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**Lab1 Characteristics of the FET Transistor**

图示, 示意图

描述已自动生成

***Part.1***

Brief introduction: This module requires me to measure the current situation at different Vds and Vgs.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Vds=0V | Vds=1V | Vds=2V | Vds=3V | Vds=4V | Vds=5V |
| Vgs=0V | infinite | infinite | infinite | infinite | infinite | infinite |
| Vgs=0.5V | infinite | infinite | infinite | infinite | infinite | infinite |
| Vgs=1.0V | infinite | infinite | infinite | infinite | infinite | infinite |
| Vgs=1.5V | infinite | infinite | infinite | infinite | infinite | infinite |
| Vgs=2.0V | infinite | 0.8 | 1.1 | 1.1 | 1.1 | 1.2 |
| Vgs=3.0V | infinite | 0.8 | 1.7 | 2.6 | 3.5 | 4.4 |
| Vgs=5.0V | 0 | 0.9 | 1.8 | 2.6 | 3.5 | 4.4 |

图表, 折线图

描述已自动生成

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| R=Vds/Id | Vds=0 | Vds=1 | Vds=2 | Vds=3 | Vds=4 | Vds=5 |
| VGS =2 | 0Ω | 1.25 | 1.81 | 2.73 | 3.64 | 4.17 |
| VGS =3 | 0Ω | 1.25 | 1.18 | 1.15 | 1.14 | 1.13 |
| VGS =5 | 0Ω | 1.11 | 1.11 | 1.15 | 1.14 | 1.13 |

图表, 折线图

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3、

**Vth = 1.78V**

Comment: In this module, I measured the resistance at different voltages by stepping 1.0 at each step. When the voltage was greater than the threshold value of 1.78, the current began to appear. Besides, I find that when Vgs=2, there will be a constant current zone.

***Part2.***

图示, 示意图

描述已自动生成

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When Vgs=3,

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Vds(V) | 0.1 | 0.2 | 0.3 | 4 | 5 | 6 | 7 | 8 | 9 | 1.0 |
| Id(mA) | 0.09 | 0.15 | 0.22 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.78 | 0.85 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Vds(V) | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 | 4.0 |
| Id(mA) | 2.6 | 2.72 | 2.75 | 2.8 | 2.9 | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 |

­2、

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Vds=0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1 | / |
| Vgs=3 | ID | 0.09 | 0.15 | 0.22 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.78 | 0.85 | / |
| Vgs=3 | R=∆VDS/∆ID | 1667 | 1429 | 1250 | 1000 | 1000 | 1000 | 1000 | 1250 | 1429 | / | / |
| Vgs=3 | R= Vds/ID | 1111 | 1333 | 1363 | 1333 | 1250 | 1200 | 1167 | 1143 | 1153 | 1142 | / |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Vds=0 | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 | 4.0 |
| Vgs=3 | ID | 2.6 | 2.67 | 2.74 | 2.8 | 2.9 | 3 | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 |
| Vgs=3 | R=∆VDS/∆ID | 1420 | 1430 | 1490 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1430 |
| Vgs=3 | R= Vds/ID | 1153 | 1161 | 1167 | 1178 | 1172 | 1167 | 1161 | 1156 | 1151 | 1147 | 1142 |

图表, 折线图

描述已自动生成

This is the line chart of the Vds from 3 to 4, step by 0.1

图表, 折线图

描述已自动生成

This is the line chart of the Vds from 0 to 1, step by 0.1

Comment: In the second module, I measured the change of the resistance from 0 to 1 and from 3 to 4 with the method of 0.1 per step. I found that the resistance calculated by using the potential difference was different from the resistance calculated by dividing the total voltage drop by the total flow current.

Lab1 Summary:

In this experiment, I first completed the circuit connection, and then used the ammeter and voltmeter to measure the data I needed, and then made the calculation.

Through this experiment, I had a deeper understanding of the three regions of FET. During the experiment, I found that certain errors may occur in data reading and calculation, and wrong circuit connection may lead to short circuit, which requires my further attention.

Conclusion: When Vgs < Vth, cut-off area. When Vgs > Vth and Vds < VGs-VTH, the variable resistance region. When Vgs > Vth and Vds > VGs-VTH, the saturated region (constant current region).

That’s all, thank you!

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