



SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

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Department of Biomedical Engineering

Course Name: **23BMB101-Electron Devices and Circuits**

I Year : II Semester

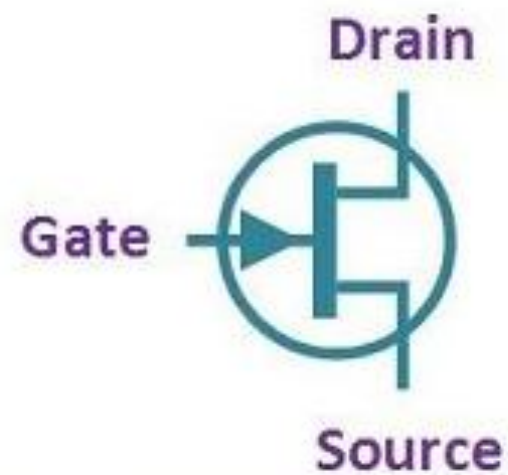
Unit II -Transistors

Topic : Junction Field Effect Transistor¹



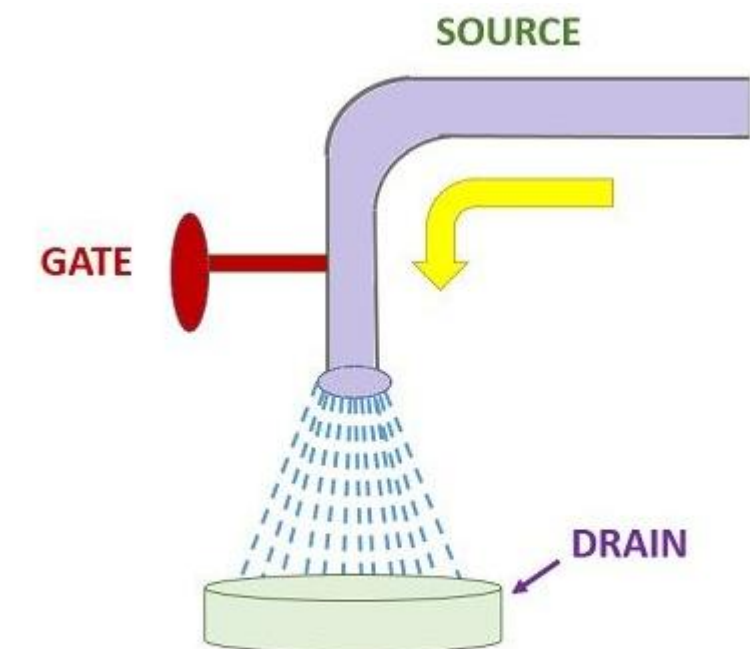
INTRODUCTION

- FET is an acronym used for “field effect transistor”. It is a three terminal unipolar device in which conduction is manipulated with the help of applied electric field.
- It is also referred as a voltage controlled device in which only majority charge carriers are involved in the conduction mechanism. It comprises of three terminals, i.e. source, gate, and drain.



FET Circuit Symbol

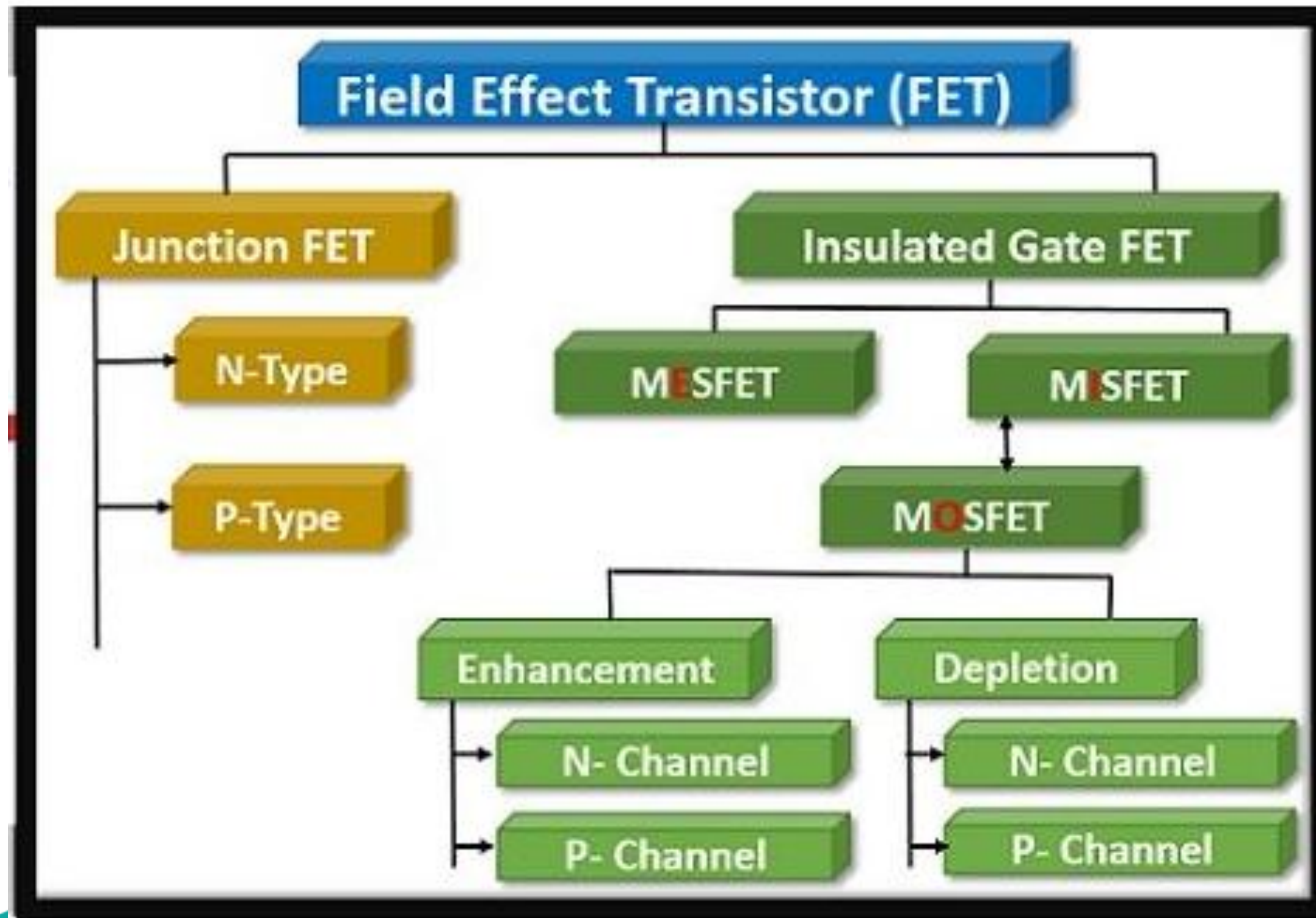
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Water Analogy for Understanding FET



Classification of FET



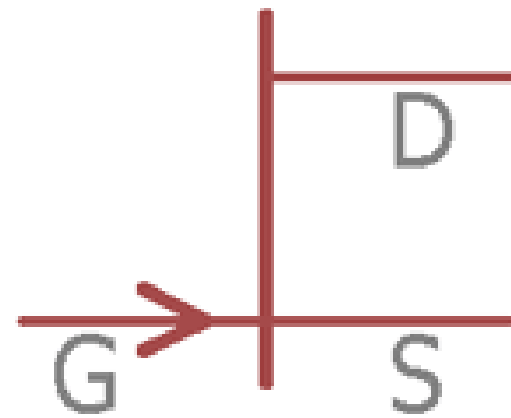
on Title 3



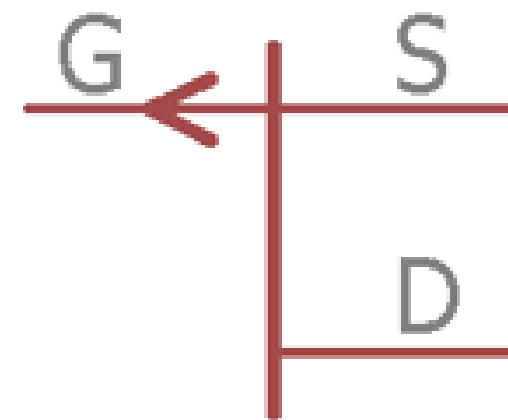
Junction Field Effect Transistor

- JFET is Junction gate field-effect transistor. Normal transistor is a current controlled device which needs current for biasing, whereas JFET is a voltage controlled device.

Vision Tit 2



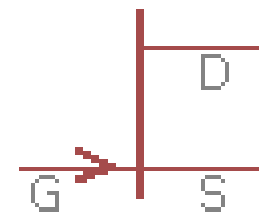
N-Channel JFET



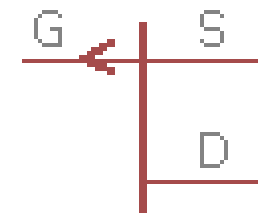
P-Channel JFET



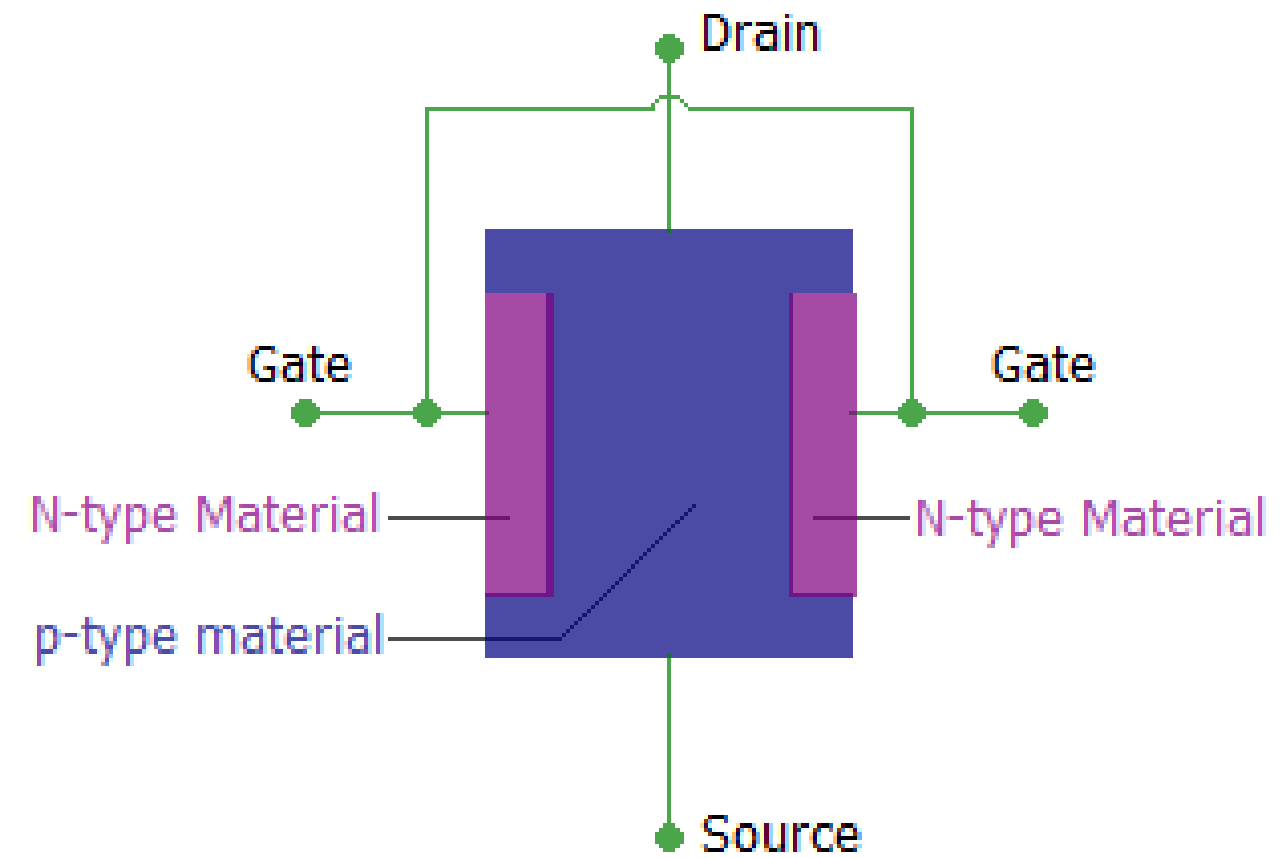
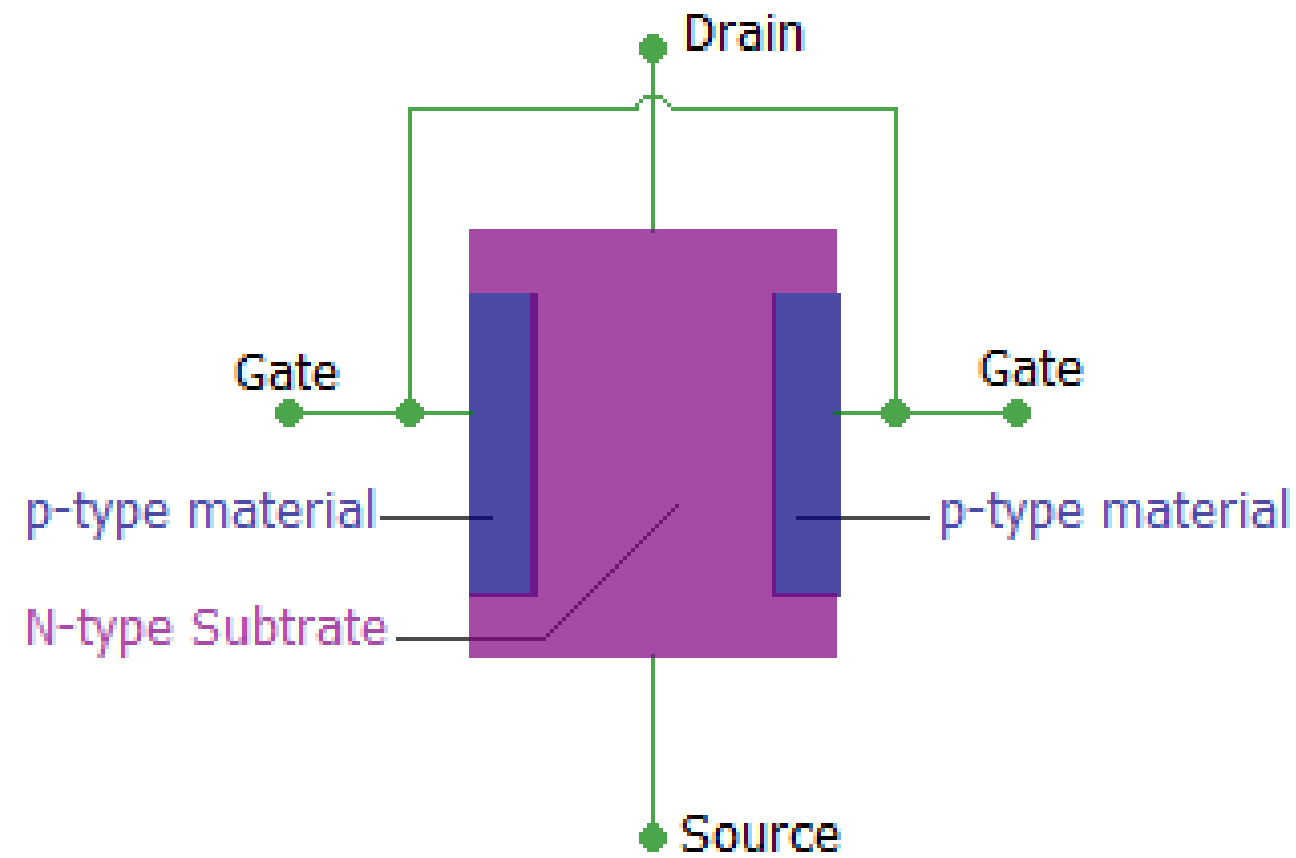
Construction



N-Channel JFET

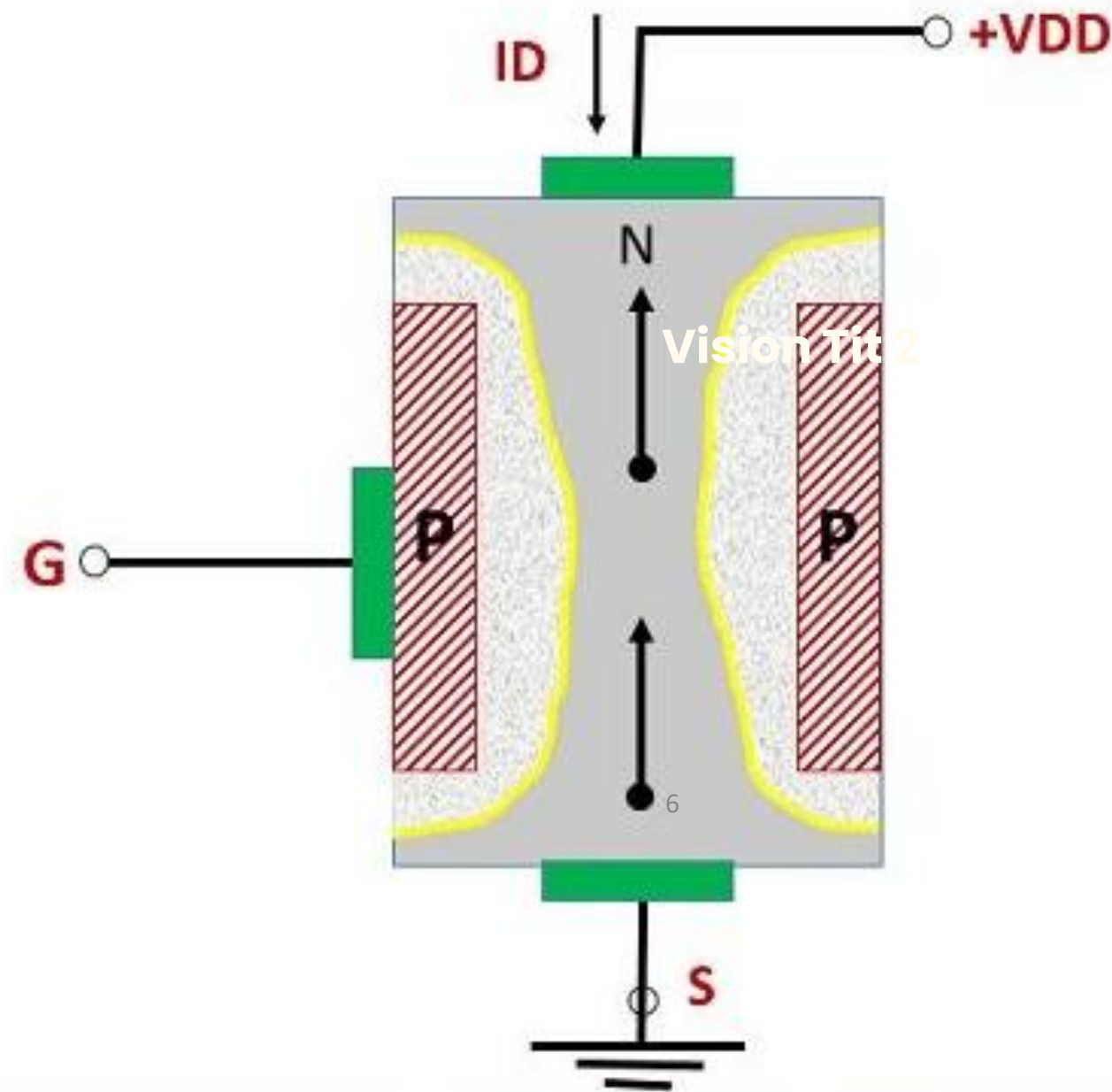


P-Channel JFET





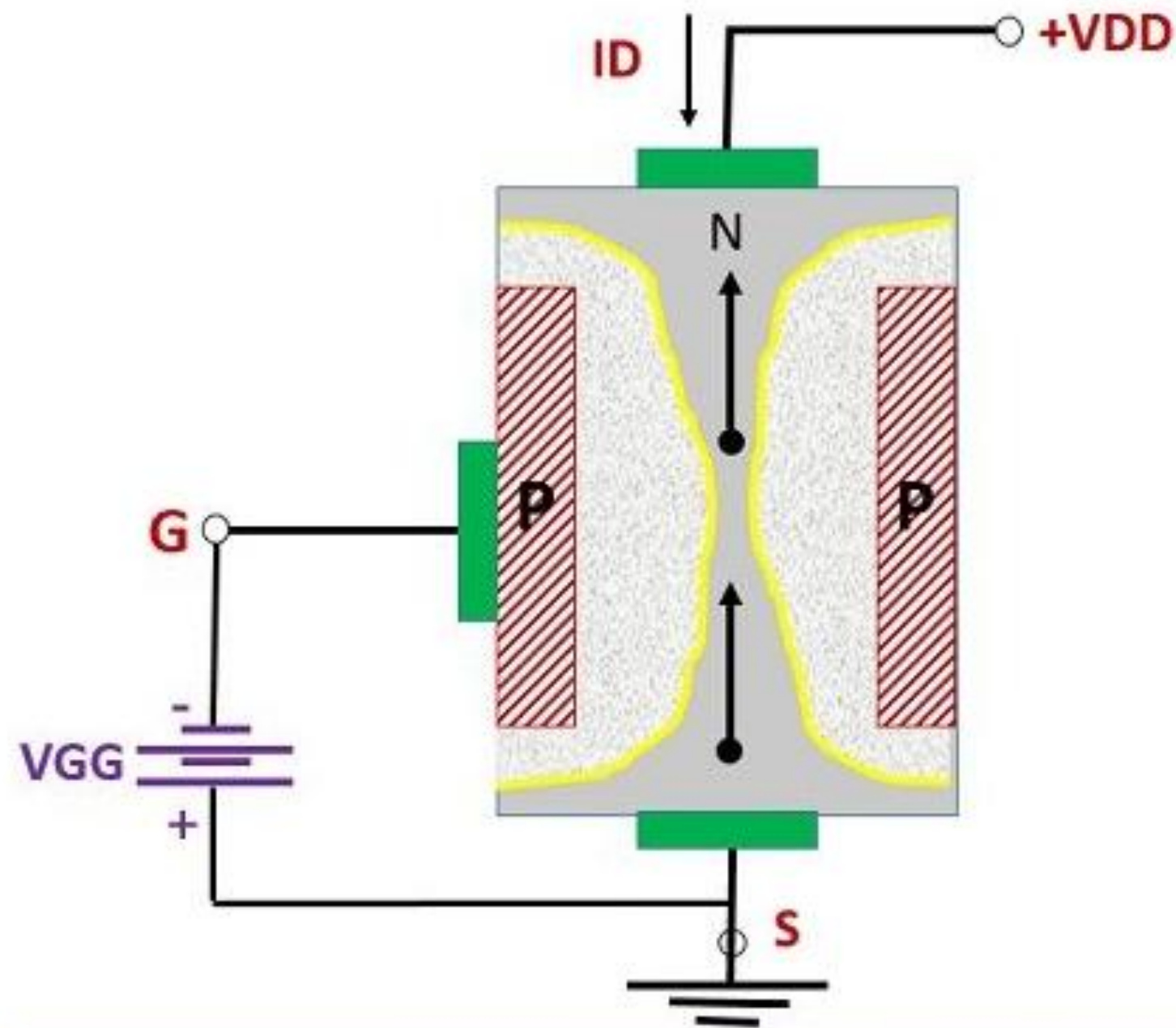
Working of JFET- When NO bias is applied



JFET with No Bias



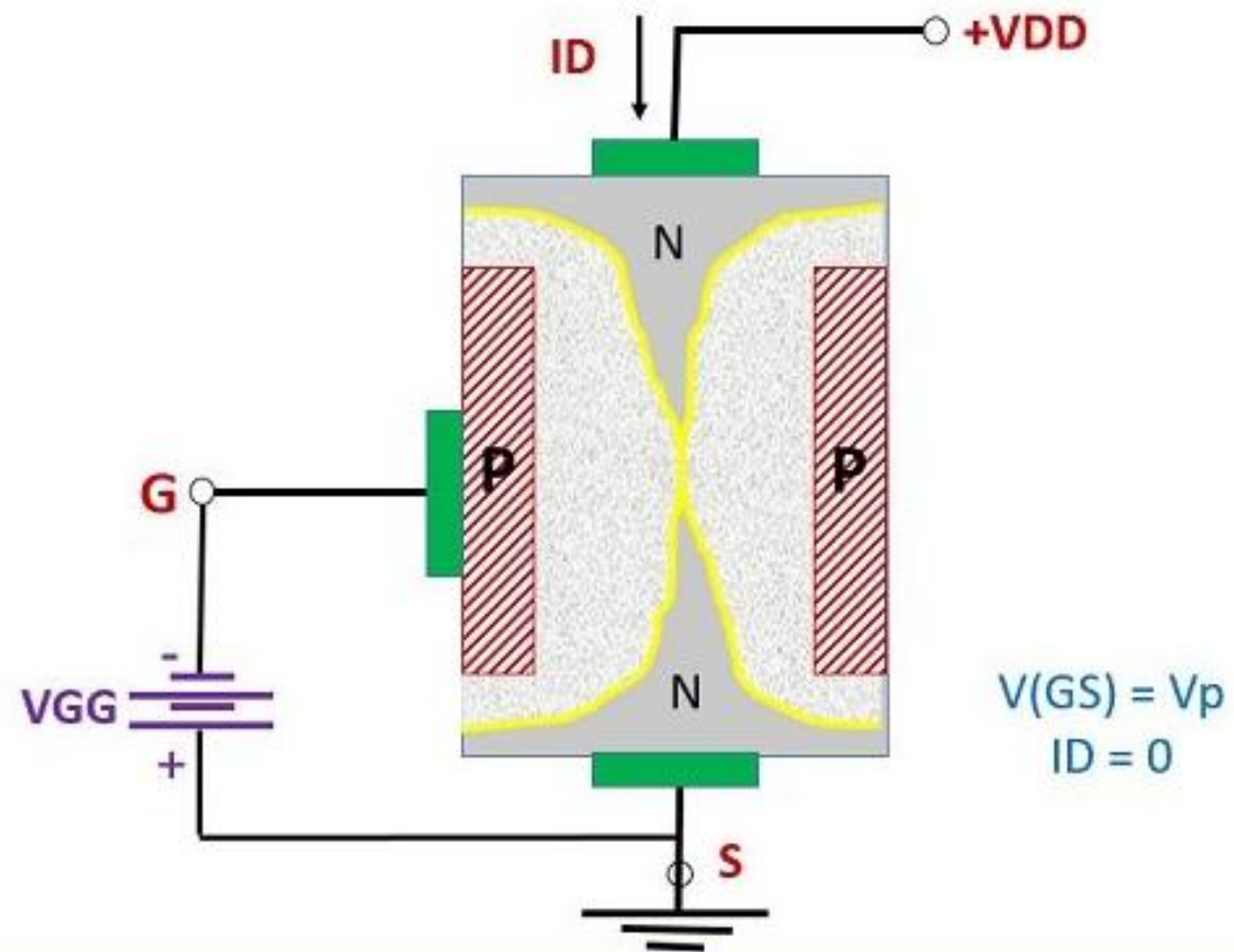
Working of JFET- When small negative bias is applied



JFET with Small Negative Bias



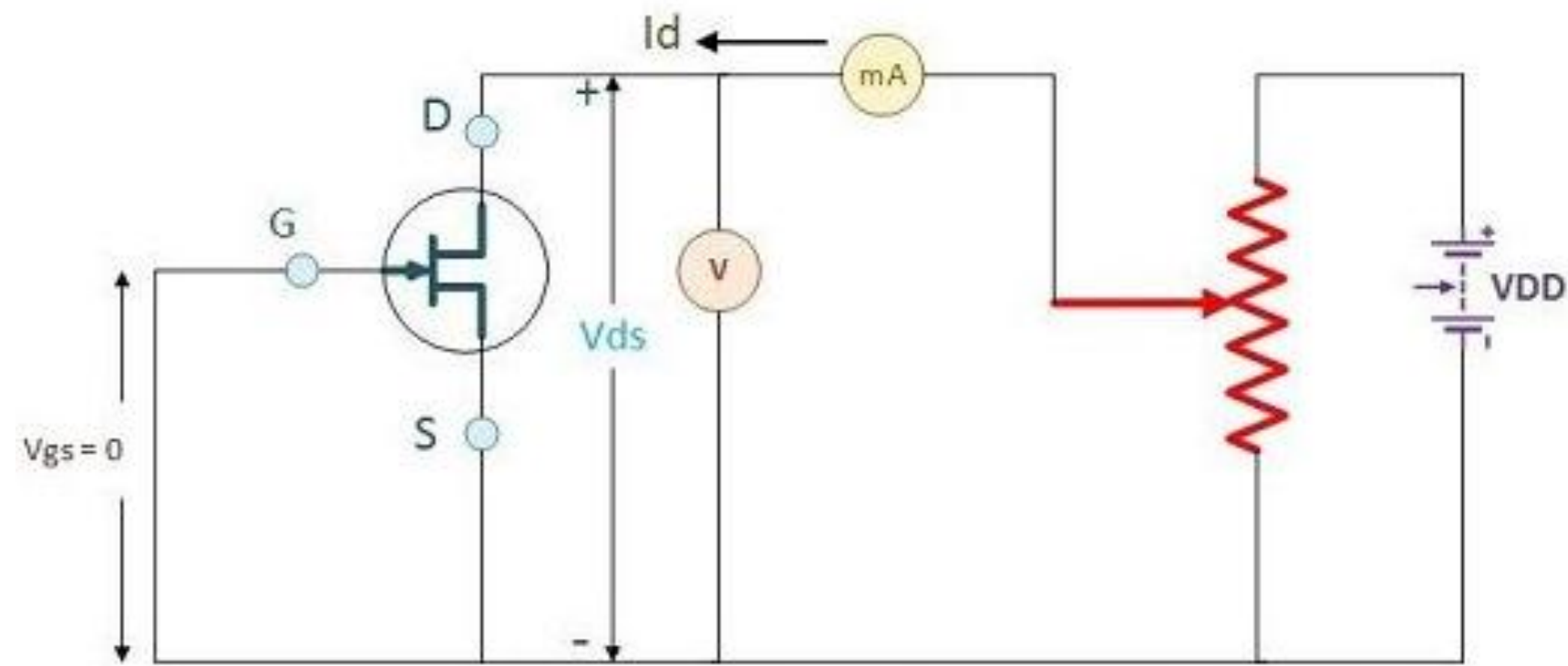
Working of JFET- When the Large negative bias is applied



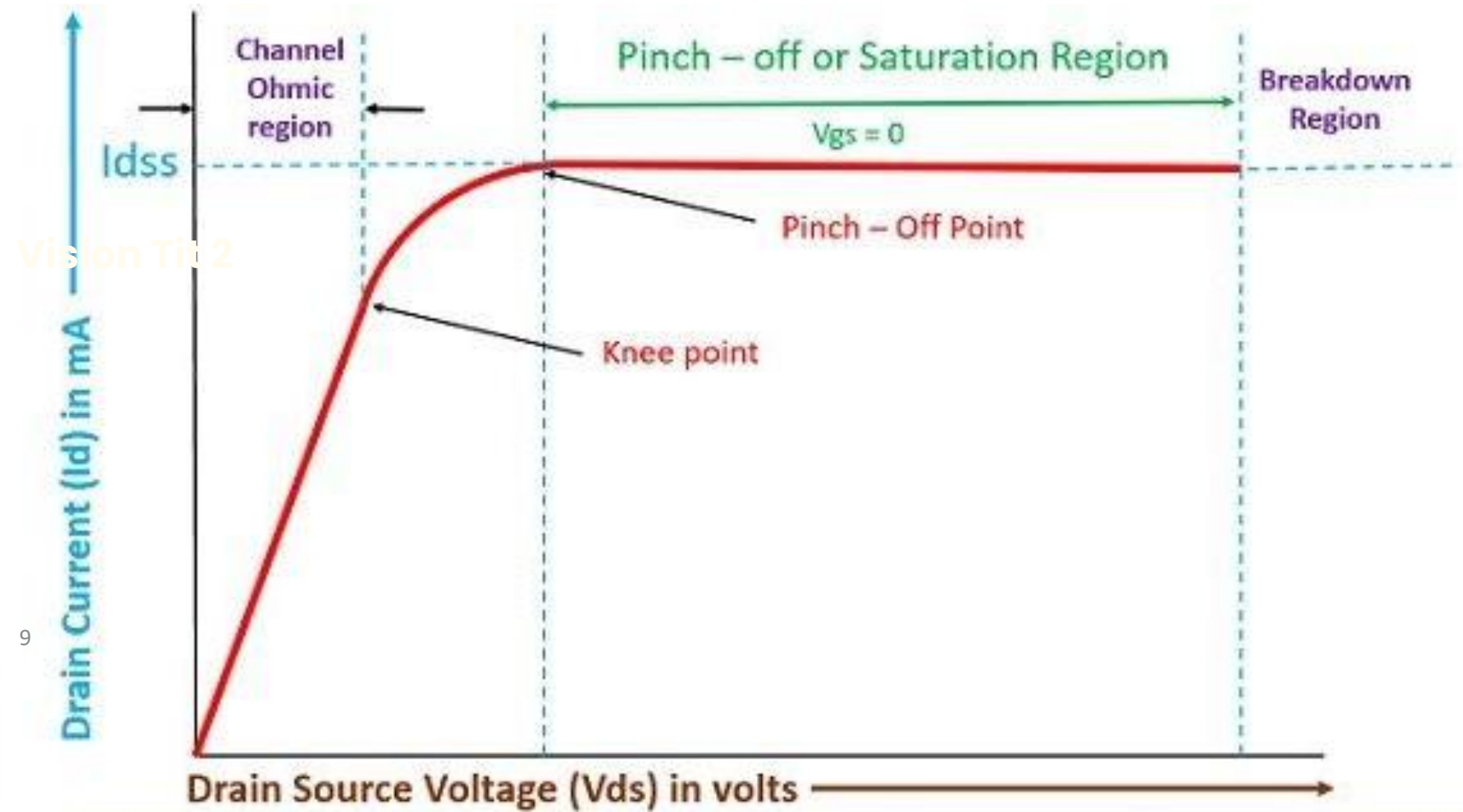
JFET with Large Negative Bias



Characteristics of JFET- Output Characteristics or Drain Characteristics



Circuit Diagram for determining drain characteristics with shorted gate for an N-channel JFET



JFET Output Characteristics with Shorted gate



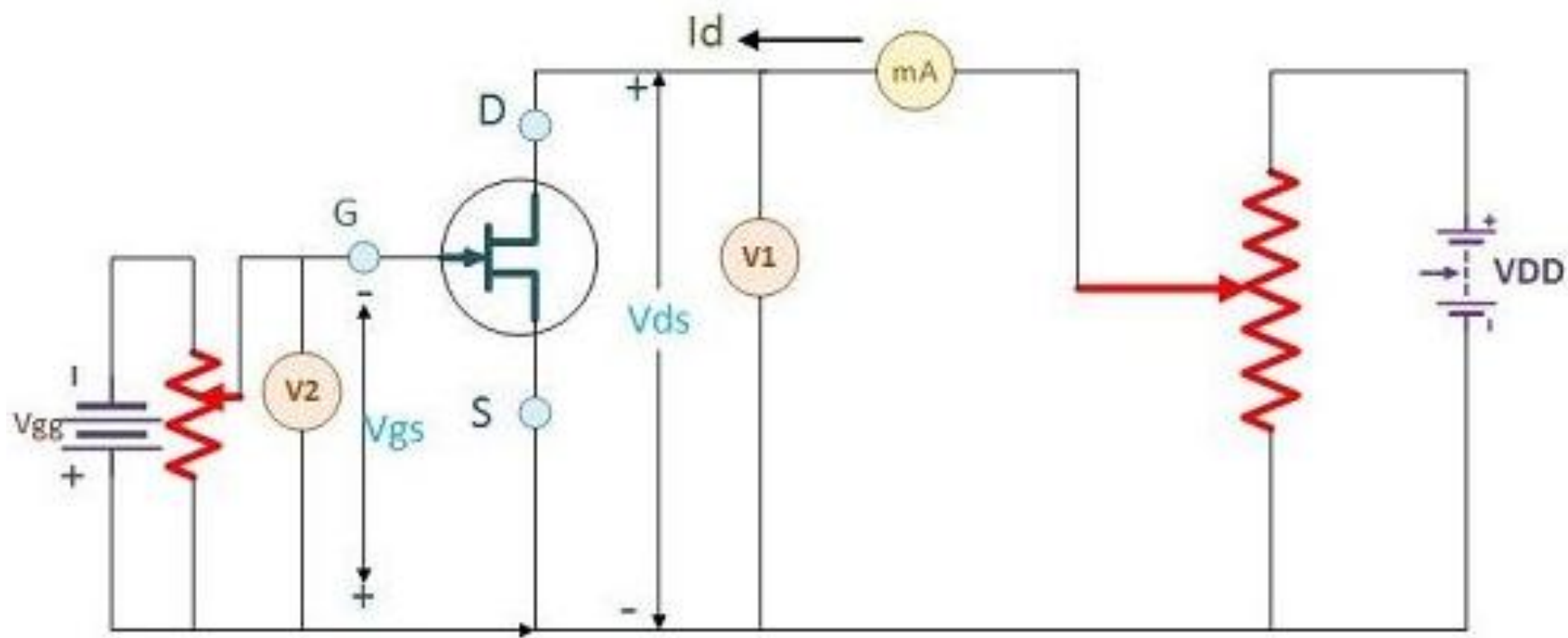
Output Characteristics

- **Knee Point:** There exists a point in the characteristics curve where the variation of drain current with drain-source voltage appears to be linear. But after this point, the linearity changes into a curve.
- **Channel Ohmic Region:** The region to the left of the knee point in the characteristics curve is the channel ohmic region.
- **Pinch-off point:** The point in the curve above which the drain current does not increase further no matter how much we are increasing the drain to source voltage, this point is termed as the pinch-off point.
- **Pinch-off Voltage:** The voltage at the pinch-off point is termed as pinch-off voltage because at this voltage the current is completely turned to be constant.
- **Drain-Source Saturation Current:** The drain to source saturation current is the current which becomes constant or completely enters a saturation state

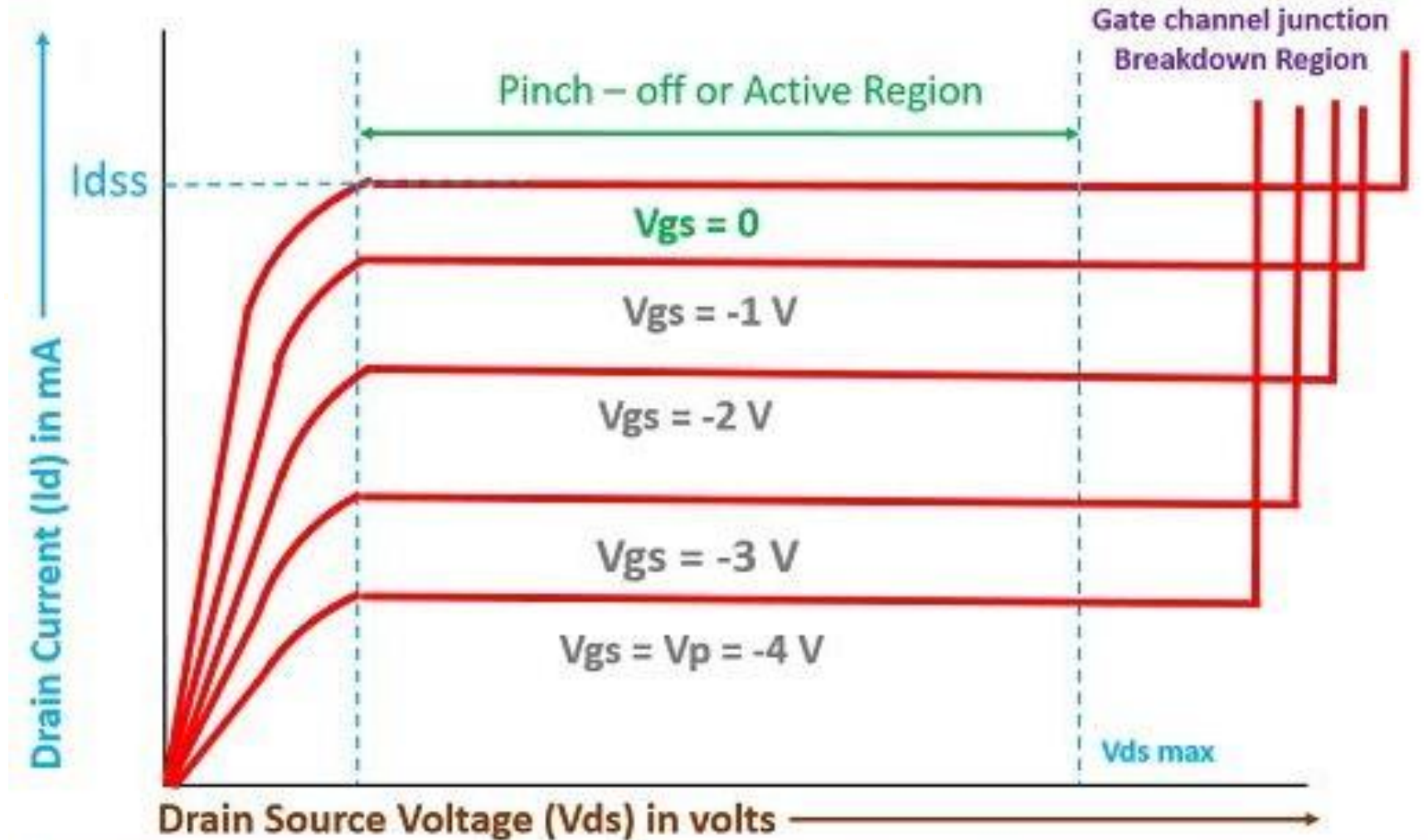
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Output Characteristics – With external bias:



Circuit Diagram for determining drain characteristics with external bias for an N-channel JFET



JFET Output Characteristics with External Bias



Transfer Characteristics

