

OPERATING INSTRUCTIONS

F.E.T CHARACTERISTICS



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FET CHARACTERISTICS

The FETs are characterised to Jfet parameters. Like an bipolar transistor a field effect transistor is also three terminal device. Its function depends upon one type of carrier only thus it is also called as unipolar device. Unlike a bipolar transistor the FET has very high input resistance and it is voltage controlled device rather than a current controlled device in case of BJT. The characteristics of a FET is studied in following manner. The board has following features.

- * DC regulated continuously variable power supplies for drain - source and gate - source, in which the gate - source supply provided on sockets.
- * Three meters to take readings of gate voltage, drain - source voltage and drain current respectively. These meters are prewired in the given circuit and shown by block diagram upon panel.
- * One fet BFW 10 or eq, fitted behind the panel with gate protection.

The parameters of FET

1. *Drain resistance*, r_d :- The drain resistance of mosfet may defined as follows,

$$r_d = \Delta V_{ds} / \Delta I_d, \quad V_{gs} \text{ at constant value...} \quad 1$$

Where V_{ds} is the drain - source supply, I_d corresponding drain current and V_{gs} is the voltage between gate - source. The r_d of such mosfet lies between 20 - 100 K ohms typically. The reciprocal of it gives admittance quantity Y_{os} in μmhos .

2. *Transconductance*, g_m :- It is defined as the control of gate voltage over drain current and measured by forward transconductance g_{fs} as

$$g_{fs} = \Delta I_d / \Delta V_{gs}, \quad V_{ds} \text{ at constant value...} \quad 2$$

Its typical value lies between 10×10^3 to $20 \times 10^3 \mu\text{mhos}$. It is sometimes expressed in millisiemens also.

3. *Amplification factor* μ :- It is related to r_d and g_{fs} by

$$\mu = r_d g_{fs} = \Delta V_{ds} / \Delta V_{gs}, \quad I_d \text{ at constant} \quad \dots \quad 3$$

The typical values of μ lies between 5 to 10 for such device.

From above relations, two characteristics curves should be drawn for input and output. The experimental procedure is given on next page.

Experiment procedure

Object : (1). To measure drain current I_d , at different values of gate voltage V_{gs} . (2) To measure drain current I_d , for different values of drain - source voltage V_{ds} . To plot input / output characteristics curves and to evaluate the parameters.

1.1. Keep both supply controls at minimum position (fully counter - clockwise). Connect gate - source connections with gate supply V_{gs} as shown dotted lines in fig 1.

1.2. Switch on the power. Adjust drain supply, V_{ds} at 10 volt and V_{gs} at + 0.25 volt. Note the current I_d , mA at $V_{gs} = + 0.25$ V.

1.3. Decrease V_{gs} in small steps and note corresponding drain current till $V_{gs} = 0$ V.

1.4. Bring $V_{DS} = 0$ V. Reverse the gate - source connections as shown in bold lines in fig 1. Now the gate terminal is negative than source. Bring $V_{DS} = 10$ V.

1.5. Increase gate voltage in small steps in negative direction and note the drain current for each increment of V_{gs} .

1.6. Repeat the steps at $V_{ds} = 15$ volt. Tabulate the readings.

Exp (2).

2.1. Remain the set up as step 1.4. Keep $V_{gs} = 0$ volt. Increase V_{ds} in small steps and note drain current with each increment of V_{ds} .

2.2. Repeat step 2.1. at -0.5, -1.00, -1.50 and -2.00 volt of V_{gs} . Tabulate the readings.

Preparation of table

Sr No	V_{gs}	I_d mA at V_{ds}	Sr No	V_{ds}	I_d mA at V_{gs}
01	+0.25	...	01	0.00	...
02	0.00	...	02	0.50	...
03	-0.50	...	03	1.00	...
04	-1.00	...	04	2.50	...
05	-1.50	...	05	5.00	...
06	-2.00
...			

From the table plot a graph between V_{gs} and I_d for the constant values of V_{ds} . Plot another graph between I_d and V_{ds} at constant values of V_{gs} . From the curves evaluate the parameters as given at page 1.

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