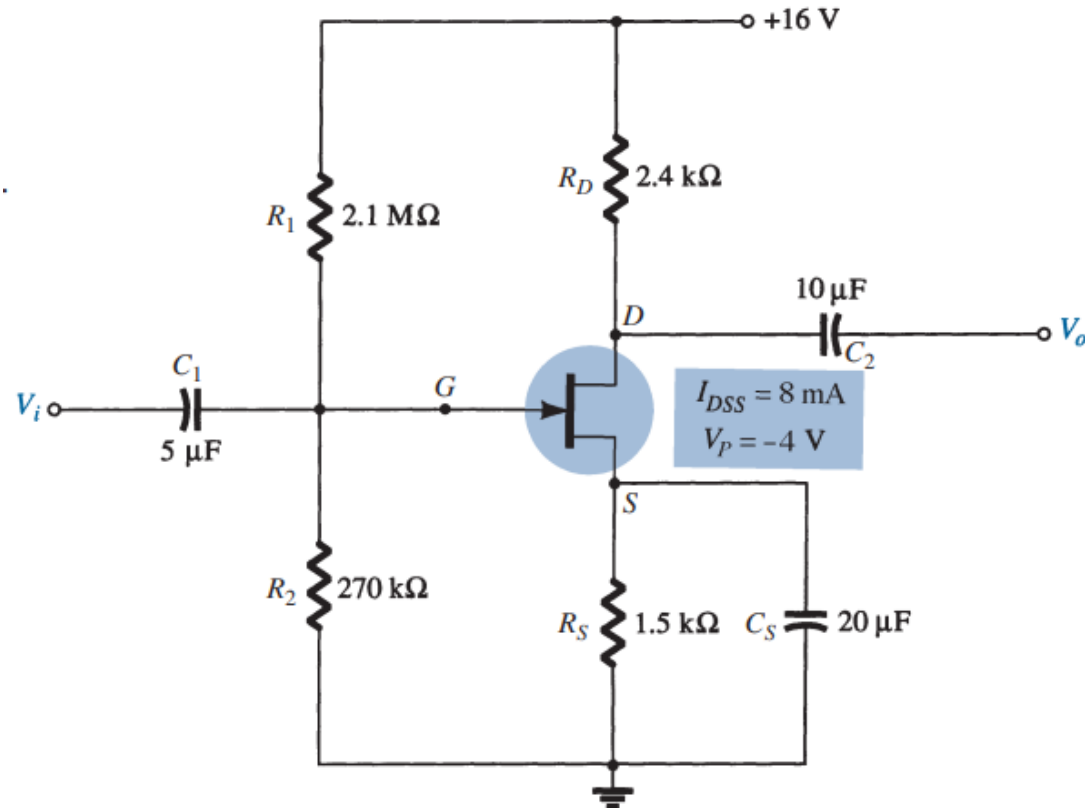


دارات الكترونية 1 المحاضرة /4/ - عملي

الدكتور السموعل صالح
المهندس جبران خليل
المهندسة ايه خيربك

Example



المطلوب :

1. مانوع الترانزستور وما نوع الوصلة
2. احسب

$$\begin{aligned} V_S &=? \\ V_G &=? \\ V_D &=? \\ V_{DS} &=? \\ I_{DQ} &=? \\ V_{GSQ} &=? \end{aligned}$$

Example

- a. For the transfer characteristics, if $I_D = I_{DSS}/4 = 8 \text{ mA}/4 = 2 \text{ mA}$, then $V_{GS} = V_P/2 = -4 \text{ V}/2 = -2 \text{ V}$. The resulting curve representing Shockley's equation appears in Fig. 22. The network equation is defined by

$$\begin{aligned} V_G &= \frac{R_2 V_{DD}}{R_1 + R_2} \\ &= \frac{(270 \text{ K}\Omega)(16 \text{ v})}{2 \cdot 1 \text{ M}\Omega + 0.27 \text{ M}\Omega} \\ &= 1.82 \text{ v} \end{aligned}$$

$$\text{And } V_{GS} = V_G - I_D R_S = 1.82 \text{ v} - I_D (1.5 \text{ (K}\Omega))$$

When $I_D = 0 \text{ mA}$,

$$V_{GS} = +1.82 \text{ v}$$

When $V_{GS} = 0 \text{ v}$,

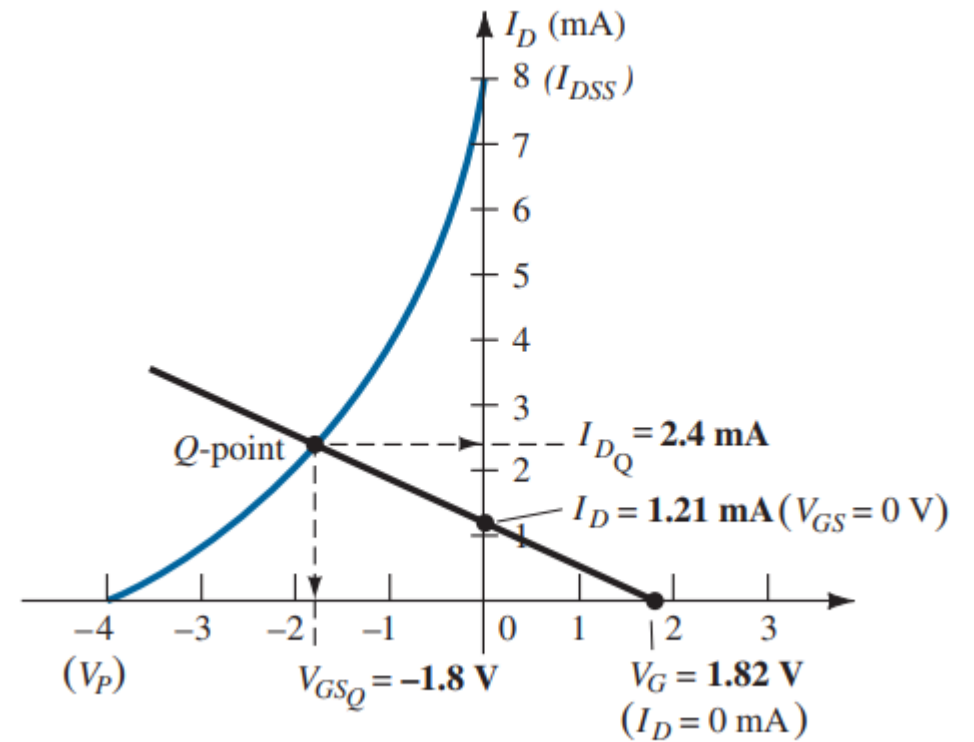
$$I_D = \frac{1.82 \text{ v}}{1.5 \text{ k}\Omega}$$
$$= 1.21 \text{ mA}$$

The resulting bias line appears on Fig. with quiescent

values of $I_{DQ} = 2.4 \text{ mA}$

and

$$V_{GSQ} = -1.8 \text{ V}$$



Example

$$b. \quad V_D = V_{DD} - I_D R_D = 16v - (2.4mA)(2.4k\Omega) = 10.24v$$

$$c. \quad V_S = I_D R_S = (2.4mA)(1.5k\Omega)$$

$$d. \quad V_{DS} = V_{DD} - I_D (R_D + R_S) = 16v - (2.4mA)(2.4k\Omega + 1.5k\Omega) = 6.64v$$

$$\text{or} \quad V_{DS} = V_D - V_S = 10.24v - 3.6v = 6.64v$$

$$e. \quad V_{DG} = V_D - V_G = 10.24v - 1.82v = 8.42v$$

I_D الطريقة الحسابية ليجاد

- $V_{GS} = V_G - I_D R_S = 1.82 \text{ V} - I_D (1.5 \text{ K}\Omega)$
 - $I_D = I_{DSS} \left(1 - \frac{V_{GS}}{V_p}\right)^2$
 - $I_D = 8 \left(1 - \frac{1.82 - 1.5 I_D}{-4}\right)^2$
 - $I_D = 8 (1.455 - 0.375 I_D)^2$
 - $I_D = 8(2.11 - 1.1I_D + 0.14I_D^2)$
 - $I_D = (17 - 8.8I_D + 1.12I_D^2)$
 - $0 = 17 - 9.8I_D + 1.12I_D^2$
 - $\Rightarrow I_{D1} = 2.4 \text{ mA} \Rightarrow V_{GS} = -1.78 \text{ V}$
 - $\Rightarrow I_{D2} = 6.3655 \text{ mA} \Rightarrow V_{GS} = -7.73 \text{ V}$
- الحل الثاني يعد مرفوض لان
- $$V_{GS} > V_p$$
- و بالتالي
- $$I_D = 2.4 \text{ mA}$$