Lab 2: **Testing of power devices by** Praprara Owodeha-Ashaka

Tetteh Bright

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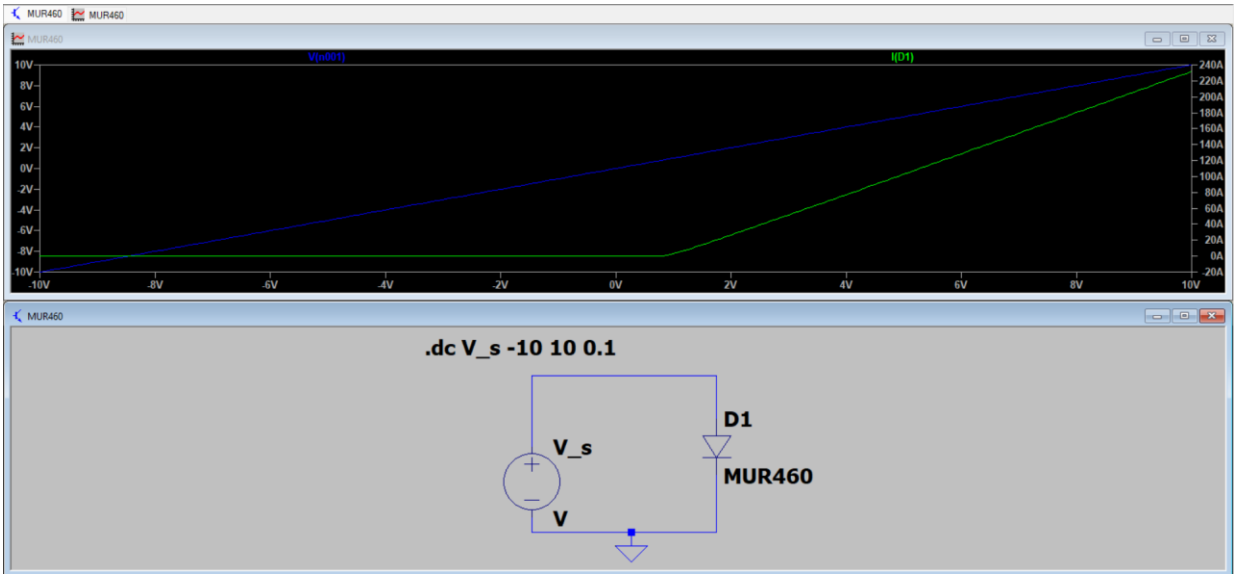
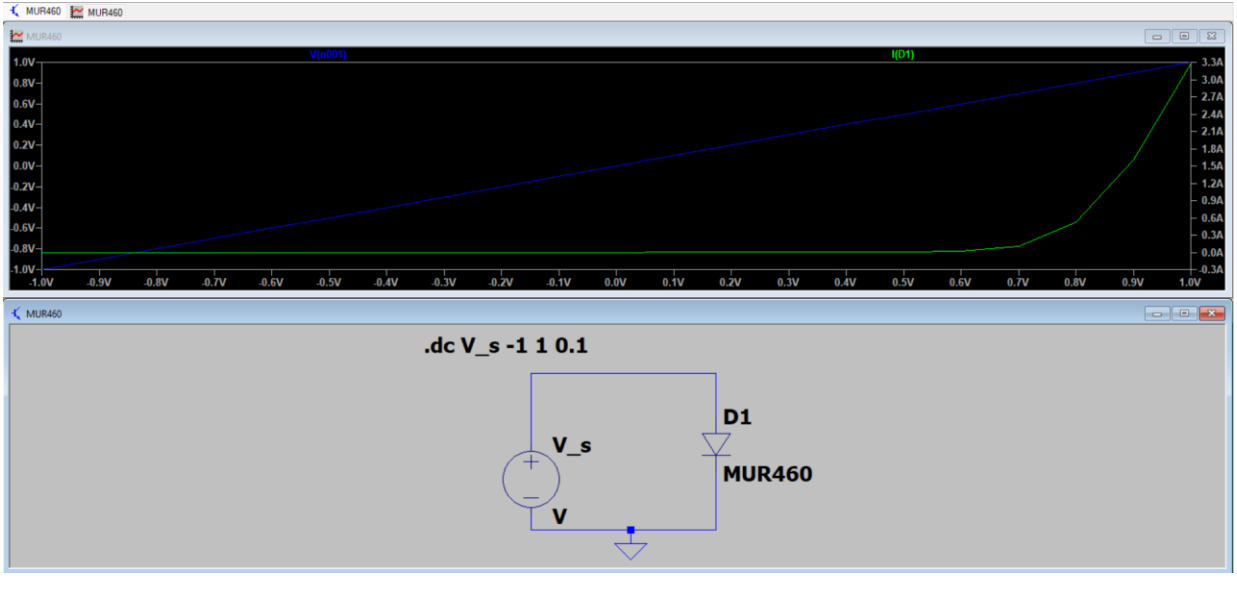
Question 1

Use Fig.1 and DC sweep to obtain the I-V characteristics for the following diodes

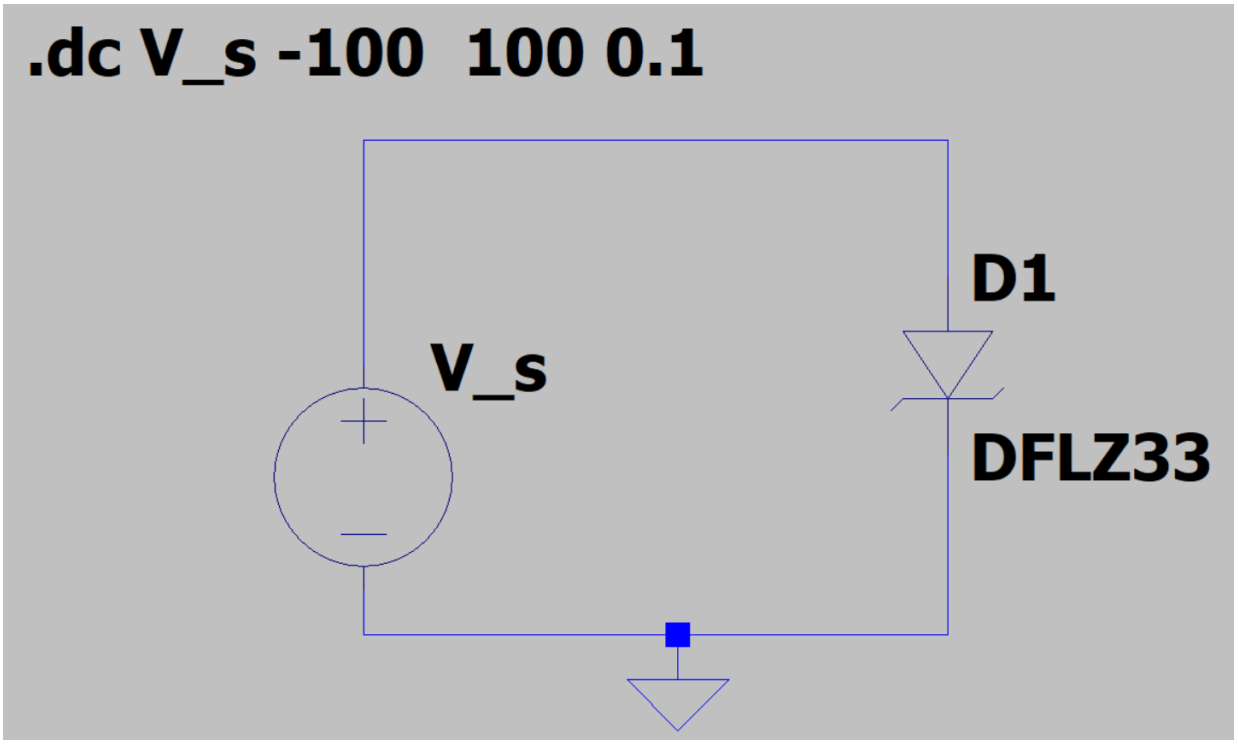
a. Power rectifier Diode (**MUR460**)

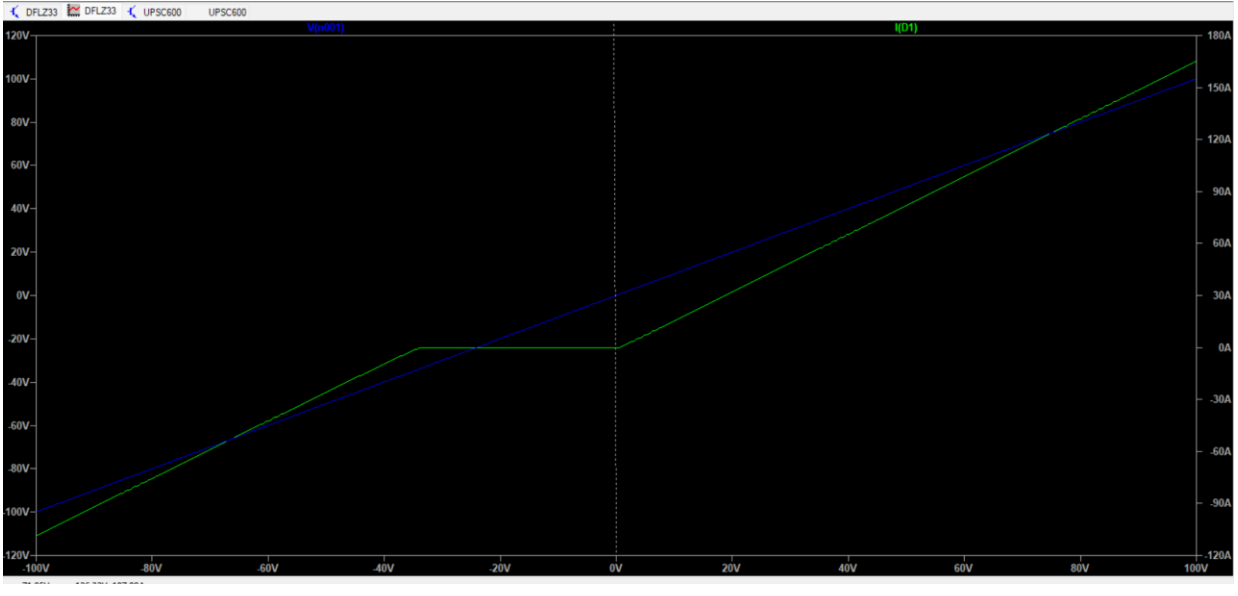


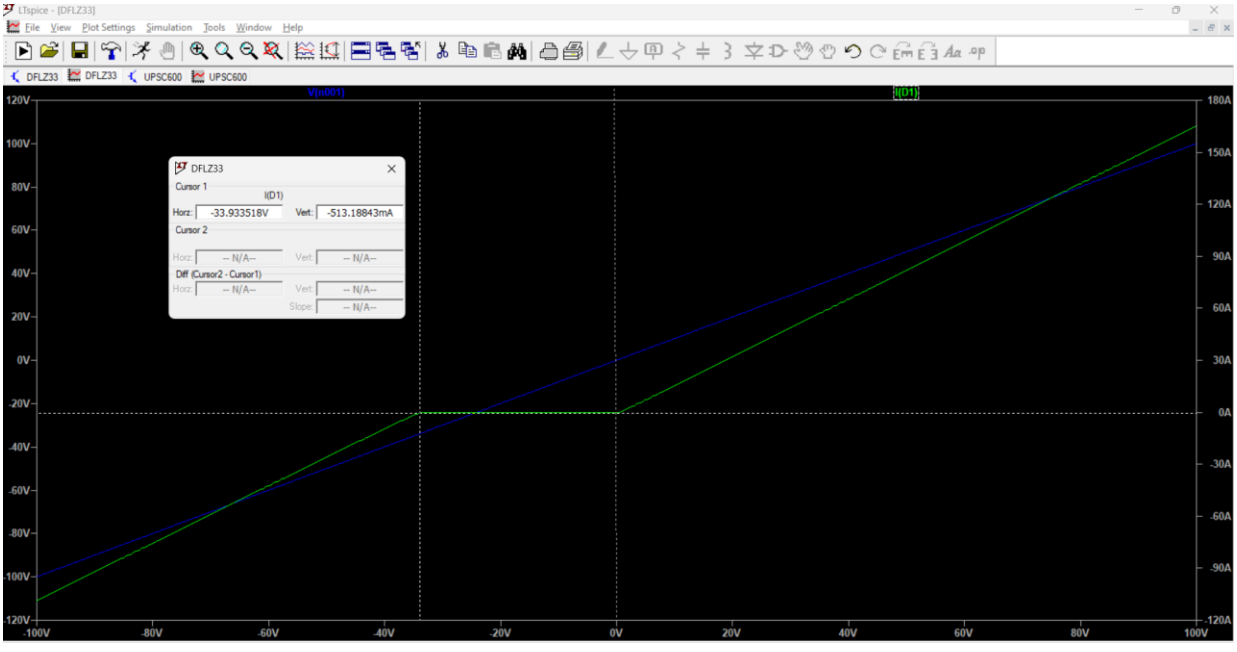


From this, we see that current through the diode is zero until the voltage across the diode exceeds a threshold (around 0.7 V), after which current starts to flow.

Zener diode (**DFLZ33**)

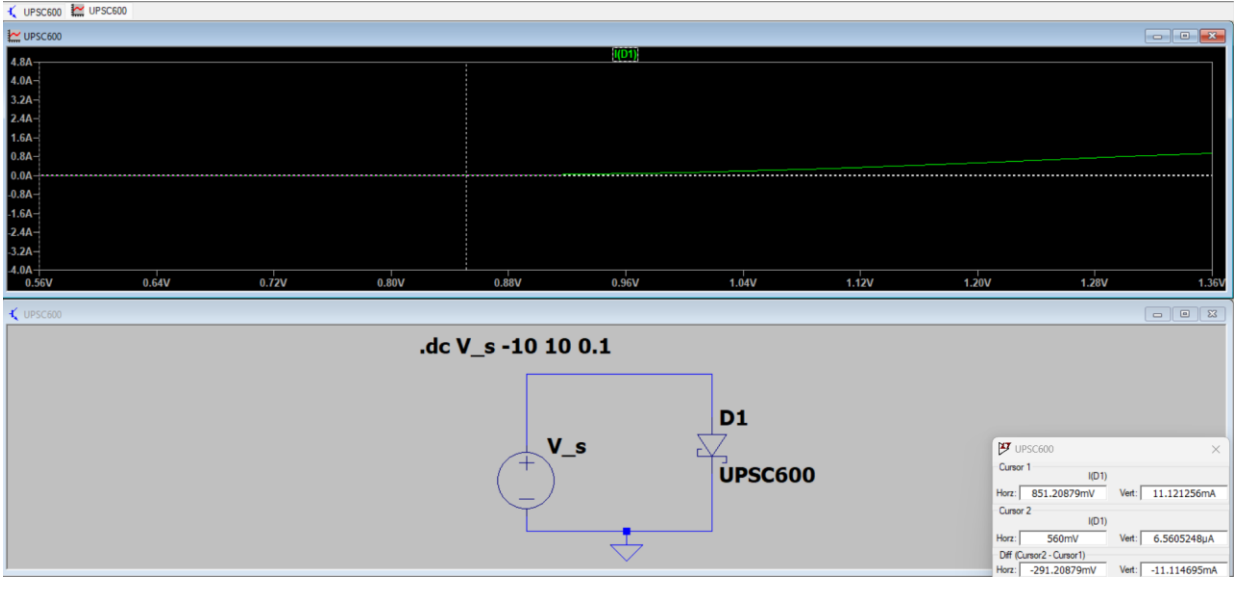

.dc V_s -100 100 0.1
D1
V_s
DFLZ33

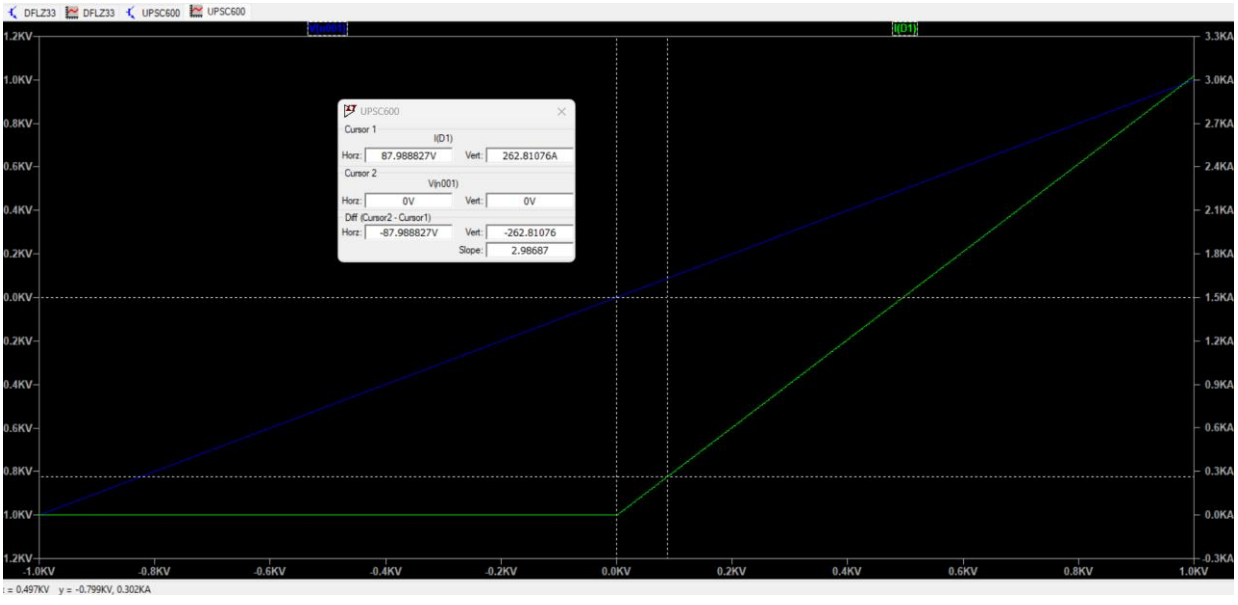

DFLZ33
DFLZ33
UPSC600
UPSC600
V(n001)
I(D1)
120V
100V
80V
60V
40V
20V
0V
-20V
-40V
-60V
-80V
-100V
-120V
180A
150A
120A
90A
60A
30A
0A
-30A
-60A
-90A
-120A
-100V
-80V
-60V
-40V
-20V
0V
20V
40V
60V
80V
100V



The Zener diode has a similar characteristic to the normal power diode when it is forward biased. When it is reverse biased, it restricts the flow of current until it gets to its Zener voltage range (31 to 35 volts),after which it allows flow of current in the reverse direction.

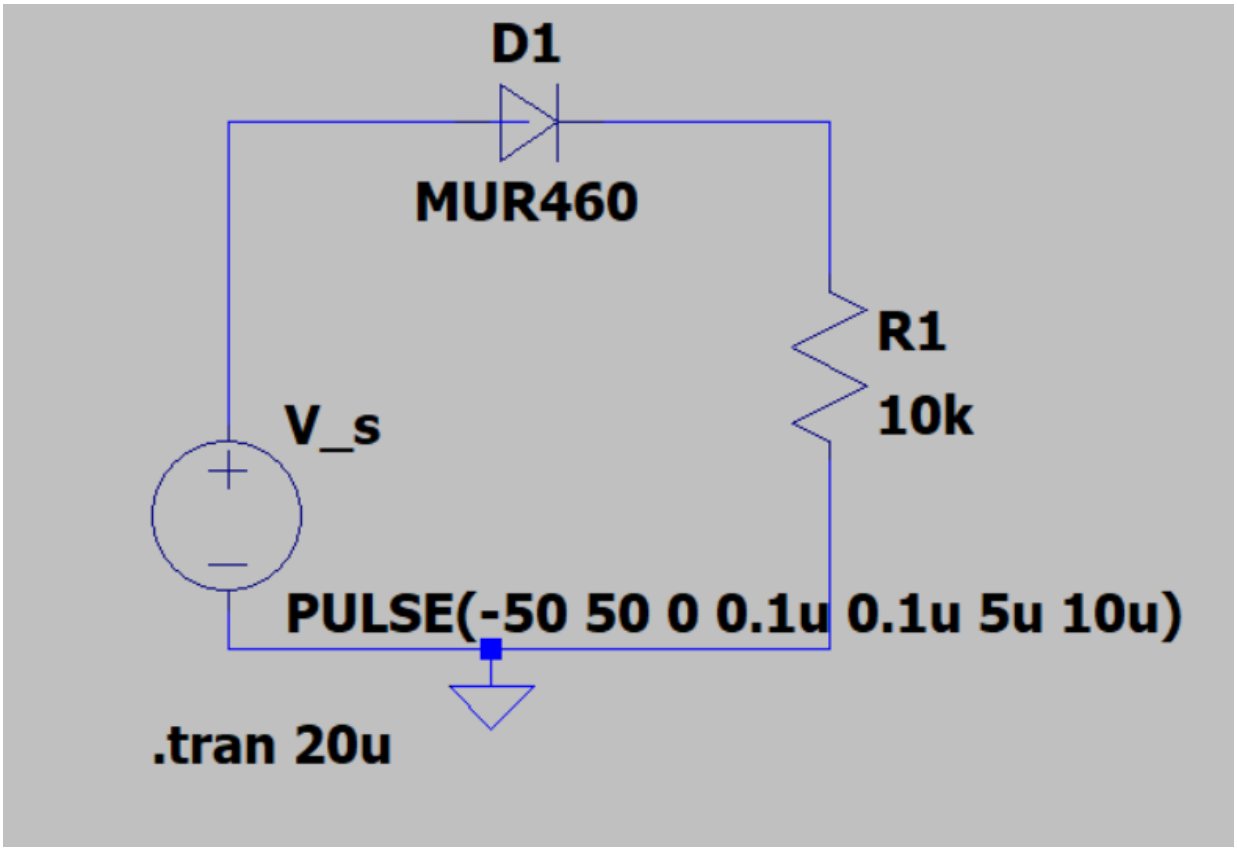
Schottky diode (**UPSC600)**

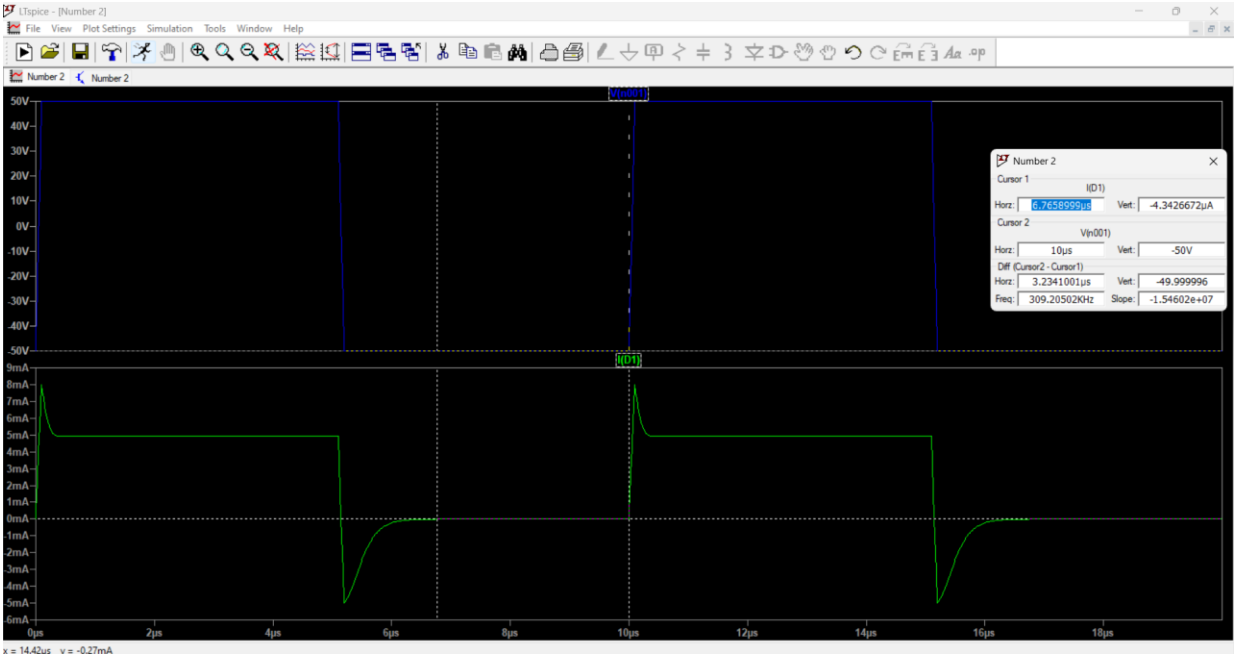




The schotky diode had a forward voltage drop less than the other two diodes (around 0.3 V). From the data sheet, the forward voltage drop is typically 1.6 V and from the simulation, the voltage drop is roughly 1 volt.

Number 2

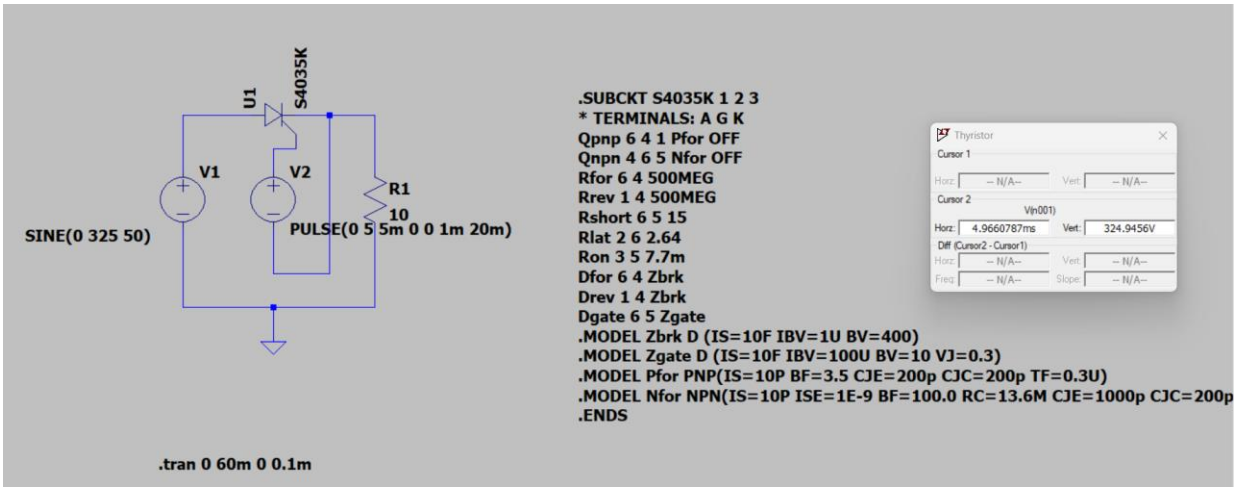




The time at 0 Amps for the first visible cycle is 5.147 uS

The maximum negative is -4.89mA. 25% of this is -1.2245mA. The time at this 25% value is 5.656uA. Thus t_{rr} = 5.656 – 5.147 = 0.509 uS. From the datasheet, the max reverse recovery time is 50 nS

Number 3



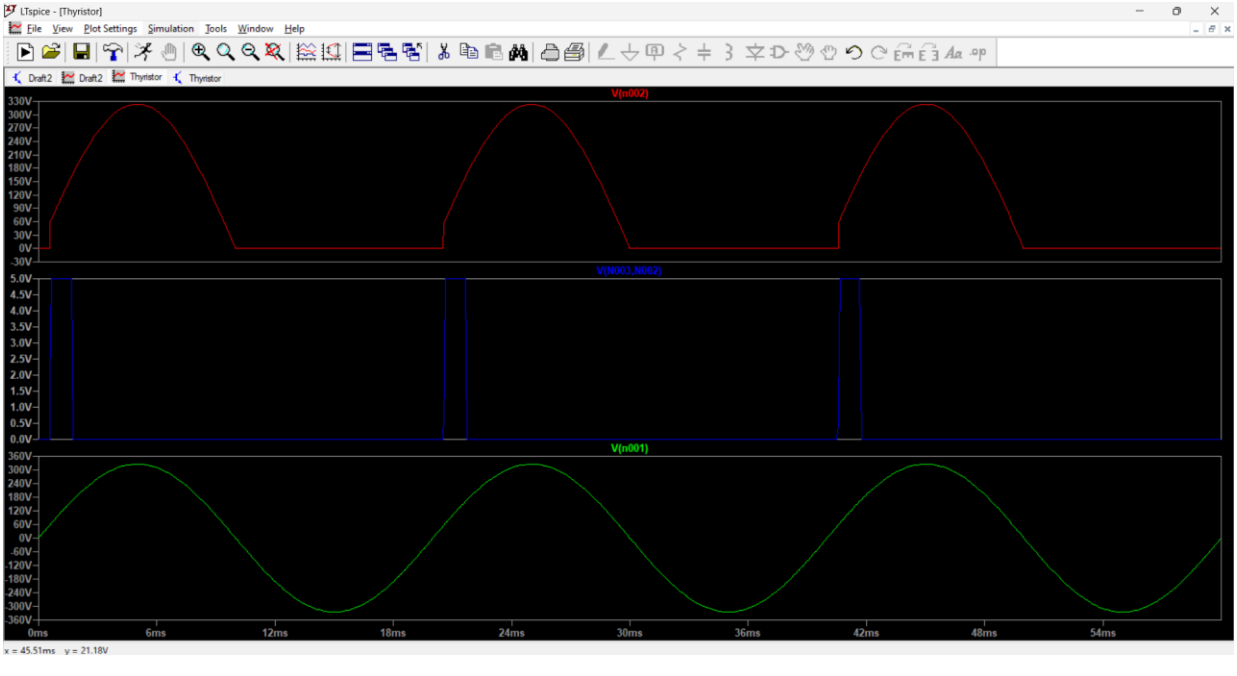
Main power source: 230 RMS, 50Hz. Period is 20m seconds

10 degrees:

Gate voltage:

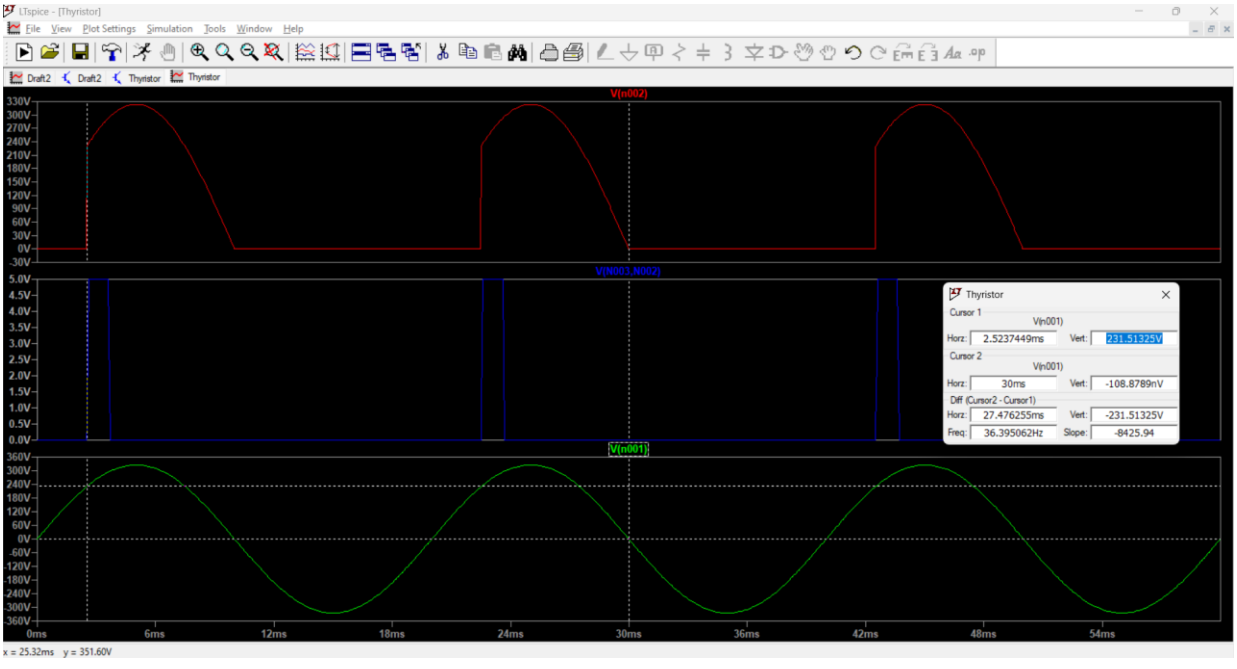
Amplitude: 5 volts

T delay: (10/360)*20m seconds = 0.5556 mS



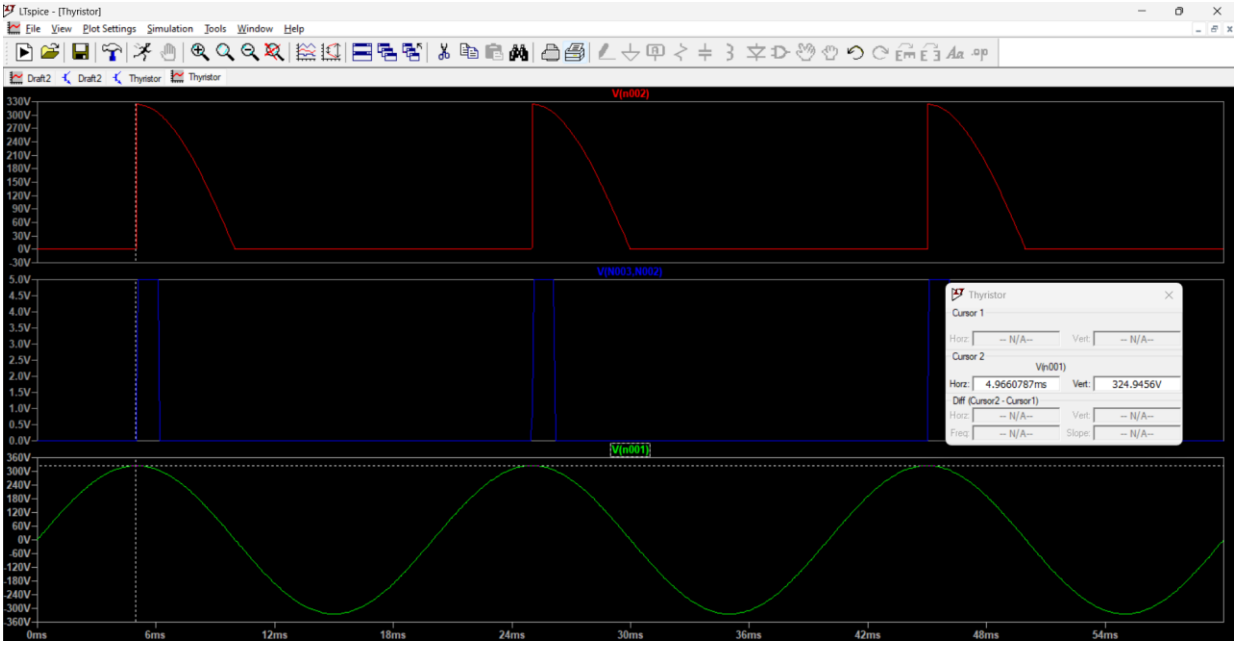
45 degrees

T delay: (45/360)*20m seconds = 2.5 mS



90 degrees

T delay: (90/360)*20m seconds = 5 mS



The thyristor only gets powered on after the gate has been activated and it stays on throughout the positive cycle of the main circuit input voltage. In the negative cycle of the input voltage, the voltage output from the thyristor remains zero. Even though the circuit input voltage is in the positive cycle, the thyristor will not allow current to flow through it until the gate has been activated. The firing angle is the angle measured between when the thyristor becomes forward biased and when its gate gets activated. A smaller firing angle will lead to a greater average output per cycle.