Laboratory 3: Diodes

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Diode

Diodes are the most fundamental circuit component which is useful in converting AC to DC and logic implementations. It is often described as two terminal device. Based on the applied voltage, often referred as biasing, the diode conducts current in one direction. The diode works only in forward biasing mode. Forward bias means connecting the anode side of the diode at higher potential than cathode side. Reverse bias means applying the voltage in opposite direction.

I-V characteristics of a diode

Setup the diode in series with Resistor of 10 K Ω. Apply DC voltage of 0 to 2 V in steps of 0.1 V and measure the current along the diode. Make sure that the DC voltage source is in series with that of diode and resistor connection. Use multimeter to measure the current for these applied voltages. Reverse the voltage polarity i.e apply 0 to -2 V and repeat the procedures. Plot the I-V curve of the diode using these measured current and voltage values in your lab report.

Different applications of diode: Limiters and clippers

Setup the circuit as shown in the Figure 1. Produce plots of input voltage (Vin) and output voltage (Vout) in the lab report for two of these circuits.

Rectifier

Diodes are mostly used for rectification. Rectifier is a type of circuit which converts from AC to relative DC. A single diode can provide half wave rectification. The other half is clipped. Construct the circuit as shown in Figure 2. Observe input and output signal in oscilloscope.

Apply a capacitor parallel to the load resistor and check the output. Observe the differance in the output with 10 μF capacitor in parallel and with no capacitor. Check the ripple voltage produced at the output. Replace the capacitor with 22 μF and 47 μF capacitors and check the ripple voltage produced with three different capacitors. Plot these four output and input signal in a single graph mentioning the capacitor values used in your experiment.

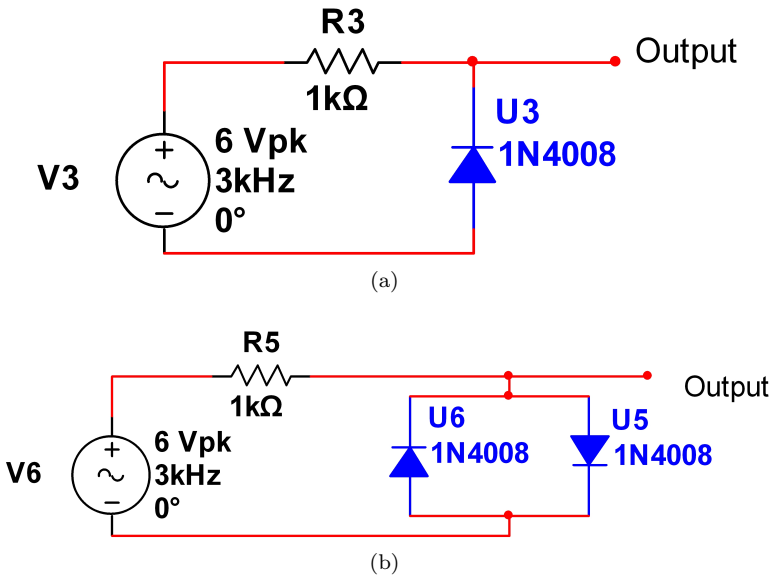

Figure 1: Schematic representation of different applications of Diode in a circuit.

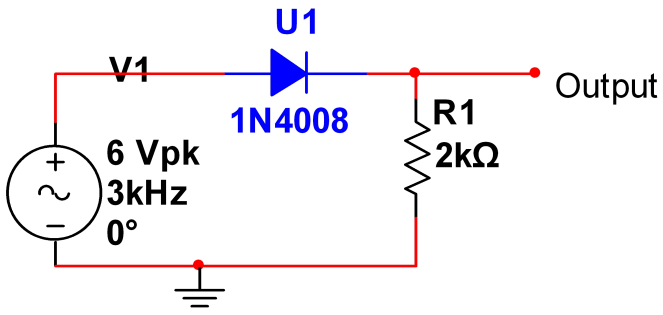

Figure 2: Schematic representation of half wave rectifier.

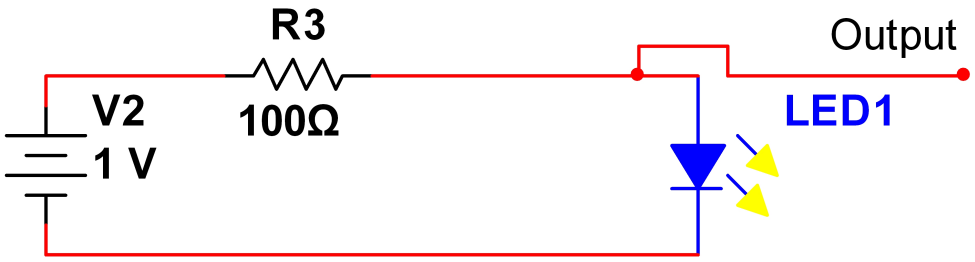

Figure 3: Schematic representation of an LED in a circuit.

LEDs

No plot is required for this experiment in your lab report. Build the circuit using an Yellow LED in series with 100 Ωas shown in Figure 3. Vary the DC voltage from 0 to 5 V in steps of 0.5 V. Measure the threshold voltage for this LED where it starts to conduct and glows. Replace the LED with another one and repeat the experiment. Repeat the experimental steps for one more LED.

Now connect all the LEDs in series and measure the threshold voltage where all the LEDs glow.

Can you make all the LEDs glow at every 1 second ? Describe your input signal in details.