EE236 : Electronic Devices Lab
Lab 3 [Tuesday Batch]

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1 Aim

1. To study the forward and reverse bias I/V characteristics of a photidiode.
2. To measure the response of the Photodiode for different lights and different intensities. (4 LEDs are provided, along with their current vs intensity data)
3. To use the Photodiode as an optical signal sensor in combination with an Infra-red LED.

2 Part 1

2.1 Circuit

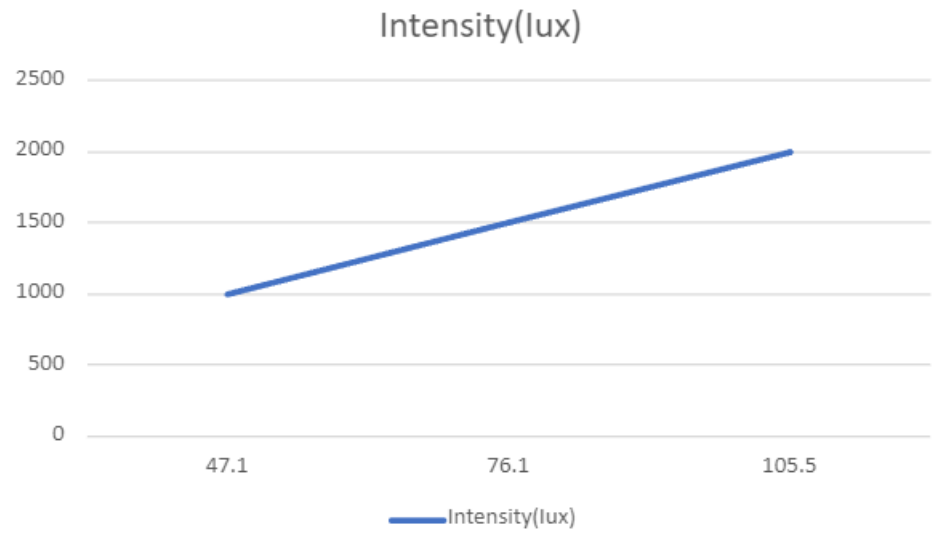


Figure 1: I-V characteristics of a diode

2.2 Plots

2.2.1 Forward Bias

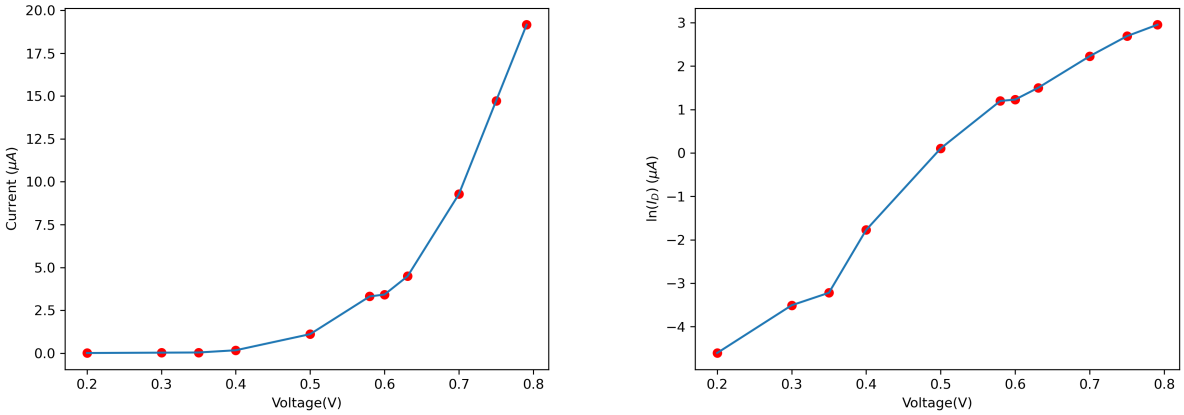


Figure 2: I-V characteristics of photodiode in forward bias

2.2.2 Reverse Bias

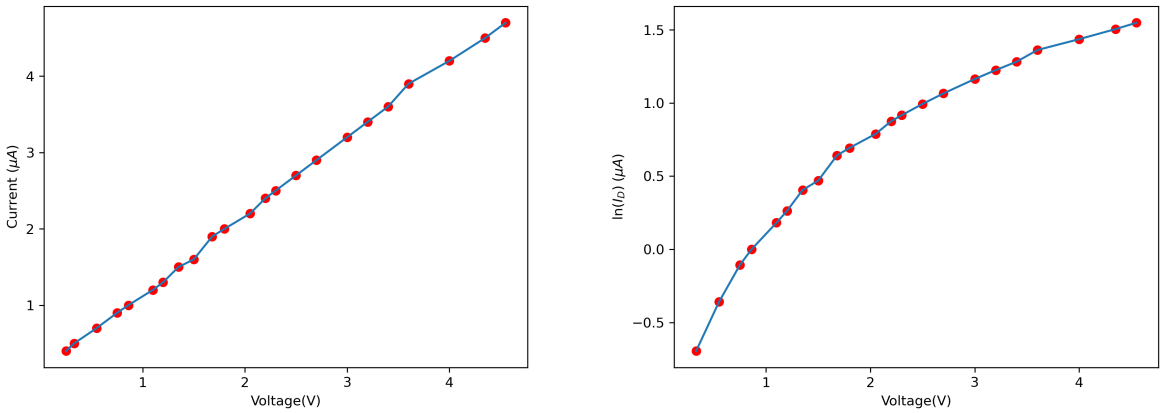


Figure 3: I-V characteristics of photodiode in reverse bias

We also see that the ideality factor of the photodiode is around 2.5.

2.3 Readings

2.3.1 Forward Bias

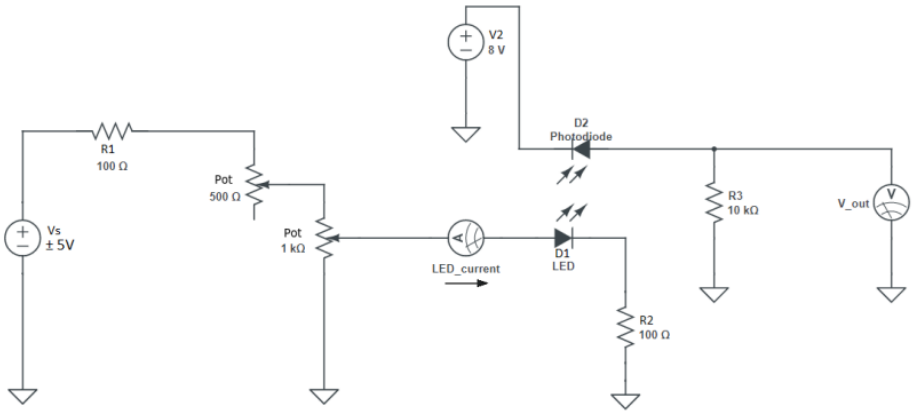
I_{pd}(mA)	V_{pd}(mV)
0.01	200
0.03	300
0.04	350
0.17	400
1.11	500
3.31	580
3.42	600
4.49	631
9.28	700
14.72	750
19.16	791

2.3.2 Reverse Bias

I_{pd}(mA)	V_{pd}(mV)
0.4	250
0.5	330
0.7	550
0.9	750
1	860
1.2	1100
1.3	1200
1.5	1350
1.6	1500
1.9	1680
2	1800
2.2	2050
2.4	2200
2.5	2300
2.7	2500
2.9	2700
3.2	3000
3.4	3200
3.6	3400
3.9	3600
4.2	4000
4.5	4350
4.7	4550

3 Part2

3.1 Circiut



3.2 Readings

LED	Wavelength	Intensity(Iμx)	Current(mA)	Vout(mV)
IR	950	1000	4.51	7.5
	950	1500	5.15	14.6
	950	2000	6.26	17.8
Blue	450	1000	0.301	1.3
	450	1500	0.416	1.6
	450	2000	0.572	2.2
Red	750	1000	2	47.1
	750	1500	3	76.1
	750	2000	4	105.5
Green	520	1000	0.188	0.3
	520	1500	0.294	0.4
	520	2000	0.371	0.4

3.3 Plots

3.3.1 For each LED

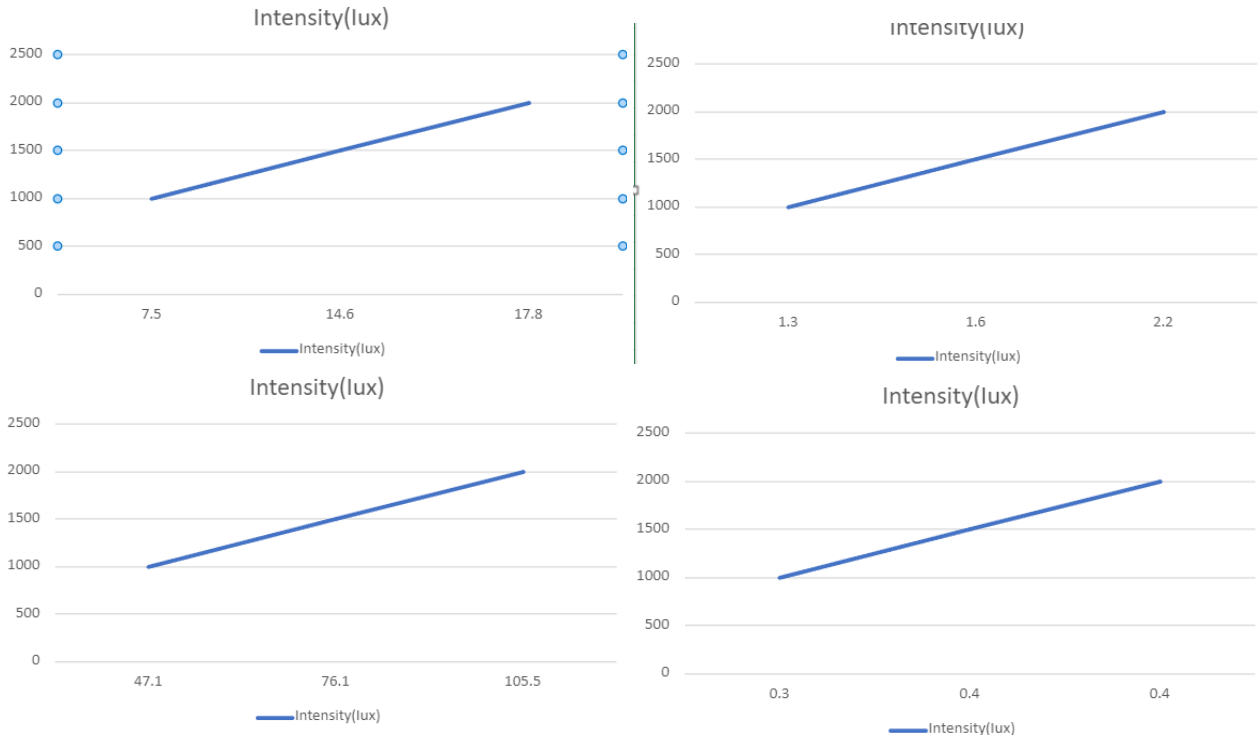


Figure 4: (a)IR (b)Blue (c)Red (d)Green

3.3.2 For each intensity

Figure 5: (a)1000 (b)1500 (c)2000

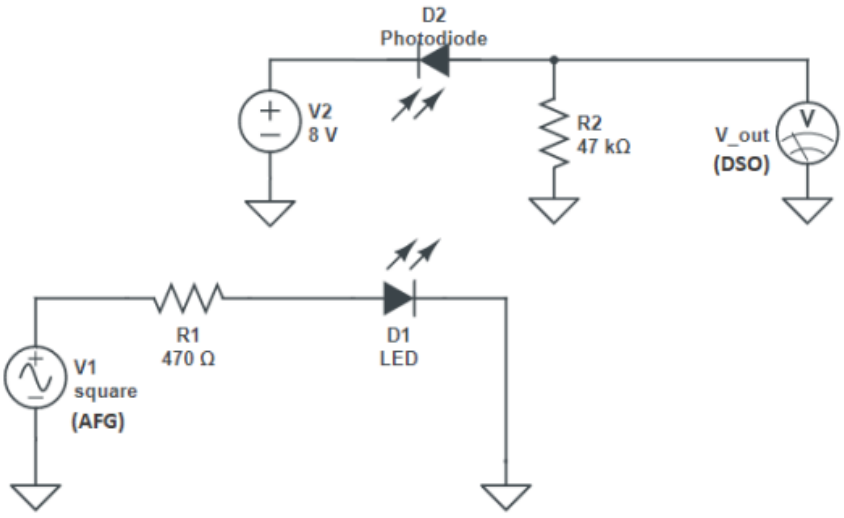
3.4 Efficiency

CLEARLY RED LED HAS THE HIGHEST EFFICIENCY

Figure 6: (a)1000 (b)1500 (c)2000

4 Part 3

As observed from the experiment there is high distortion after 3-4Khz. Since the reversed saturation time excceds the time period of the input wave hence it does not get discharged completely and reverse saturation current still flows through the circuit due to the stored charge.


D2
Photodiode
V2
8 V
R2
47 kΩ
V_out
(DSO)
V
R1
470 Ω
D1
LED
V1
square
(AFG)