JFET Output Characteristic Curve Analysis

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13.05.2025

a) Characteristic Curve Field

The circuit shown below was used to measure the output characteristics of a junction field-effect transistor (JFET), by sweeping V_{DS} for different values of V_{GS} in a common-source configuration.

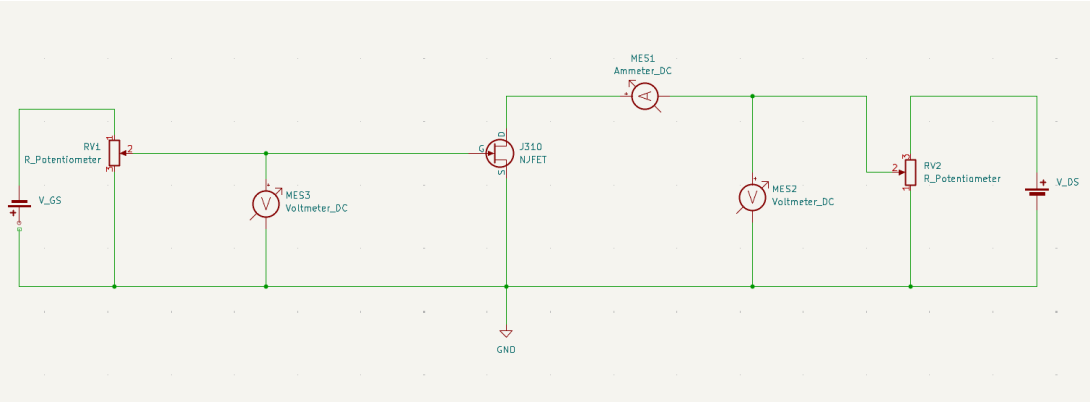

Figure 1: KiCad schematic of the JFET output characteristic measurement circuit (common-source configuration).

The following plot shows the measured I_{DS} vs V_{DS} characteristics:

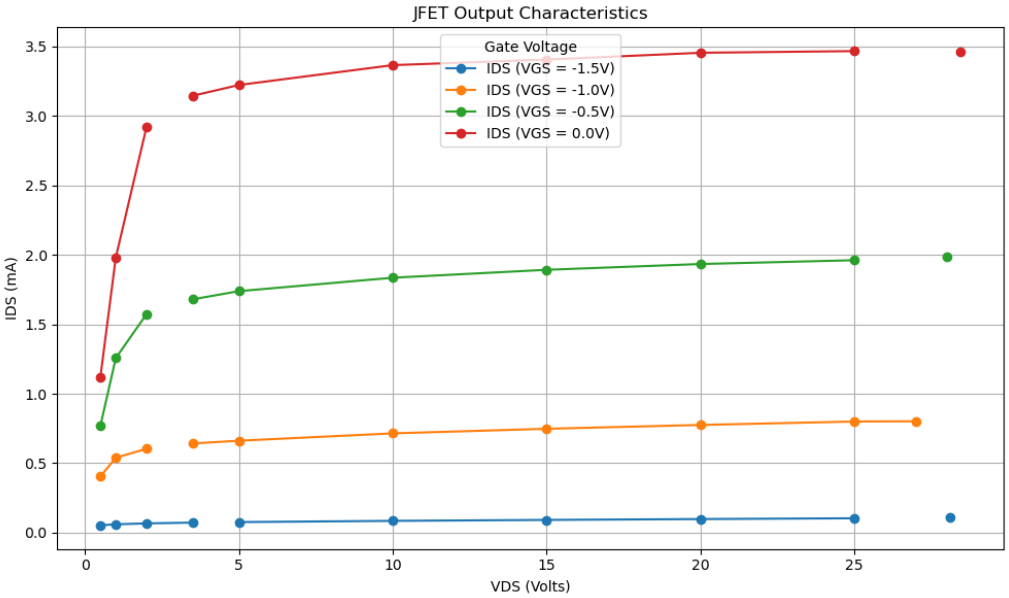

Figure 2: Measured I_{DS} vs V_{DS} characteristics for various V_{GS} values.

b) Matching Commercial JFET Model

From the measured data, the transistor exhibits a drain current (I_{DS}) of approximately 3.4500 mA at $V_{GS} = 0.0000$ V. As the gate-source voltage decreases, the current reduces significantly, reaching around 0.1000 mA at $V_{GS} = -1.5000$ V — even at drain-source voltages up to 28.0000 V, the transistor does not fully turn off.

This suggests that the pinch-off voltage $V_{GS(off)}$ lies slightly below -1.5000 V, but not as low as in high-cutoff devices like the J310.

BF256A – According to its datasheet[1], the BF256A has a typical I_{DSS} range of 2.0000 mA to 6.0000 mA and a $V_{GS(off)}$ range of -0.5000 V to -3.0000 V, making it the most plausible match for the observed output characteristics.

Therefore, based on the measured behavior and datasheet alignment, the transistor most closely matches the characteristics of the **BF256A**.

[1] `https://www.onsemi.com/download/data-sheet/pdf/bf256a-d.pdf`