Chart, funnel chart

Description automatically generated

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| --- | --- |
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|  |  |
| Report Title | Diode |

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# Introduction

This report is for lab 1 “Diodes”. The lab took place on 26 Jan 2022. The prelab is placed at the end of the report as an Appendix.

# Objectives

The objective of this lab was to examine the V-I property of the 1N4148 silicon diode and its small-signal behavior when in forward-bias region.

# Circuit Under Test

Diagram, schematic

Description automatically generated

Figure 2.a shows the diode connected in series with a resistor R, Id (current in diode) was set by changing Vcc (Voltage of the supply) and then measuring the voltage VD (VD1 in the table) (voltage across the Diode). Figure 2.b shows the same diode but connected in series with Resistor R and in parallel with resistor Rsh When Id was set the resistor Rsh was added and voltage across the diode was recorded as VD2.

# Experimental and Results

The Simulated Circuit:

Diagram

Description automatically generated with medium confidence

The Table for the circuit:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Id/mA | Vcc/V | Vd1/V | Rsh/KΩ | Vd2/V | ΔVd/V | ΔId/mA | Rd/Ω |
| =Vd2-Vd1 | =-VD2/Rsh | =ΔVd\*1000/ΔId |
| 10 | 11.28 | 0.672 | 1.5 | 0.670 | -0.002 | -0.4467 | 4.4776 |
| 7 | 7.92 | 0.657 | 2.2 | 0.655 | -0.002 | -0.2977 | 6.7176 |
| 5 | 6.00 | 0.646 | 2.7 | 0.644 | -0.002 | -0.2385 | 8.3851 |
| 2 | 2.64 | 0.616 | 6.8 | 0.614 | -0.002 | -0.0903 | 22.1498 |
| 1 | 1.68 | 0.598 | 12.0 | 0.597 | -0.001 | -0.0498 | 20.1005 |

# Conclusions and Remarks



Graph P1(a)

Circuit for the graphs:

Diagram, schematic

Description automatically generated

Vs:

Chart, line chart

Description automatically generated

This is the graph for the source/function generator which is a triangular waveform with amplitude of 12V at 1kHz frequency. The graph came out as expected since these were the settings of the function generator.

Vi:

Chart, line chart

Description automatically generated

This graph is for the voltage between the 50-ohm resistor, and the ground point the graph is very similar to that of the function generator, but it is slightly offset (the offset is barely noticeable) due to the small resistance of the resistor. The graph came out as expected.

Vd:

Chart, line chart

Description automatically generated

This is the graph of the voltage across the diode. It does not go above 0.7V when the diode is on but follows the function generator for the negative voltages. The graph came out as expected since it acts like a closed switch when the circuit is on, when the diode is on the oscilloscope reads 0.7V because this is the internal voltage of the diode.

Id:

Chart

Description automatically generated

This is the graph for the current in the diode. The graph looks like the opposite of the Vd graph. The current flats out during the time the voltage is negative this is to open the circuit however the graph isn’t completely flat there is a small saturation current, but it is so small to be seen on the oscilloscope with these settings. This graph came out as expected as the diode in reverse bias does not allow current to pass through acting like an open switch.

Graph P1(b):

Circuit for the graph:

Calendar

Description automatically generated

I-V Characteristic graph of the Diode:

Chart

Description automatically generated

The graph is flat till V=0.4V the grows exponentially after. This is expected since the resistance of the diode decreases exponentially in the forward bias configuration.

Text, letter

Description automatically generated

To plot a straight-line graph for this equation

|  |  |
| --- | --- |
| Y axis | Vd |
| X axis | ln|Id| |
| Gradient | n/40 |
| Y intercept | -ln|Is| |

*Table

Description automatically generated*

# Appendix – Prelab

Circuit

Diagram, schematic

Description automatically generated

Graph P1(a)

Vs:

Chart, line chart

Description automatically generated

Vi:

Chart, line chart

Description automatically generated

Vd:

Chart, line chart

Description automatically generated

Id:

Chart

Description automatically generated

Graph P1(b):

Calendar

Description automatically generated

Chart

Description automatically generated