

## Characteristic of FET

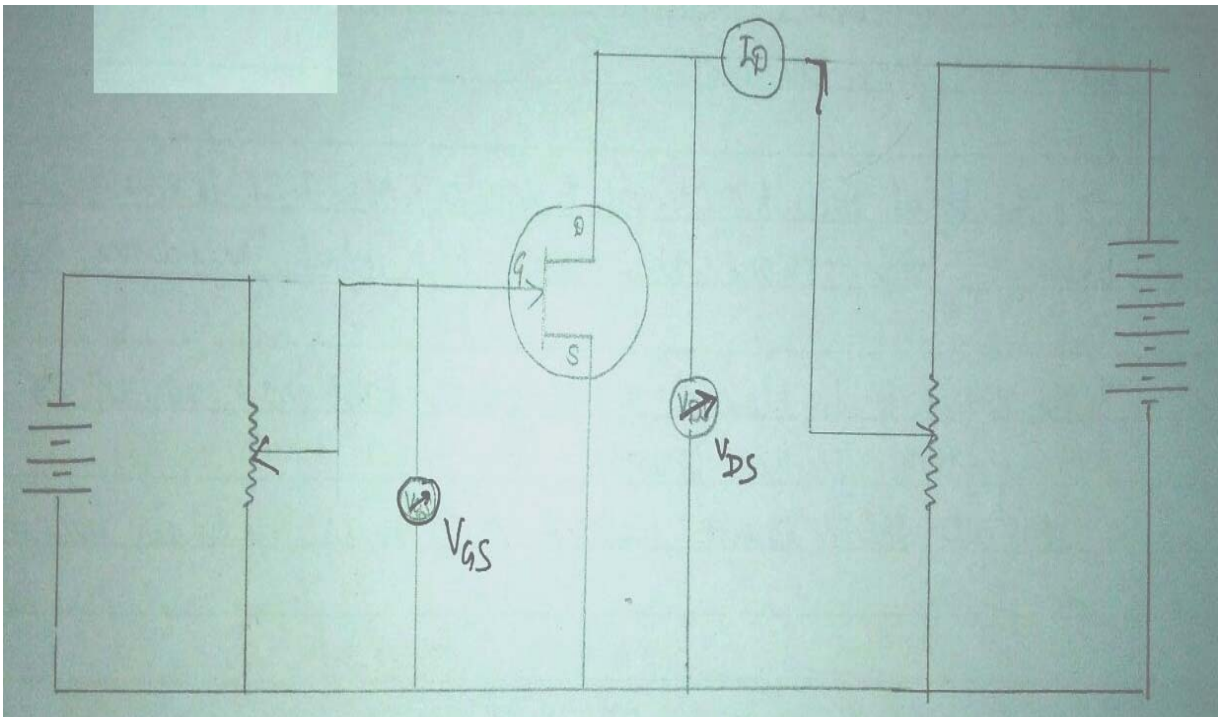
**Object:** To study the output or Drain and transfer characteristic of field effect transistor.

**Apparatus used:** N channel J-FET (BF W-10), variable DC source of range 0-3 volt and 0-15volts, voltmeter of range 0-3 and 0-15volt, mili-ammeter, wires/leads.

**Theory:**

- (1) Output / drain characteristic:** The variation of drain current ( $I_D$ ) with drain-source voltage ( $V_{DS}$ ) at constant gate source voltage ( $V_{GS}$ ) provides the drain characteristic. For  $V_{GS}$  off, the value of  $V_{DS}$  at which the drain current becomes constant gives pinch off voltage.
- (2) Transfer characteristic:** The variation of drain current ( $I_D$ ) with gate-source voltage  $V_{GS}$  at constant drain-source voltage  $V_{DS}$ . The value of  $V_{GS}$  at which  $I_D$  becomes zero called as pinch off voltage.

### Circuit Diagram:



Observation:-

Least count of gate to source Voltage = 0.1V

Least count of drain to source Voltage = 0.25V

Least count of ammeter = 0.25mA

Output characteristics:-

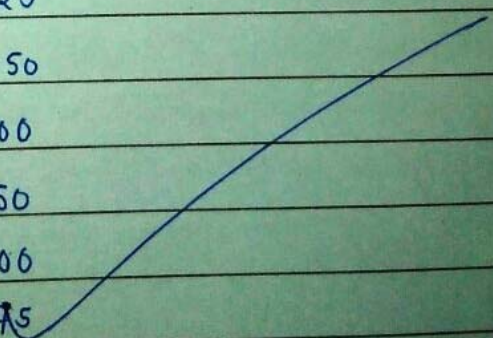
S.N.	$V_{GS} = 0V$		$V_{GS} = -1V$		$V_{GS} = -1.5V$	
	$V_{DS} (V)$	$I_D (mA)$	$V_{DS} (V)$	$I_D (mA)$	$V_{DS} (V)$	$I_D (mA)$
1.	0	0	0	0	0	0
2.	0.5	3	0.5	2	0.5	1.25
3.	1.0	5.5	1.0	3.50	1.0	2.75
4.	1.5	7	1.5	4.75	1.5	3.50
5.	2.0	8.75	2.0	5.50	2.0	4.25
6.	2.5	9.75	2.5	6.00	2.5	4.50
7.	3.0	10.50	3.0	6.25	3.0	4.75
8.	3.5	10.75	3.5	6.50	3.5	5.0
9.	4.0	10.75	4.0	6.75	4.0	5.0
10.	4.5	10.75	4.5	6.75	4.5	5.0
11.	5.0	10.75	5.0	6.75	5.0	5.0
12.	5.5	10.75	5.5	6.75	5.5	5.0
13.	6.0	10.75	6.0	6.75	6.0	5.0
14.	6.5	10.75	6.5	6.75	6.5	5.0
15.	7.0	10.75	7.0	6.75	7.0	5.0 ✓



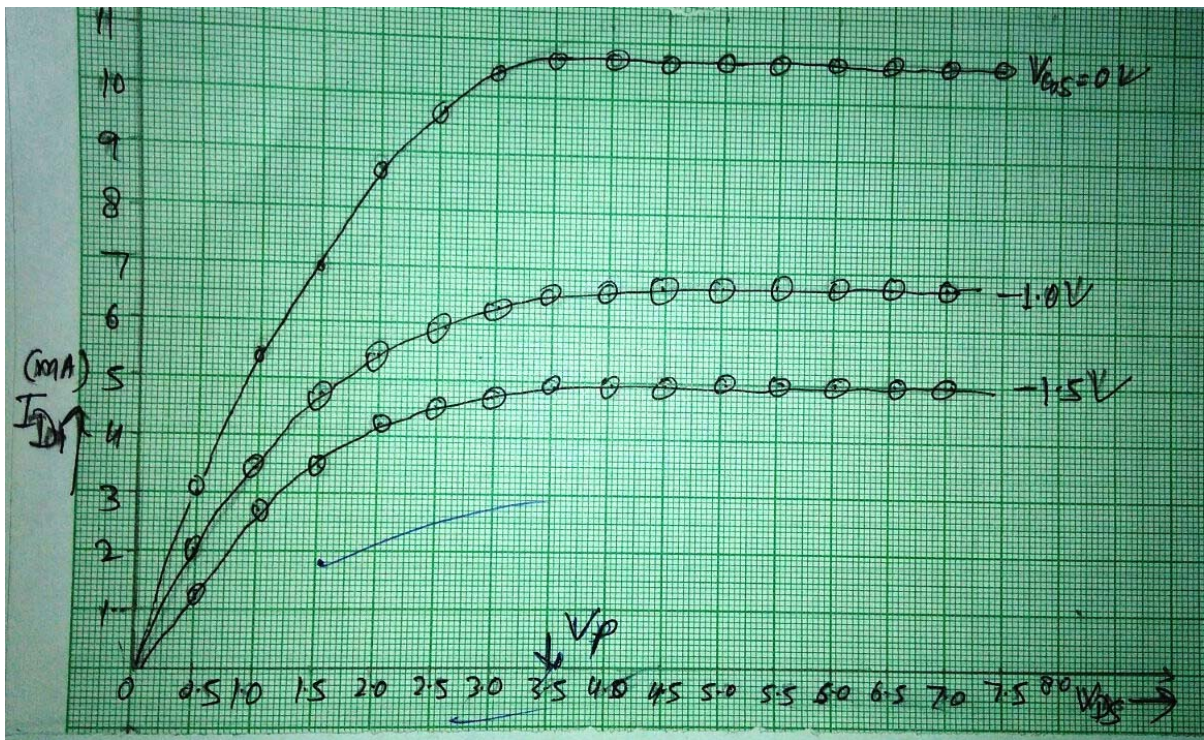
## Transfer characteristics:-

$$V_{DS} = 5V$$

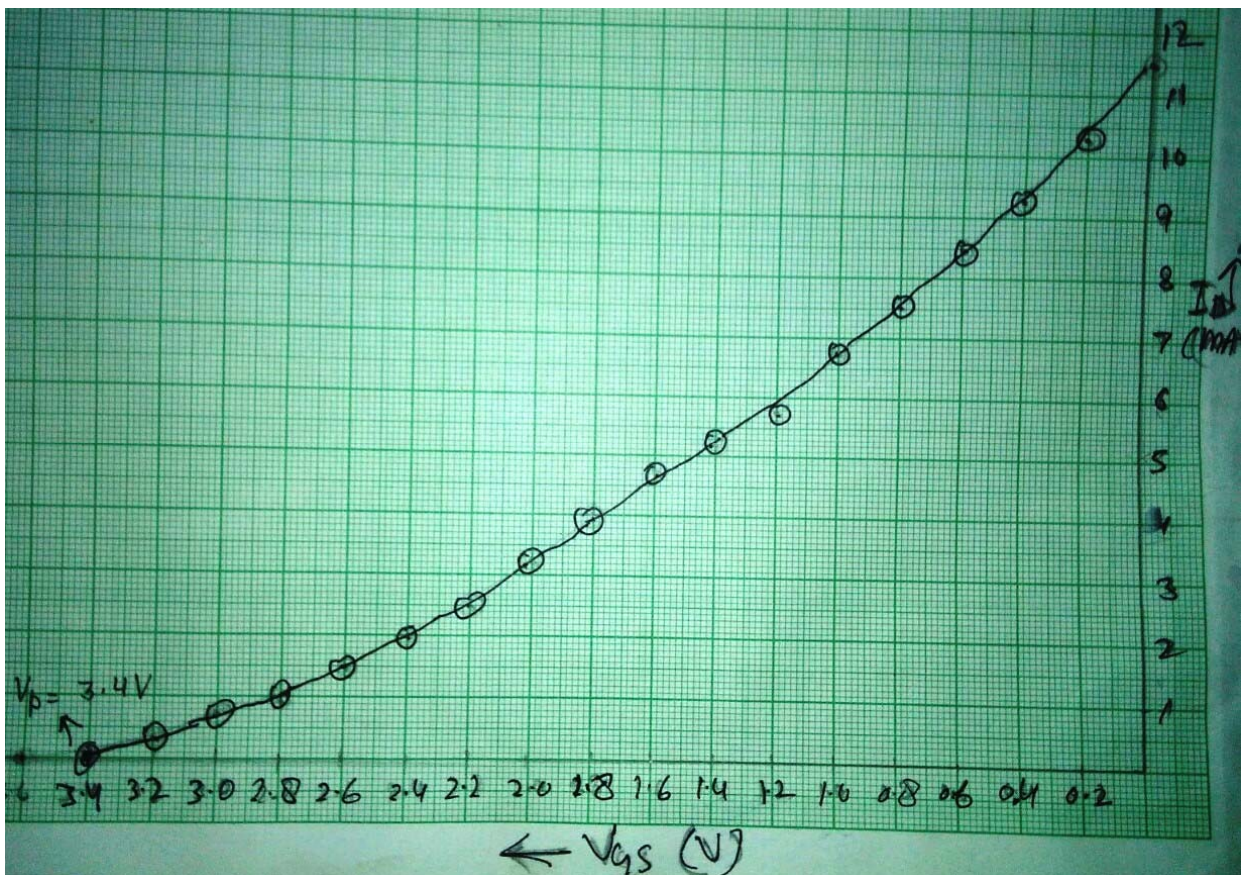
S.N.	$V_{GS}$ (Volt)	$I_D$ (mA)
1.	0	11.50   10.75
2.	0.2	10.25
3.	0.4	9.25
4.	0.6	8.50
5.	0.8	7.50
6.	1.0	6.75
7.	1.2	5.75
8.	1.4	5.25
9.	1.6	4.75
10.	1.8	4.00
11.	2.0	3.25
12.	2.2	2.50
13.	2.4	2.00
14.	2.6	1.50
15.	2.8	1.00
16.	3.0	0.75
17.	3.2	0.25
	3.4	0







Drain Characteristics



Transfer Characteristics

**Result:** *The following results can be written on the basis of characteristic curve.*

- (A) Output or drain characteristic curve shows that drain current  $I_D$  at constant  $V_{GS}$  increases initially with drain-source voltage  $V_{DS}$  and after that it becomes constant. At  $V_{GS}=0$  volt, drain current saturates at 3.5 volt value of  $V_{DS}$ . Hence this characteristic curve provides that  $V_P=3.5$  volts.
- (B) The transfer characteristic indicates that the drain current  $I_D$  decreases with the gate-source voltage  $V_{GS}$  at constant  $V_{DS}$ . The current becomes zero at 3.4 volts. This is called as pinch off voltage.

**Precautions:**

1. The connection should be tight otherwise fluctuation in voltage and current will happen.
2. At the turning point of curve, more reading should be taken.
3. For the accuracy, current should be taken both in mA and  $\mu A$ .
4. The reading should be in multiple of least count.