

Experiment 6:

LEDs and Zener Diodes

In-Lab Report

A.1

Connect the circuit of Fig. 1 using the *red* light emitting diode (LED). Starting from a value of 0.5 V, increase V_s in steps of 0.5 V and measure the LED voltage and current for each V_s . Do not exceed 30 mA of current in the diode.

V_s	V_{LED}	I_{LED}
0.5	552 mV	0.001 mA
1.0	1.07 V	0.001 mA
1.5	1.49 V	0.0028 mA
2.0	1.65 V	1.492 mA
2.5	1.67 V	2.849 mA
3.0	1.69 V	4.577 mA
3.5	1.71 V	6.137 mA
4	1.72 V	7.883 mA
4.5	1.74 V	9.518 mA
5	1.75 V	11.174 mA
5.5	1.76 V	12.879 mA
6	1.77 V	13.235mA
6.5	1.78 V	14.251 mA
7.0	1.79 V	17.194 mA
7.5	1.79 V	18.99 mA
8.0	1.8 V	20.503 mA

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8.5	1.81 V	22.09 mA
9.0	1.82 V	24.309 mA
9.5	1.83 V	25.805mA
10.0	1.85 V	27.99 mA
10.5	1.85 V	28.85 mA`
11.0	1.86 V	30.856 mA
11.5		
12.0		
12.5		
13.0		
13.5		
14.0		
14.5		
15.0		
15.5		
16.0		
16.5		
17.0		

A.2

Repeat Part A.1 with the diode connection reversed. Plot the forward and reverse characteristics of the LED and determine the incremental resistance of the diode in the forward and reverse conducting regions.

V_s	V_{LED}	I_{LED}
0.5	579 mV	0.001 mA
1.0	1.01 V	0.002 mA
1.5	1.6 V	0.002 mA
2.0	2.07 V	0.003 mA
2.5	2.54 V	0.003 mA

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3.0	3.08 V	0.004 mA
3.5	3.58 V	0.004mA
4	4.07 V	0.005 mA
4.5	4.54 V	0.005 mA
5	5.01 V	0.006 mA
5.5	5.51 V	0.006 mA
6	6.07 V	0.007 mA
6.5	6.57 V	0.008 mA
7.0	7.04 V	0.008 mA
7.5	7.57 V	0.008 mA
8.0	8.03 V	0.009 mA
8.5	8.50	0.010 mA
9.0	8.97 V	0.01 mA
9.5	9.64 V	0.011 mA
10.0	10.1 V	0.011 mA
10.5	10.6 V	0.012 mA
11.0	11.1 V	0.012 mA
11.5	11.6 V	0.013 mA
12.0	12.1 V	0.013 mA
12.5	12.6 V	0.014 mA
13.0	13.1 V	0.014 mA
13.5	13.6 V	0.015 mA
14.0	14.0 V	0.015 mA
14.5	14.5 V	0.016 mA
15.0	15.1 V	0.016 mA
15.5	15.6 V	0.017 mA
16.0	16.1 V	0.017 mA
16.5	16.6 V	0.018 mA
17.0	17.1 V	0.019 mA

B.1

Connect the circuit and measure V_Z when V_S is 15 V.

V_S	5.64 V
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B.2

Reduce the value of V_S in steps of 0.5 V, and measure V_Z and I_Z .

V_S	V_Z	I_Z
0.5	496 mV	0.001 mA
1.0	1.04 V	0.002 mA
1.5	1.57 V	0.002 mA
2.0	2.04 V	0.003 mA
2.5	2.52 V	0.003 mA
3.0	3.06 V	0.004 mA
3.5	3.54 V	0.005 mA
4	4.02 V	0.007 mA
4.5	4.55 V	0.016 mA
5	5.03 V	0.052 mA
5.5	5.32 V	0.154 mA
6	5.49 V	0.428 mA
6.5	5.53 V	0.79 mA
7.0	5.56 V	1.21 mA
7.5	5.58 V	1.59 mA
8.0	5.59 V	1.928 mA
8.5	5.6 V	2.39 mA
9.0	5.61 V	2.85 mA
9.5	5.61 V	3.19 mA
10.0	5.61 V	3.64 mA

10.5	5.62 V	4.079 mA
11.0	5.62 V	4.438mA
11.5	5.63 V	4.910 mA
12.0	5.63 V	5.24 mA
12.5	5.63 V	5.688 mA
13.0	5.64 V	6.256 mA
13.5	5.64 V	6.468 mA
14.0	5.64 V	6.908 mA
14.5	5.64 V	7.335 mA
15.0	5.65 V	7.744 mA

B.4

Measure V_Z . What is the DC (average) value of V_Z ?

What is the AC component in V_Z ?

V_Z (DC)	5.62 v
V_Z (AC)	34 mV