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PHY366 Lab Report
Practical: 9 Registration No.: 11912610 Section: G2903

Aim

To profile the output and transfer characteristics of a JFET.

Methods

A JFET circuit with an n-channel was constructed. The circuit is available at https://www.multisim.com/content/RyER9NMjAwDDNWqQmnkheN/output-charactersitics-of-jfet/open/ and is shown in Figure 1.

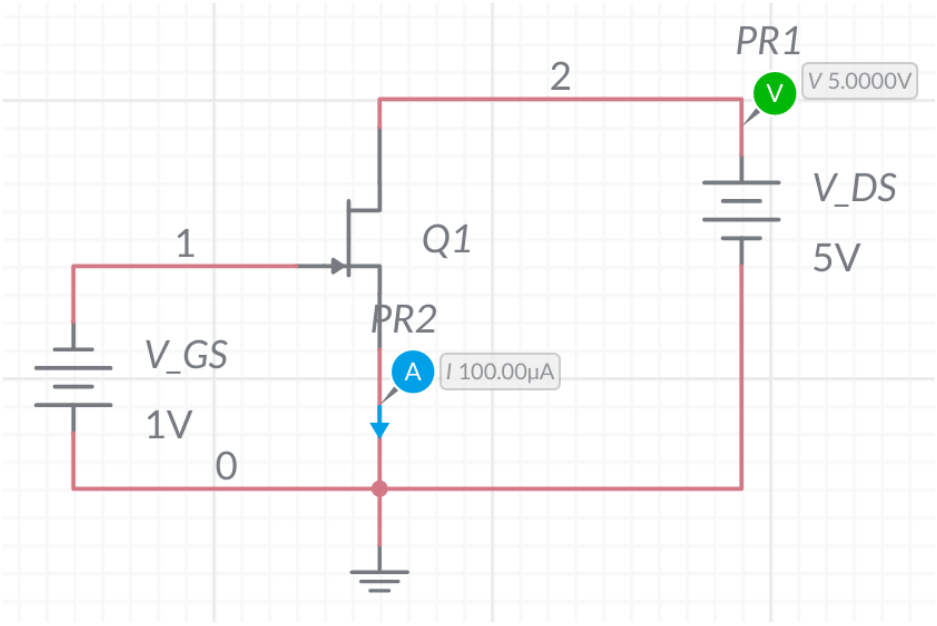

Figure 1: Circuit diagram of the n-channel JFET

For the output characterisation, we studied the JFET in the shorted input ($V_{GS} = 0$) configuration and then also varied V_{GS} to obtain characteristics for different input voltages.

Results & Conclusions

We show the output and transfer characteristics in Figure 2. It is evident that in the short-circuit configuration (i.e. $V_{GS} = 0$) the drain current saturates at $I_{DSS} = 400\mu$A. The corresponding pinch voltage occurs at $V_{DS} = 2$V, which we highlight using a grey dotted vertical line.

Clearly, if the input is set to the pinch voltage (i.e., 2V), the output current vanishes, which is consistent with what we expect from the relation

$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_p}\right)^2$$

from the expression we also see that I_D is not a linear function of the input V_{GS}, a phenomenon that is evident in the transfer characteristics (also shown in Figure 2).

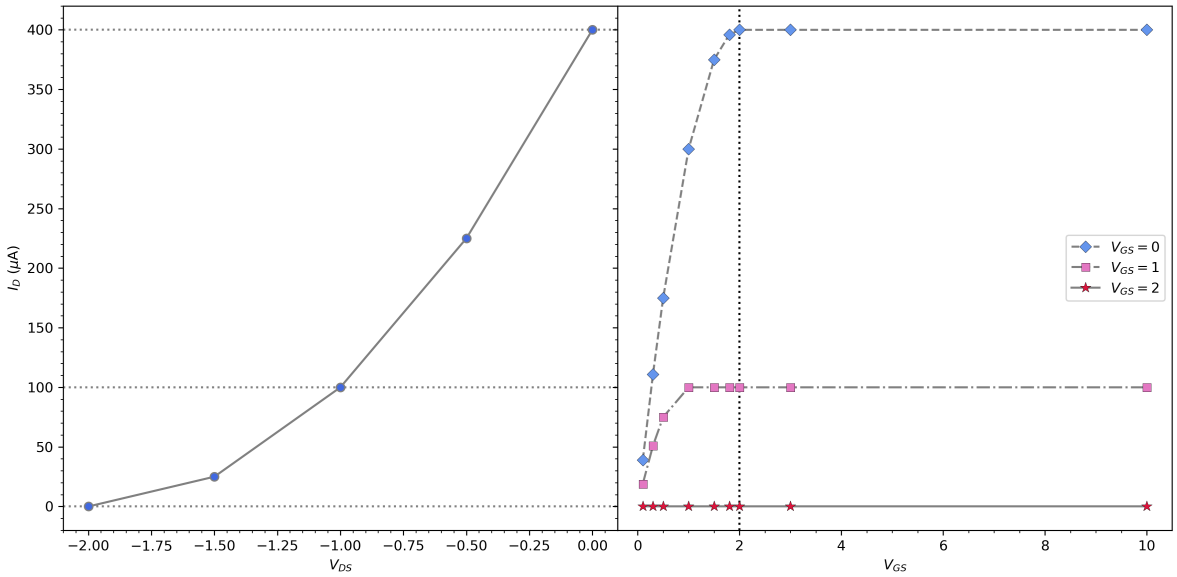

Figure 2: The transfer (left) and output (right) characteristics of the JFET. The pinch voltage V_p for the short-circuit configuration was clearly found to be $V_p = 2$V. The dotted vertical line shows the pinch voltage for the shorted input configuration.

The transfer characteristics show a non-linear relationship of I_D with V_{GS}. These were obtained by finding the saturation points of I_D for different input V_{GS}.

V_{DS} (V)	I_D (μA)		
	$V_{GS} = 0$	$V_{GS} = 1$	$V_{GS} = 2$
0.10	39	19	-2.01×10^{-6}
0.30	111	51	..
0.50	175	75	..
1.00	300	100	..
1.50	375	100	..
1.80	396	100	..
2.00	400	100	..
3.00	400	100	..
10.00	400	100	-2.01×10^{-6}

Table 1: The output characteristics measurements.

The measurements for the output characteristics have been summarized in Table 1.