

Lab 3

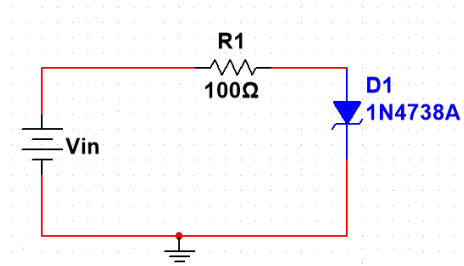
Measuring Zener Diode Characteristics using Multisim

Learning outcomes

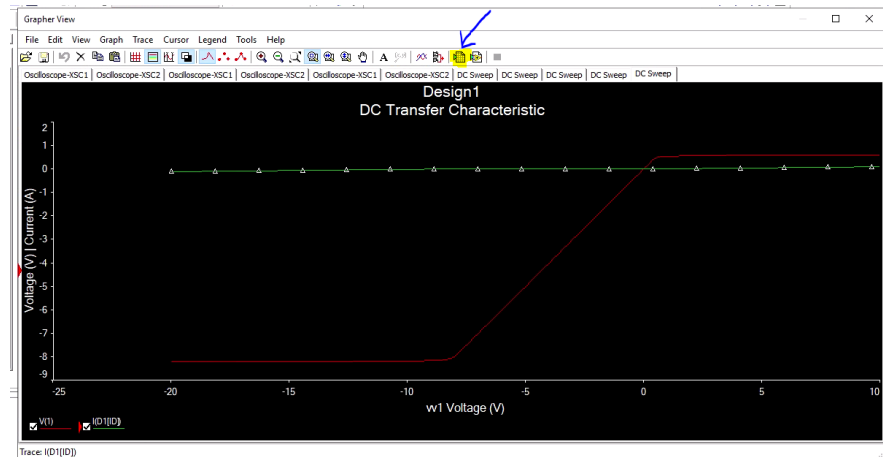
- 1) Learn sweep technique in Multisim
- 2) Learn 2 techniques to measure Zener diode's characteristics
- 3) Explore one application of Zener diodes

Experiment 1) Measure Diode's characteristics using step by step measurements

- A) Create new Multisim project
- B) Insert and connect the required components
 1. Insert R1 resistor and adjust its value to 100 Ω
 2. Insert a DC power source
 3. Insert a Ground
 4. Insert 1N4738A Zener Diode (Select Diode from Group list, Zener from Family list, and 1N4738A from the Component list)
 5. Connect the circuit as shown bellow



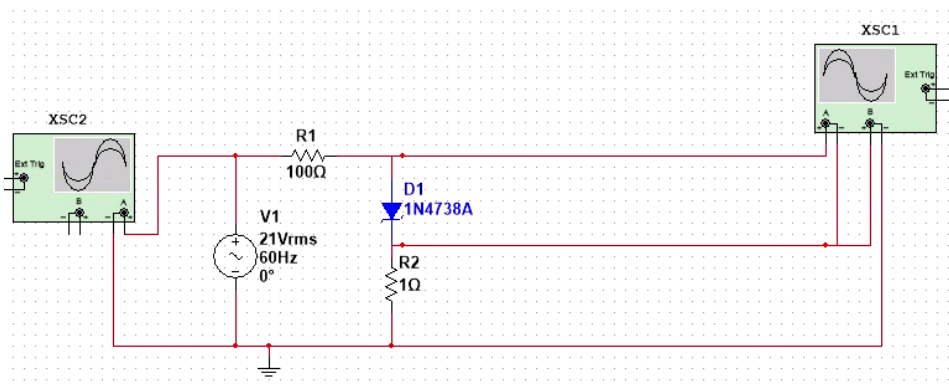
- C) Simulate the circuit using Seep analysis as follows:
 1. Choose Simulate -> Analysis and simulation
 2. DC Sweep
 3. From the Analysis parameters tab Choose VIN from Source 1 list
 4. Choose start value = -20, stop value = 10 and step 0.2
 5. From the Output tab Choose ID and VD (for the circuit above it was I(D1) and V(1))
 6. Click run
 7. Choose Export to Excel from the output window as shown bellow



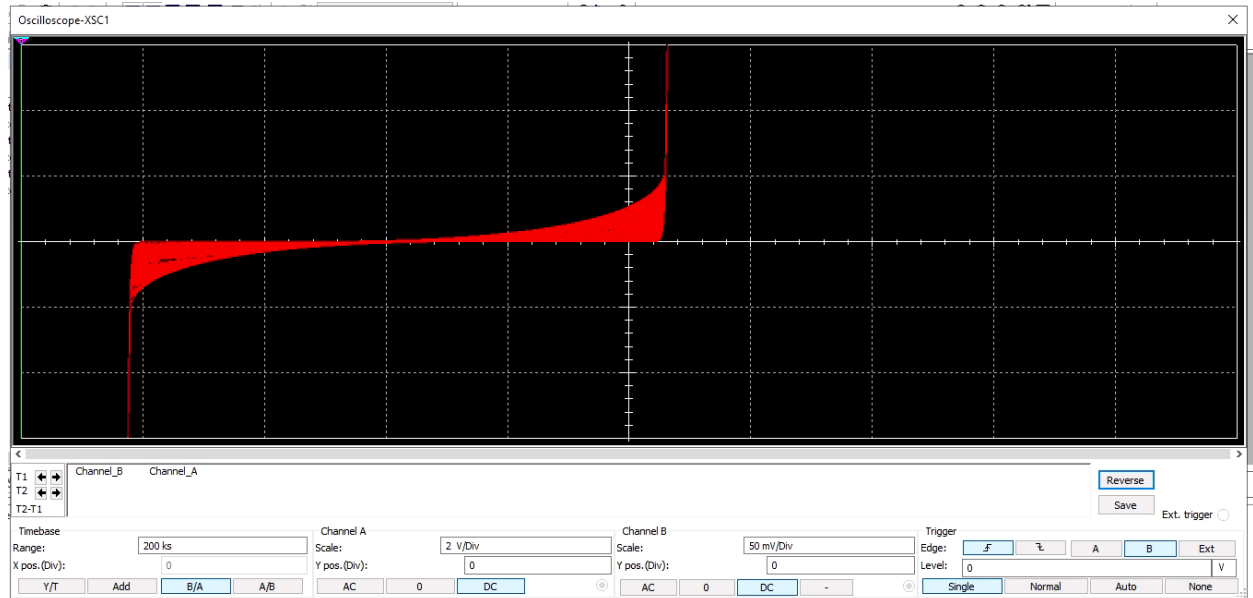
- D) In the Excel sheet created plot I_D vs V_D
- E) Find Saturation current I_S , break down voltage V_{BD} and built-in voltage V_{bi}
- F) Save the project with an appropriate name in a new folder for future reference

Experiment 2) Measure Diode's characteristics automatically using AC source and oscilloscope

- A) Insert and connect the required components
 1. Insert 2 resistors and set their R_2 1Ω and R_1 100Ω
 2. Insert an AC power source and set its rms to 21V ($\approx 60V_{pp}$)
 3. Insert from the same list a ground
 4. Insert an oscilloscope from the rightmost list (the fourth icon is the oscilloscope) and another on the far left to measure input
 5. Insert the same Zener Diode of Exp 1; 1N4738 A
 6. Connect the circuit as shown bellow



- B) Running the simulation
 1. From Simulate click Run
 2. Double on the oscilloscope
 3. Set the front panel knobs of the oscilloscope as shown bellow

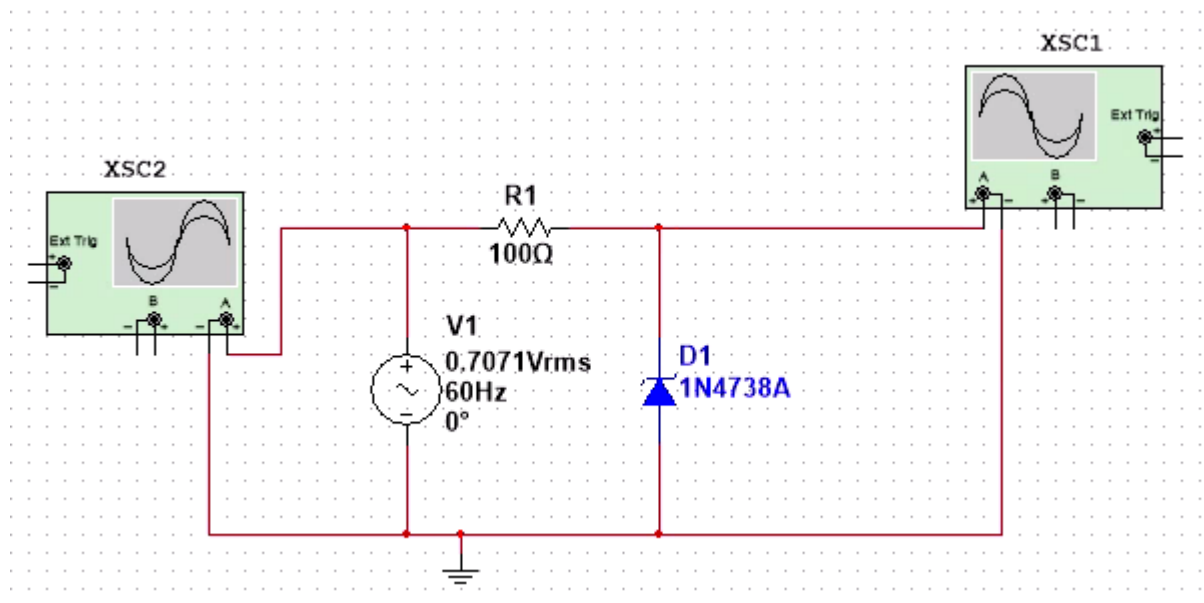


4. Try to measure the Diode break down voltage and built-in voltage

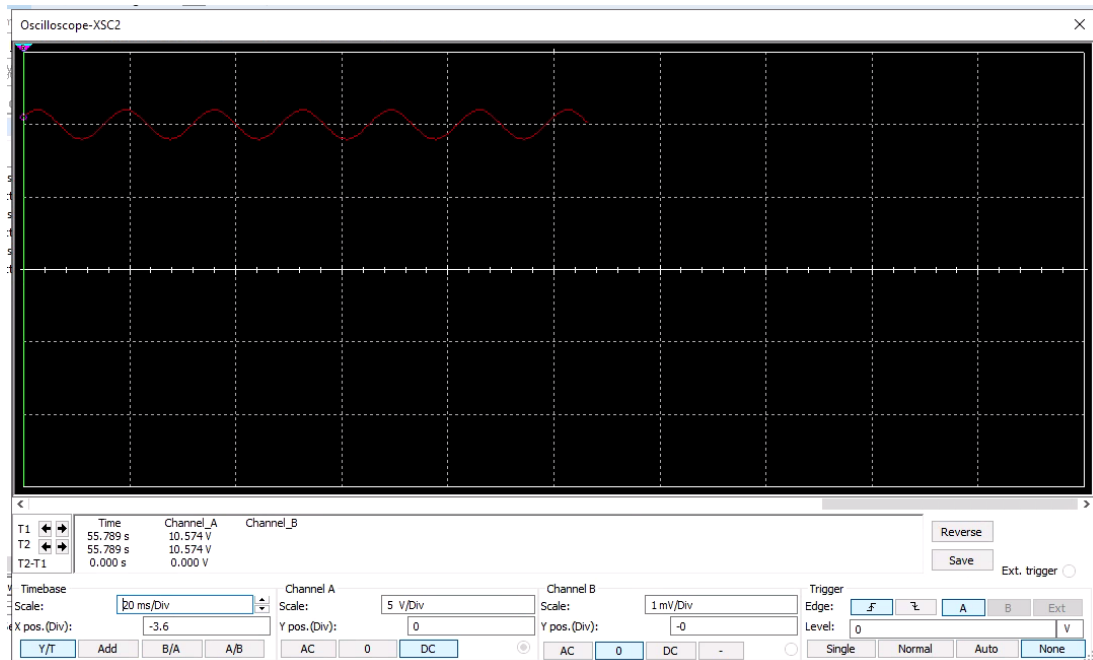
C) Save the current project with a proper name

Experiment 3) Zener application (AC to DC conversion)

A) Insert and connect the required components as shown bellow



B) Set rms value of V1 to 0.7071 and add a shift of 10V to it. The input voltage should be as shown bellow



- C) What do you notice in V_o at channel A? is an ac signal? Can you explain why/why not it is ac signal?