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## Section: 009

## Lab: 3

## AD2 #: 210321AA2E82

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## Abstract

The purpose of these experiments was to show the IV relations of MOSFETs and demonstrate how to use different methods to find parameters of MOSFETs. An AD2 was used to provide waveforms, DC power, trace waveforms, and monitor waveforms. This lab was valuable because it shows the applications of the more abstract theories we learn in class.

## Task 1

### Objective

The objective of this task was to demonstrate how to find using a threshold voltage tester.

### Procedure

The circuit below was built first. Next, the was set using the waveform output of the AD2 as a DC output. To confirm the circuit was built correctly, voltage was measured across Rs to confirm that was set to 1μA. The measurement of was taken for all 4 MOSFETs in the ALD1106 chip.

### Results

Circuit

A diagram of a circuit

Description automatically generated

chart

|  |  |  |
| --- | --- | --- |
| Transistor # | (mV) | Difference in on datasheet (mV) |
| 1 | .674 | .026 |
| 2 | .673 | .027 |
| 3 | .669 | .031 |
| 4 | .688 | .012 |

The found through the threshold tester and the found on the datasheet are very similar. They are less than 1 mV away from each other.

ALD1106 Datasheet

A white rectangular box with black text

Description automatically generated

### Conclusions

While there was trouble setting up the circuit since we originally powered it with v+ and v-, once we solved that problem the task was successful. The threshold voltages for all transistors matched the datasheet closely and fell within the acceptable range.

## Task 2

### Objective

The objective of this task was to demonstrate how to find the Iv characteristics of a transistor by using the tools within the AD2.

### Procedure

First, the circuit below was built. An AD2 was used to measure the and . Next, the tracer on the AD2 was configured by changing the settings to “N-FET,” “no-adapter,” “ = 470,” and “/.” The tracer measured from  = 0 to = 5v in 500mV steps over 0<=<10. From the data, was calculated using found in the previous task.

### Results

Circuit Diagram:

A diagram of a circuit

Description automatically generated

I-V curve graph from AD2:

A screen shot of a graph

Description automatically generated

Equation to find :

= 1.323

### Conclusions

The task was successful because was found and the curve was created. The values made sense and matched the datasheet.

## Task 3

### Objective

The objective of this lab was to demonstrate measurement of and characteristics using the AD2.

### Procedure

The circuit from the last task was reused and the AD2 probes were moved to measure the and . The same tracer was run again. A screenshot was taken, and data exported. From the data: was calculated, vs was plotted, and theoretical and found vs was plotted.

### Results

Circuit

A diagram of a circuit

Description automatically generated

Curve tracer screenshot

A screen shot of a graph

Description automatically generated

Excel graph

formula (3.5)

vs graph

vs correlations

vs plot

The models appear to agree for approximately < 1.29 V

### Conclusions

This task was successful because the vs and vs graphs made matched what was expected of them. The and found/theory align for a short amount of time but then theory continues to increase while found flattens out, as expected.

### References

<https://www.digikey.com/htmldatasheets/production/759162/0/0/1/ald1106-116.html>