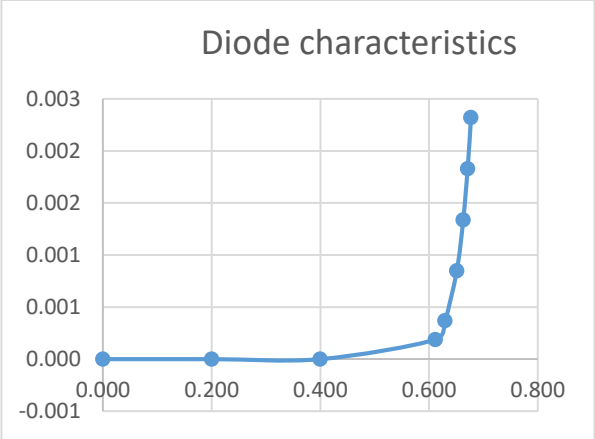


Figure 3:Diode characteristics

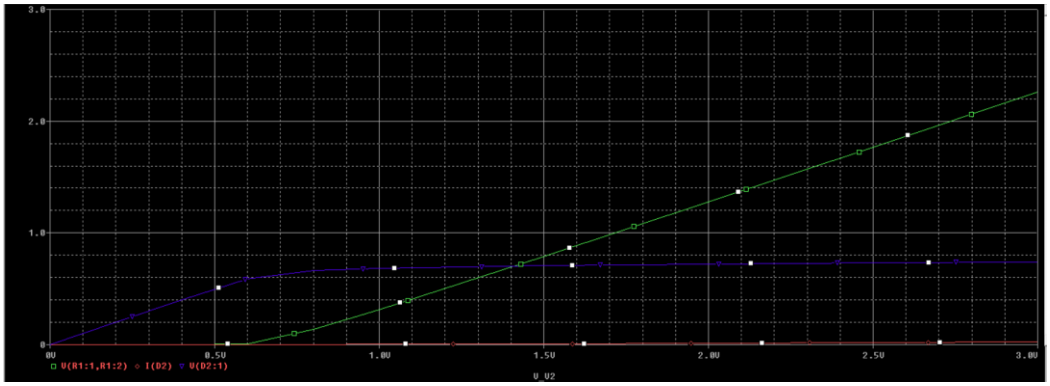


Figure 4: plot for Diode Characteristics

V peak =4.37

Part III

We connect the same circuit as above however we rotate the diode in the opposite side just as shown below

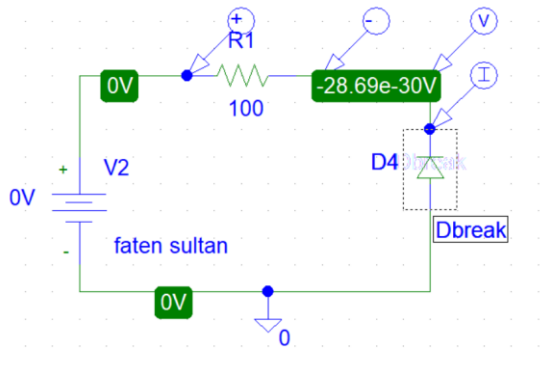


Figure 5: Inverse Diode Circuit

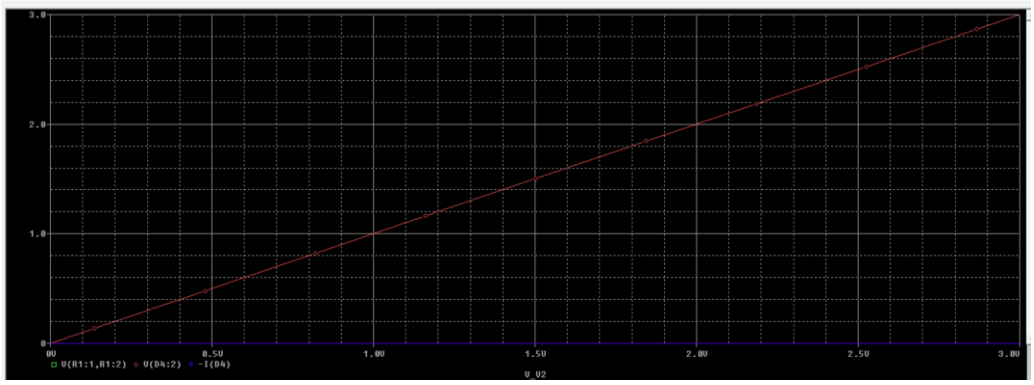


Figure 6: Graph for reversing diode

As we know the diode works as a one way amplifier that allows the current to pass only in one direction. As a result we can conclude that the diode has two terminals -anode and cathode - it passes the current when the voltage on the anode is higher than the voltage of the cathode. When it was forward (the anode is on the side of the positive terminal of the voltage source) it worked as a voltage source with a voltage near 0.7 volts, and when it is reversed on any value of the applied voltage source current become very close to zero and the voltage on the diode as the input voltage, so the diode acts like an open circuit.

RECTIFICATION.

HALF - WAVE RECTIFICATION.

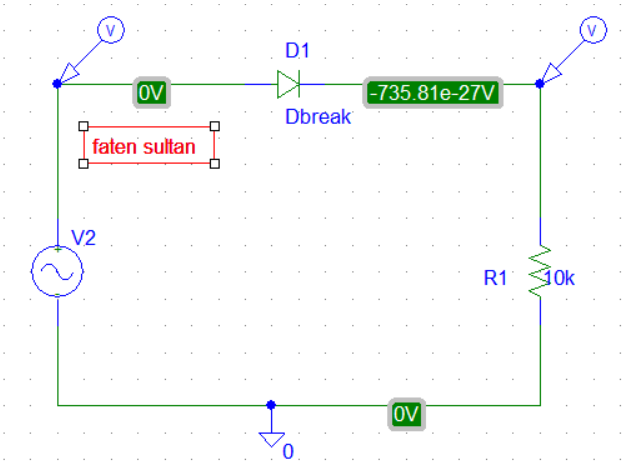


Figure 7:HALF - WAVE RECTIFICATION Circuit

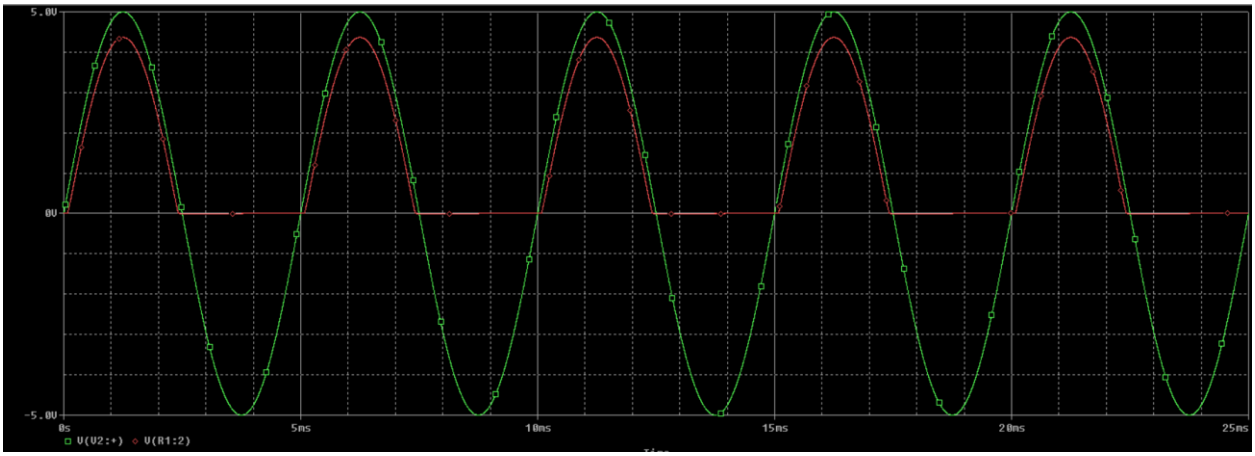


Figure 8: Half wave rectifier graph.

As we can see the negative part of the current has been removed as the diode cut the negative side. So when the current is positive "forward it passes "however when the current is negative the current begins to move in the opposite side which result in prevent the current to pass

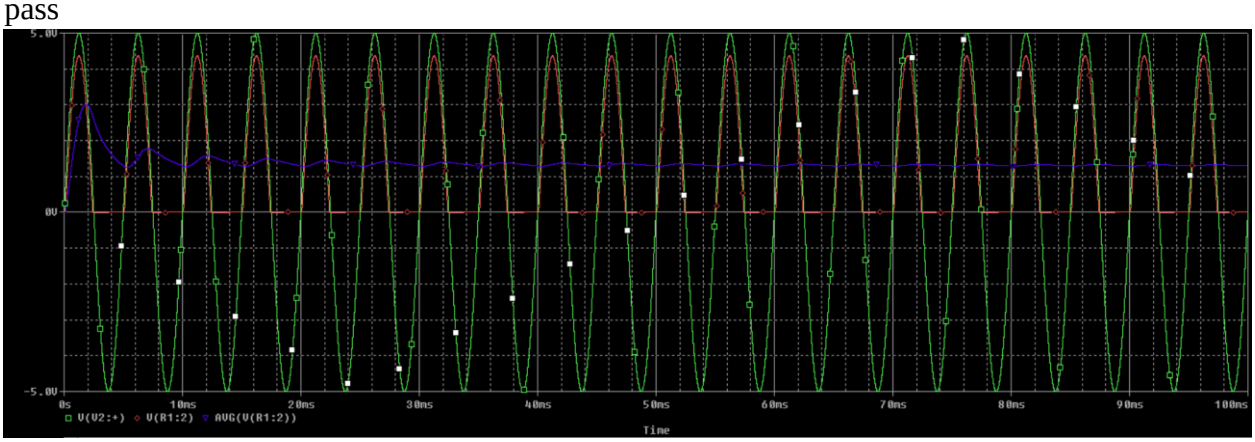


Figure 9:DC value plot

Reverse Diode

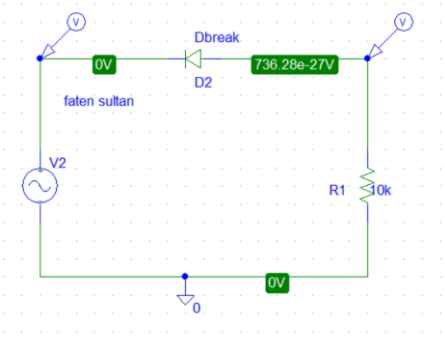


Figure 10:HALF - WAVE RECTIFICATION Circuit with inverse Diode

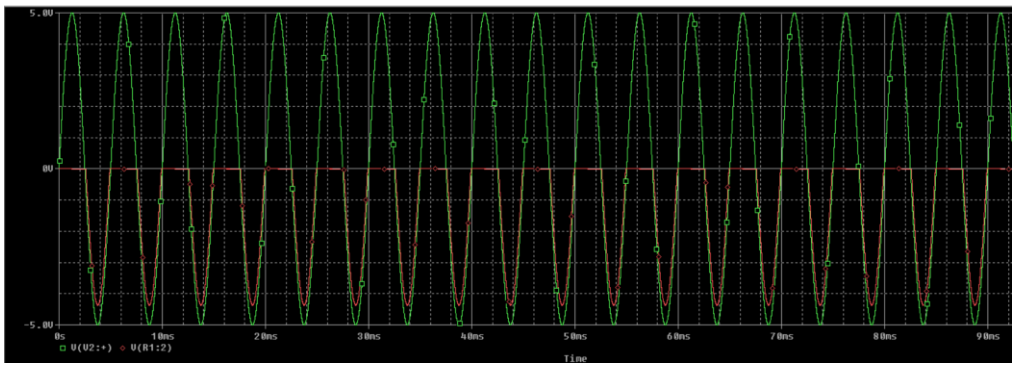


Figure 11: Half wave rectifier graph. For inverse diode

Adding Capacitor

We can notice here that the value if the current when the diode reversed has changed to minus value

After adding the capacitor, the circuit becomes:

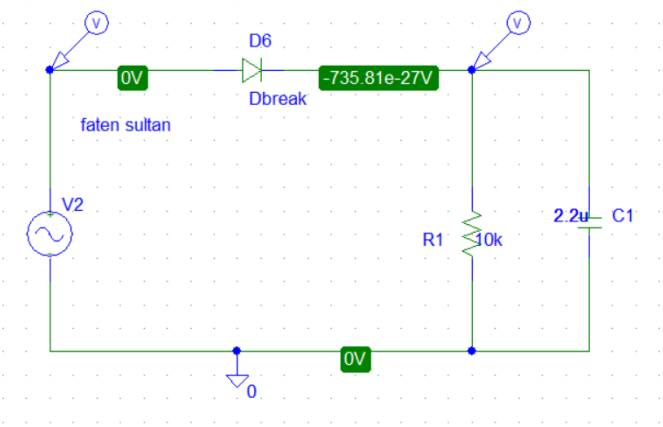


Figure 12: Circuit after adding the capacitor

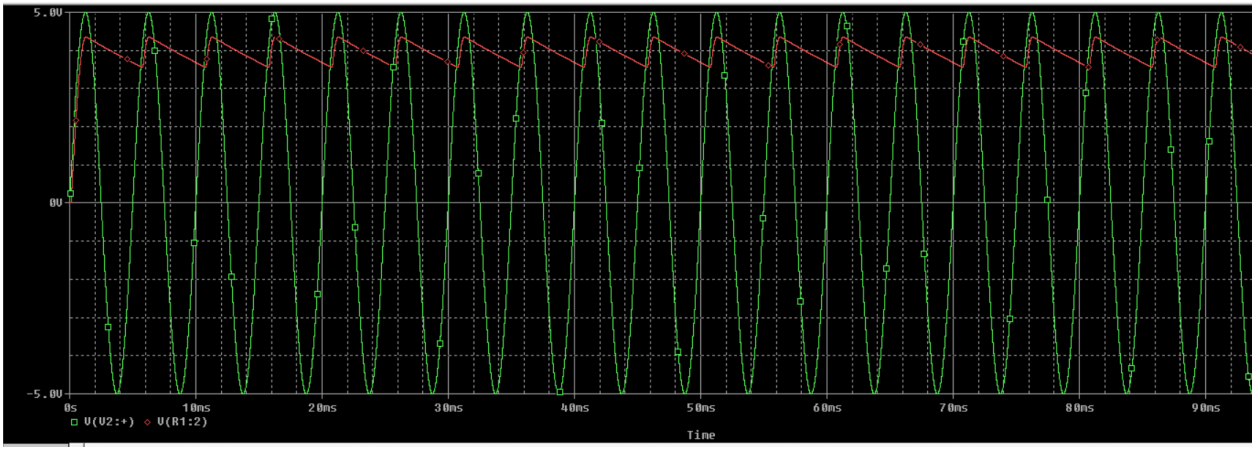


Figure 13:Graph after adding the C

At the beginning, the capacitor begins to charge as the voltage wave increases and as the voltage graph begins to decrease the capacitor begins to discharge

Average DC value = 3.9581V
Vpeak-peak = 0.7 V
DC value = Vpk/pi=0.248v

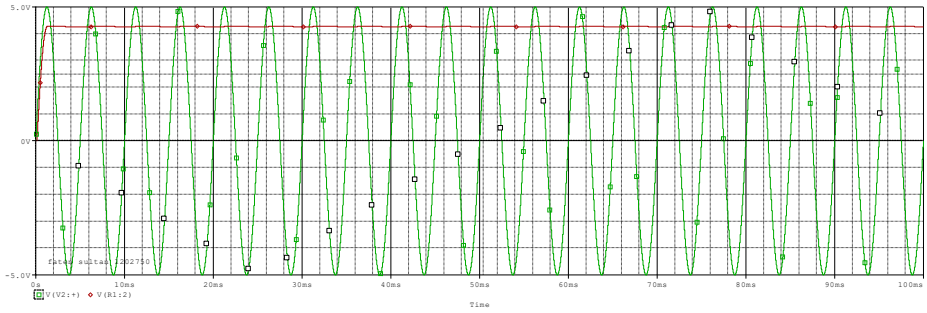


Figure 14:After changing C to 47u

"I take the screen from the Copy to clipboard that's why the screen is white "

Full-Wave Rectifier

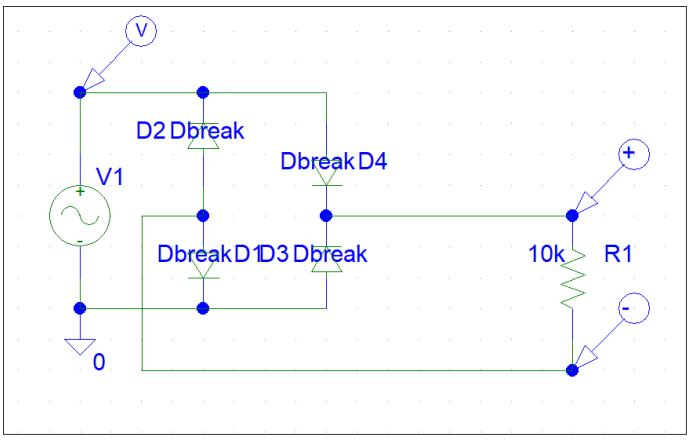


Figure 15:Bridge diode full wave rectifier

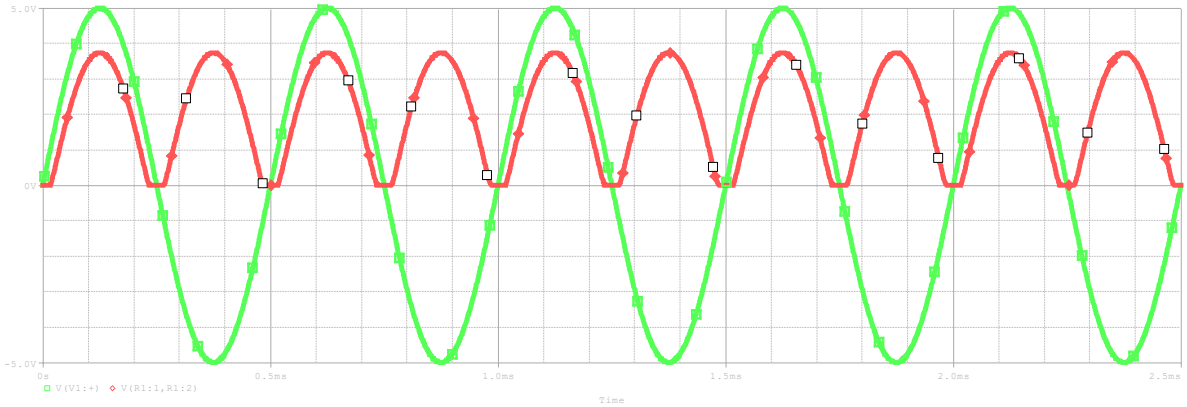
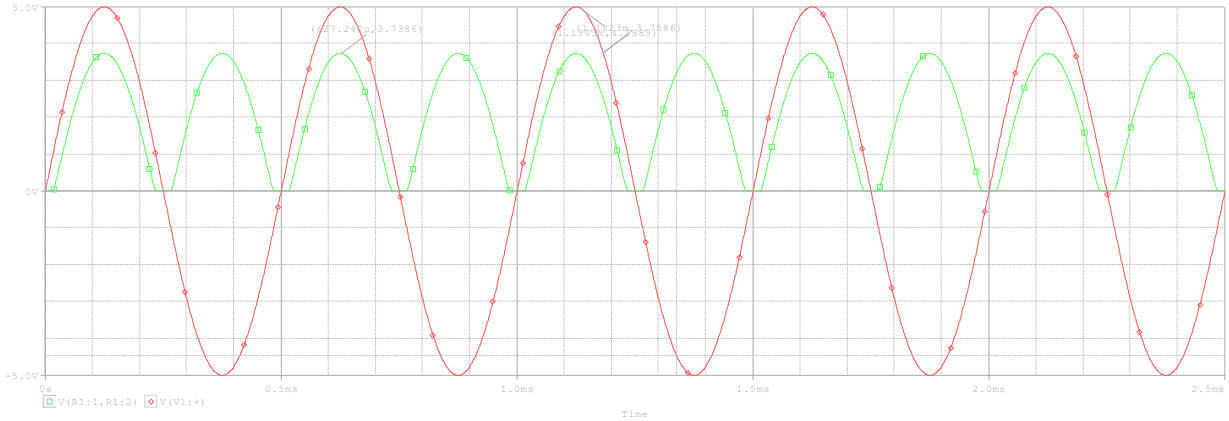


Figure 16:Full wave rectification



Peak value = 3.75v, DC value = Vpk/π= 1.193v

- **After adding 2.2uf capacitor**

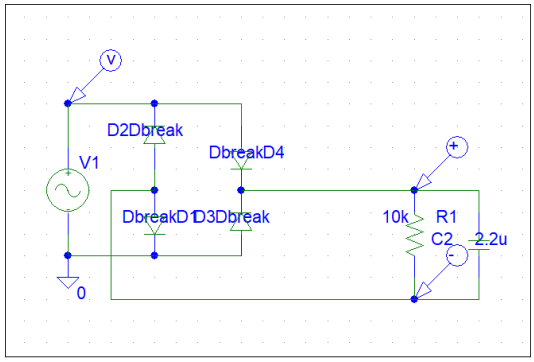


Figure 17:Full wave rectifier circuit with capacitor.

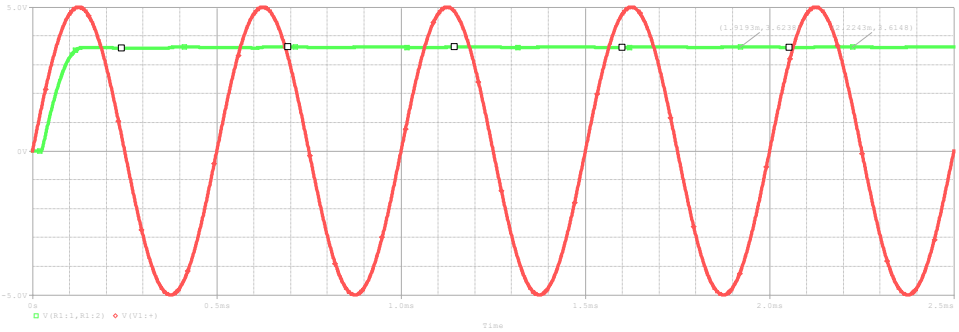


Figure 18:Full wave rectifier circuit with capacitor graph.

Ripple peak = 3.6238 – 3.6148 = 9mv, and the DC voltage = 3.6v

.III. Other applications:

A. clipping:

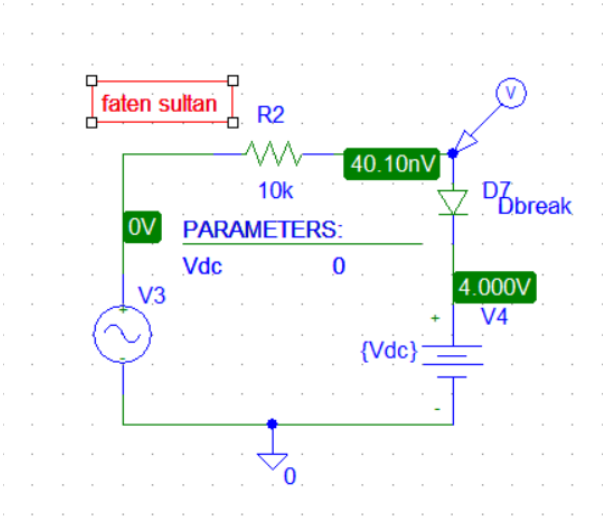


Figure 19:Clipper circuit.

The three graphs of the three values of the DC voltage are shown in order below (0 V, 1.5 V, 3.5 V).

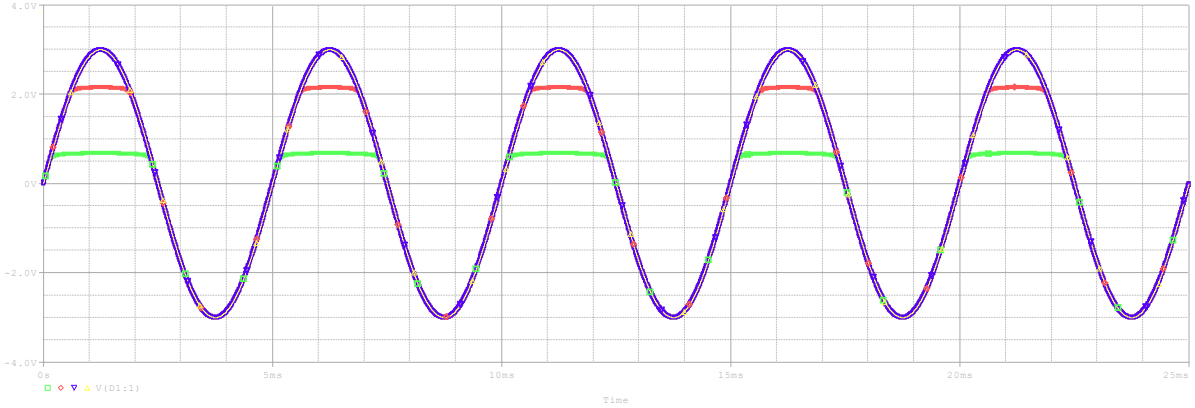


Figure 20:Clipper circuit graph.

Note: that in figure 17 there are two identical graphs, the reason is because since the input's voltage ranges between [-3, 3] it will always be less than the DC voltage so the diode will act as open circuit and the output voltage will equal the input voltage.

B. Clamping

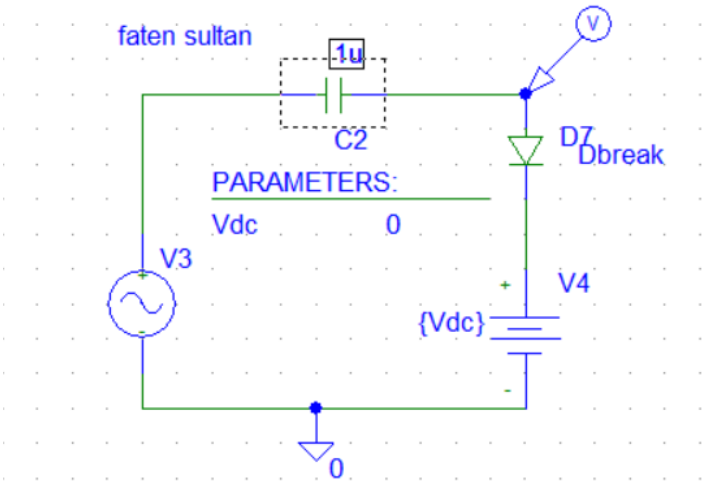


Figure 21: Clamping circuit.

The three graphs of the three values of the DC voltage are shown in order below (0 V, 1.5 V, 3.5 V).

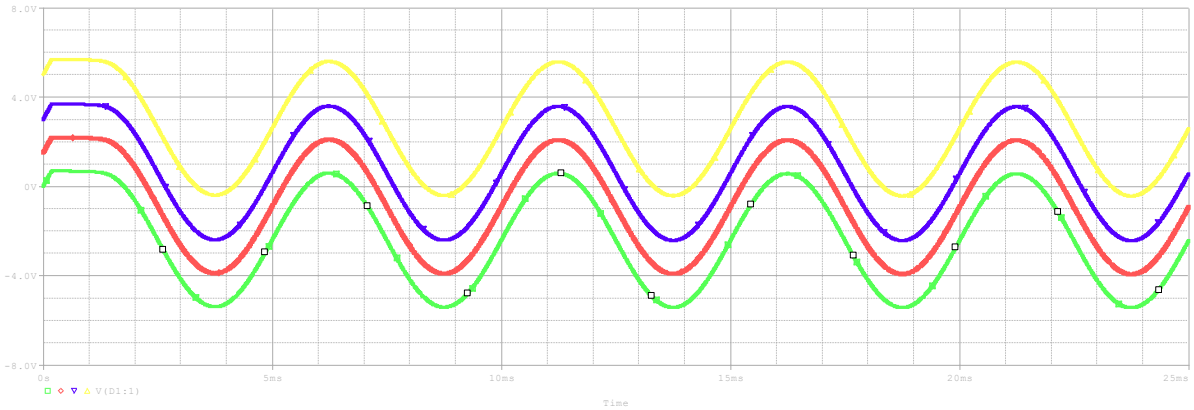


Figure 22:Clamping circuit graph.

C. Voltage Multiplication Circuits

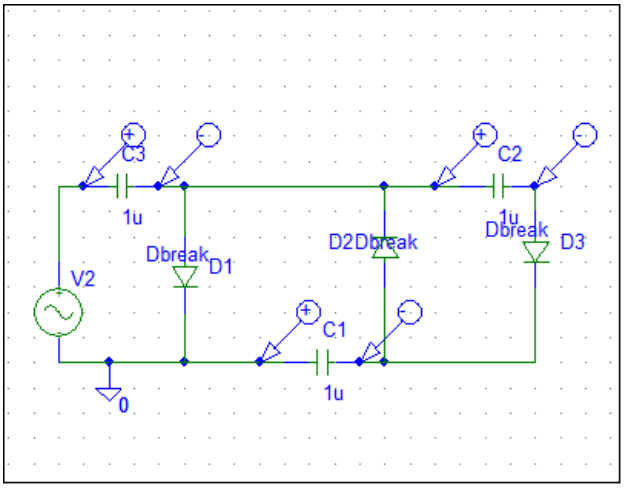


Figure 23: Voltage Multiplication Circuits

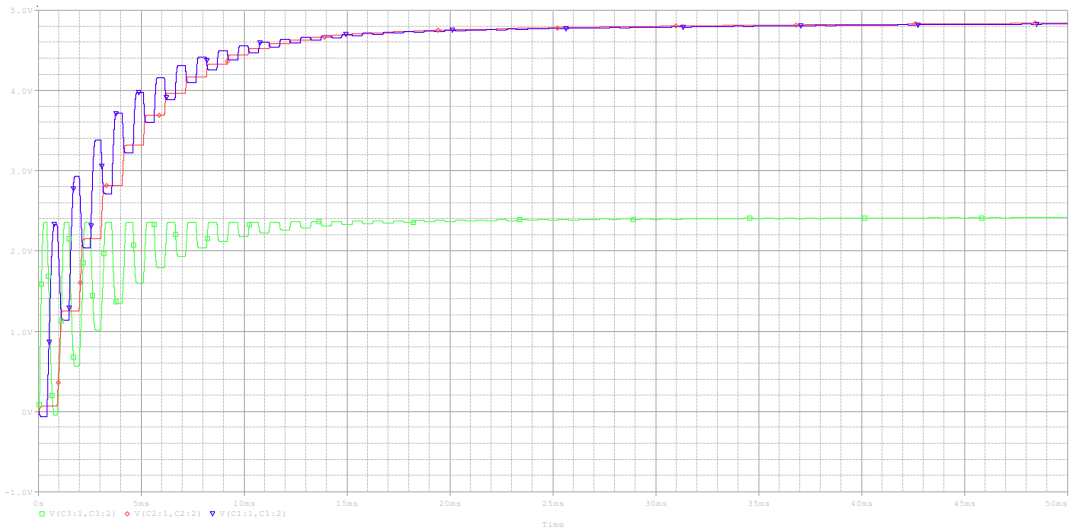


Figure 24:C. Voltage Multiplication Circuits graph.

This figure shows Voltage multiplication circuit C1 + C3 voltage plot

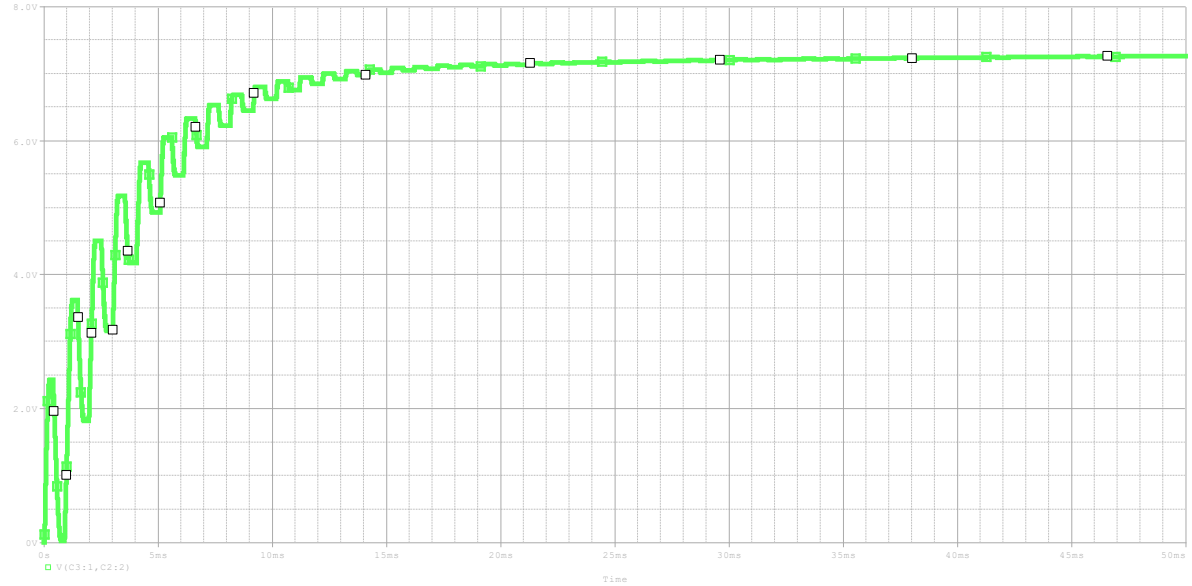


Figure 25:Voltage multiplication circuit C1 + C3 voltage plot.