

EE 236: Electronic Divice Lab

Lab No. 5

HARDIK KHARIWAL, 22B3954

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1 Dark forward characteristics at different temperatures

1.1 Prelab

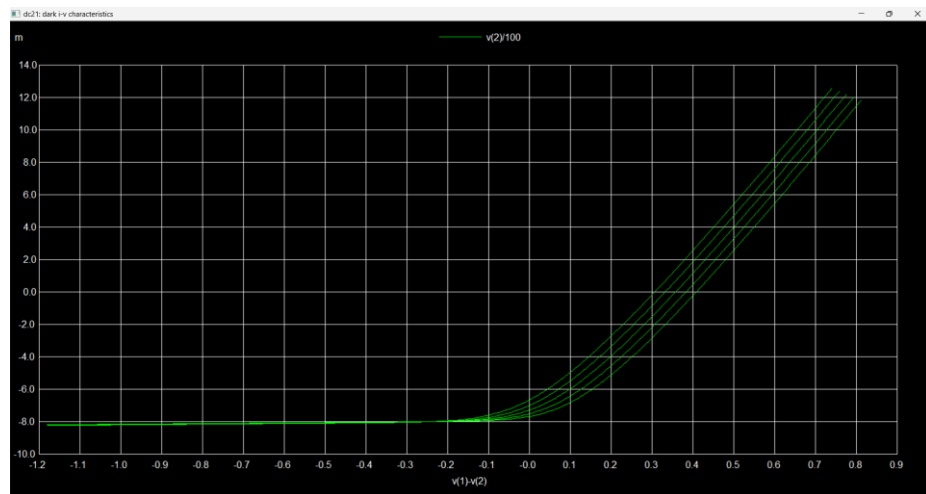


Figure 1: I-V Characteristics for Dark

In the above diagram, the graph at the bottom represents a temperature of 35 °C, increasing up to 75 °C at the top.

1.2 InLab

1.2.1 Circuit Diagram

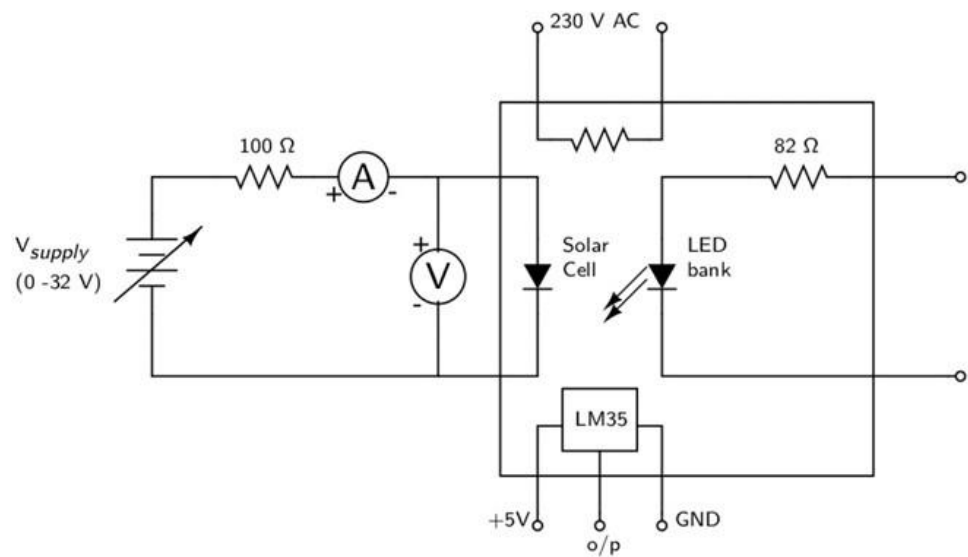


Figure 2: Circuit Diagram

1.2.2 Reading of V_d , I_d and $\ln(I_d)$ for different temperatures

- MEASUREMENTS AT 35-DEGREE

35 dark	
v35d	i35d
0.091	0
0.173	0.2
0.288	1
0.35	2.4
0.386	4
0.409	5.8
0.426	7.6
0.439	9.4
0.45	11.3
0.458	13.2
0.466	15.1
0.478	18.9
0.492	24.7
0.501	29.6
0.509	34.6
0.516	39.5
0.522	44.5

Table 1: Dark I-V Characteristics at 35°C

35 light		
v35l	i35l	i35l
0.439	0.6	-0.6
0.434	1.3	-1.3
0.43	1.8	-1.8
0.42	2.8	-2.8
0.411	3.8	-3.8
0.398	4.9	-4.9
0.397	5.5	-5.5
0.376	6.1	-6.1
0.366	6.6	-6.6
0.351	7.1	-7.1
0.329	7.7	-7.7
0.252	8.9	-8.9
0.218	9.2	-9.2
0.159	9.4	-9.4
0.06	9.6	-9.6
0.026	9.7	-9.7
0	9.7	-9.7

Table 2: Light I-V Characteristics at 35°C

- MEASUREMENT S AT 45-DEGREE

45 dark	
v45d	i45d
0.199	0
0.279	1.2
0.334	2.6
0.368	4.2
0.39	5.9
0.42	9.6
0.43	11.4
0.438	13.3
0.445	15.3
0.452	17.1
0.457	19.1
0.462	21.1
0.467	23
0.471	25
0.479	28.9
0.485	32.8
0.49	36.8
0.494	39.8

Table 3: Dark I-V Characteristics at 45°C

45 light		
v45l	i45l	i45l
0.419	0.6	-0.6
0.411	1.4	-1.4
0.404	2.2	-2.2
0.393	3.4	-3.4
0.384	4.1	-4.1
0.375	4.9	-4.9
0.359	5.9	-5.9
0.34	6.8	-6.8
0.316	7.5	-7.5
0.299	8	-8
0.276	8.4	-8.4
0.253	8.6	-8.6
0.236	8.9	-8.9
0.196	9.2	-9.2
0.169	9.3	-9.3
0.136	9.4	-9.4
0.078	9.6	-9.6
0.059	9.6	-9.6

Table 4: Light I-V Characteristics at 45°C

- MEASUREMENTS AT 55-DEGREE

55 dark	
v55d	i55d
0.166	0.3
0.264	1.1
0.317	2.7
0.35	4.4
0.38	7
0.399	9.8
0.417	13.5
0.43	17.4
0.44	21.3
0.45	25.1
0.456	29
0.463	32.9
0.469	36.8
0.474	40.9

Table 5: Dark I-V
Characteristics at 55°C

55 light		
v55l	i55l	i55l
0.389	0.6	-0.6
0.386	1	-1
0.377	2.2	-2.2
0.371	2.9	-2.9
0.365	3.6	-3.6
0.353	4.5	-4.5
0.34	5.4	-5.4
0.31	6.9	-6.9
0.261	8.2	-8.2
0.244	8.5	-8.5
0.212	8.9	-8.9
0.163	9.2	-9.2
0.103	9.4	-9.4
0.056	9.4	-9.4
0.025	9.6	-9.6

Table 6:Light I-V
Characteristics at 55°C

- MEASUREMENTS AT 65-DEGREE

65 dark	
v65d	i65d
0.158	0.4
0.25	1.4
0.297	2.7
0.327	4.4
0.346	6.3
0.361	8.1
0.37	9.6
0.38	12
0.398	15.7
0.412	20.5
0.423	25.4
0.429	28.4
0.435	32.2
0.442	37.3

Table 7: Dark I-V
Characteristics at 65°C

65 light		
v65i	i65l	i65l
0.375	0.5	-0.5
0.365	1.2	-1.2
0.356	2.2	-2.2
0.348	3	-3
0.338	4	-4
0.325	5	-5
0.309	6	-6
0.273	7.4	-7.4
0.257	8	-8
0.156	9.1	-9.1
0.026	9.6	-9.6

Table 8:Light I-V
Characteristics at 65°C

1.2.3 Plots

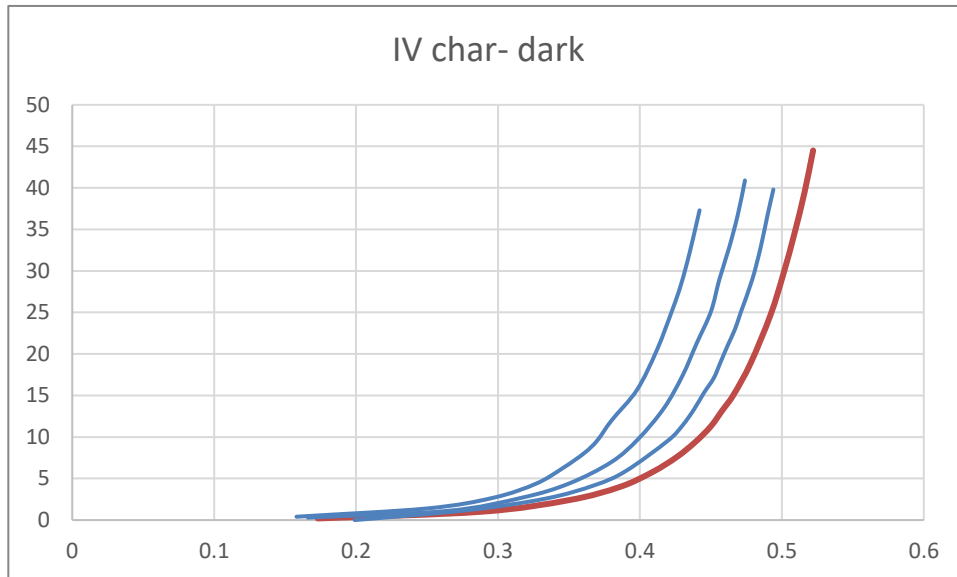


Figure 3: I_d vs V_d

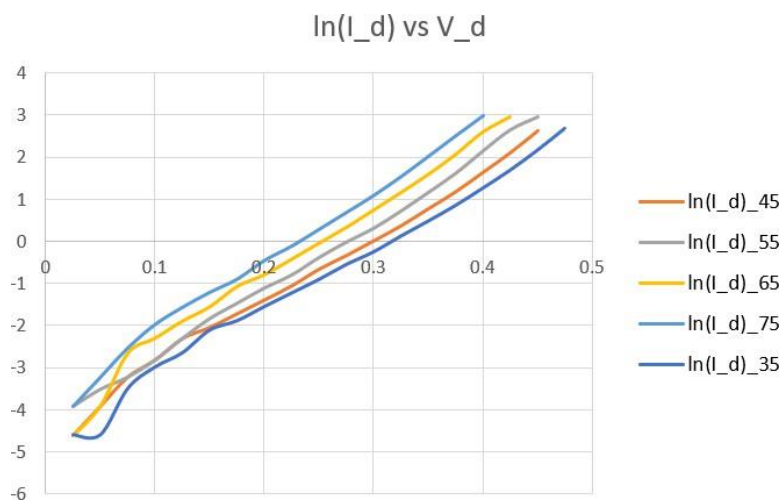


Figure 4: $\ln(I_d)$ vs V_d

1.2.4 Observations

Table 6: Observation Table

Temperature	V_d for $I_d = 1mA$	V_d for $I_d = 2mA$	V_d for $I_d = 5mA$	η for low for- ward bias	η for high for- ward bias
35°C	0.316	0.364	0.42	2.255677	2.394703
45°C	0.296	0.344	0.397	2.322295	2.278349
55°C	0.276	0.323	0.375	2.413138	2.175333
65°C	0.253	0.297	0.352	2.184457	2.159706
75°C	0.23	0.275	0.328	2.155205	2.074933

2 Lighted I/V at different temperatures

2.1 Prelab

2.1.1 Plot

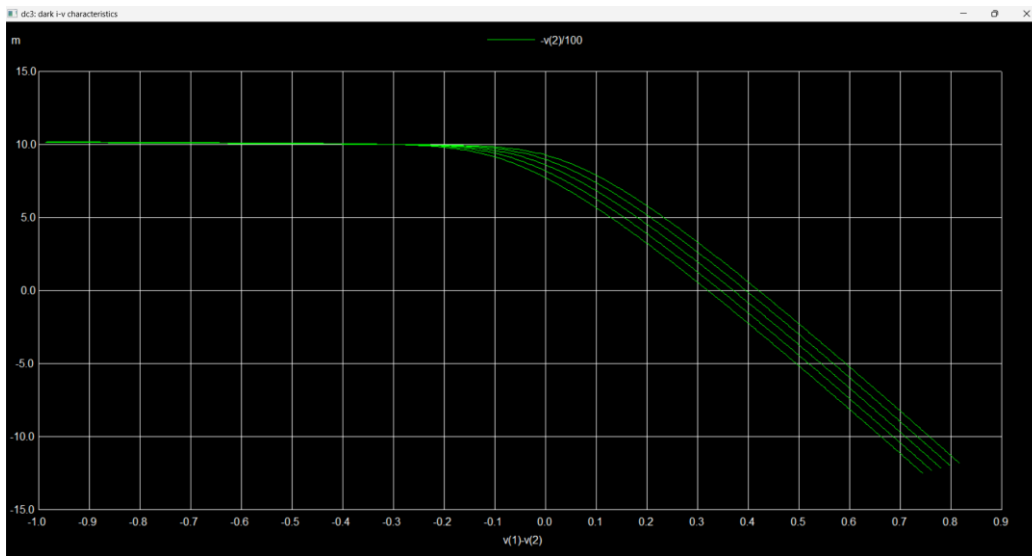


Figure 5: Lighted I-V characteristics

2.1.2 Calculated Values

Temperature (°C)	Vm (V)	Im (mA)	Isc (mA)	Voc (V)	FF
35	0.2612	-0.0076	-0.0099	0.4159	0.4831
45	0.2410	-0.0074	-0.0099	0.3944	0.4582
55	0.2209	-0.0072	-0.0099	0.3728	0.4330
65	0.2005	-0.0072	-0.0098	0.3513	0.4182
75	0.2019	-0.0061	-0.0098	0.2790	0.4526

Table 7: Temperature dependence of solar cell parameters

2.2 Inlab

2.2.1 Circuit Diagram

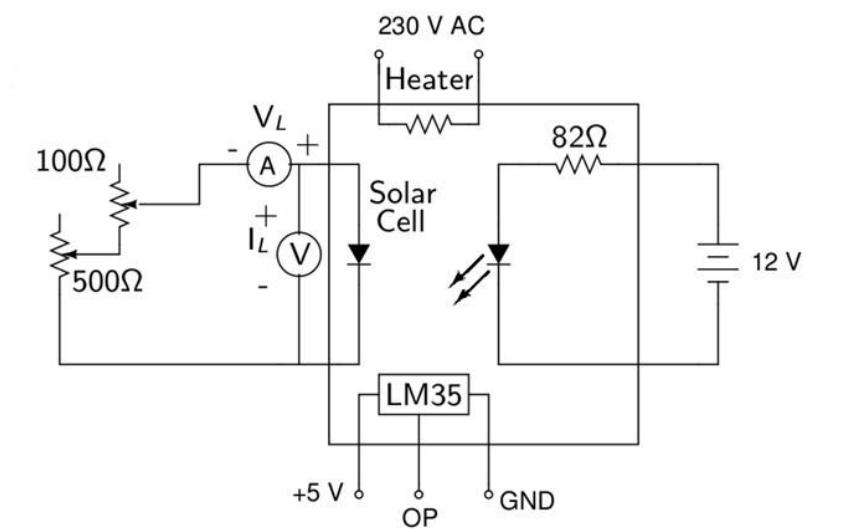


Figure 6: Circuit diagram for lighted I/V characteristics

2.2.2 Plots

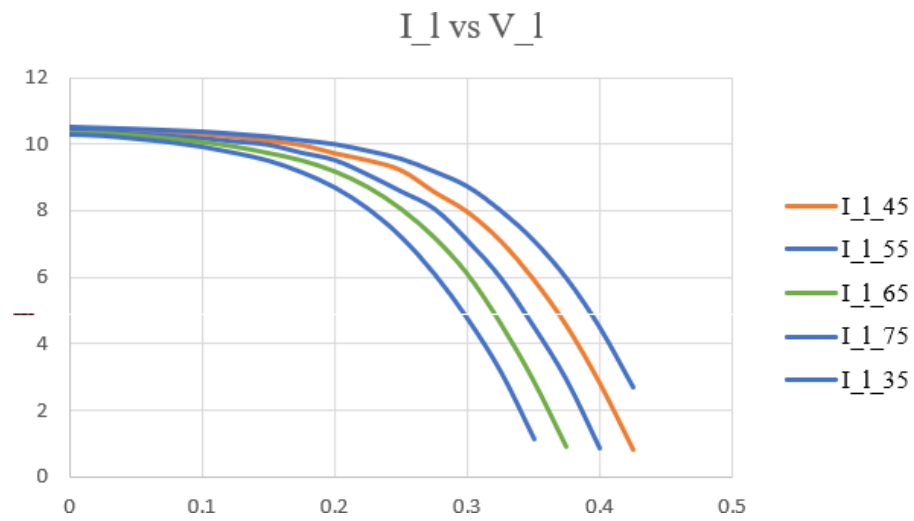


Figure 7: Caption

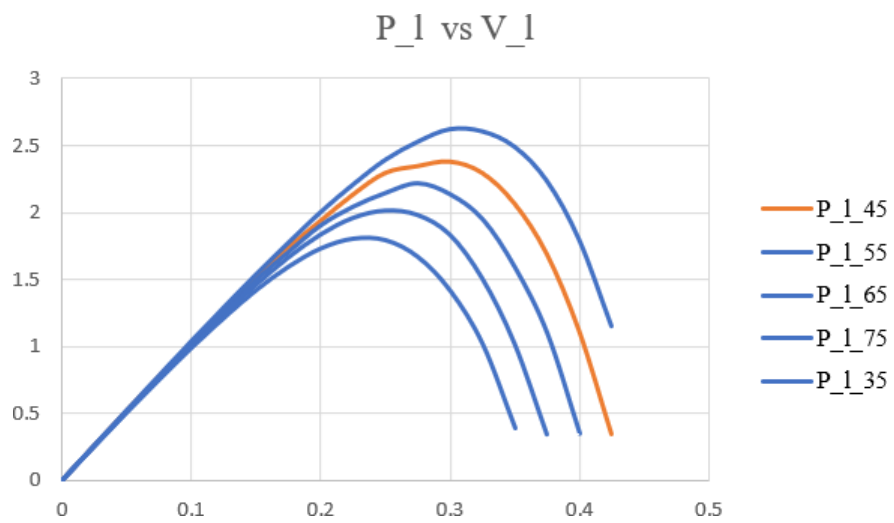


Figure 8: Caption

2.2.3 Observations

Temp	35°C	45°C	55°C	65°C	75°C
I_{sc}	11.9378	12.2615	12.1759	12.0530	11.9037
V_{oc}	0.8096	0.6475	0.6024	0.5570	0.5145
$I_m \times V_m$	2.6190	2.3850	2.2220	2.0125	1.8068
FF	0.2710	0.3004	0.3029	0.2998	0.2950

Table 13: Performance Metrics at Different Temperatures