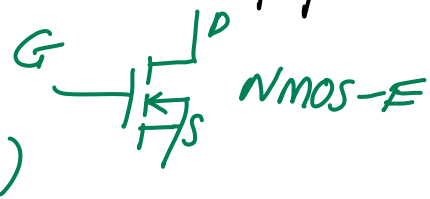
AEC Lecture 19 25/8/23

# MOSFET amplifier configurations:

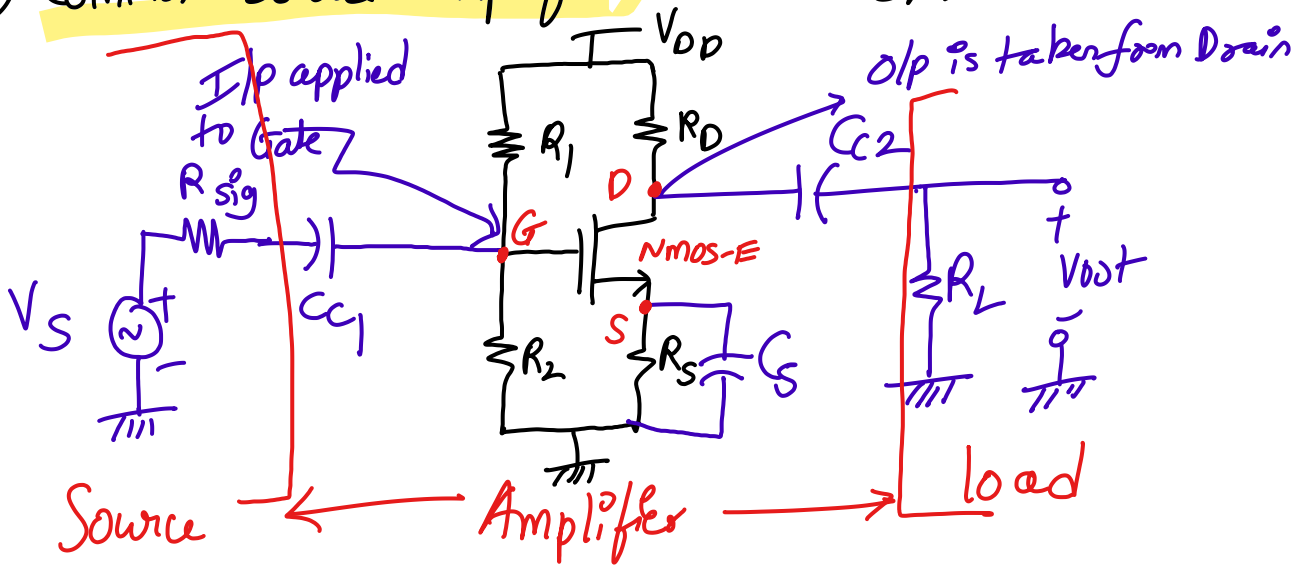



① Common source (CS) amplifier (CE)

② Common-drain (CD) amplifier (Source follower) (CC)

③ Common-gate (CG) amplifier (CB)

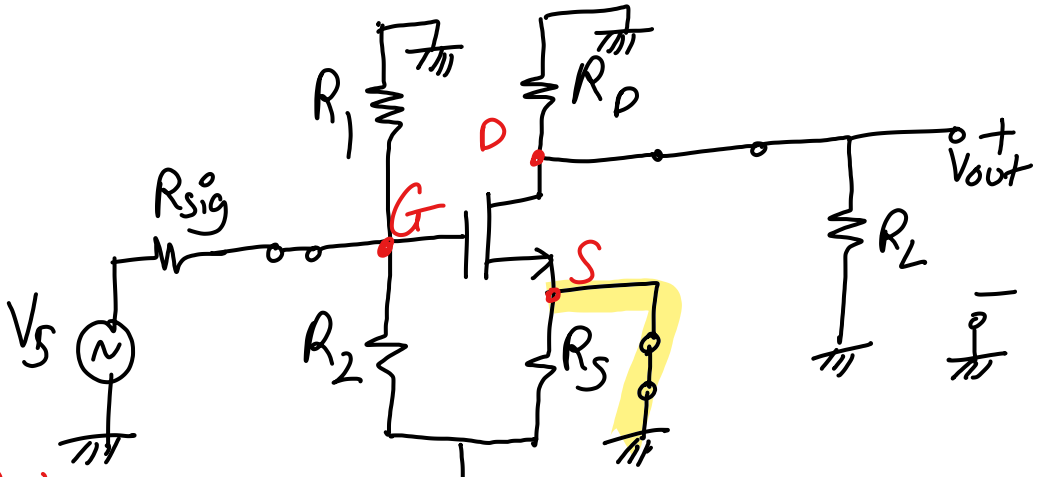
## ① Common Source amplifier: (NMOS-E type)




## AC equivalent ckt:

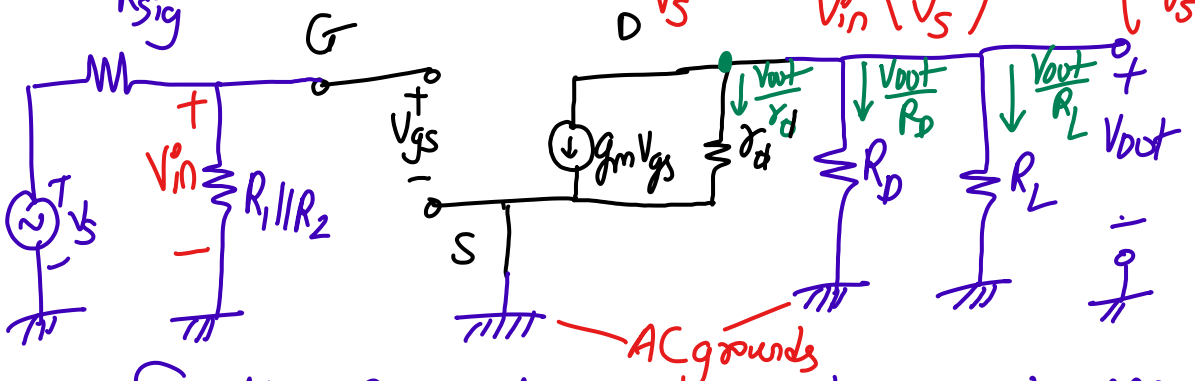
① Short all DC sources

② Short-ckt all capacitor's




③ Replace MOSFET with its SSM

$$A_{V_T} = \frac{V_{out}}{V_S} = \frac{V_{out}}{V_{in}^{\circ}}\left(\frac{V_{in}^{\circ}}{V_S}\right) = A_V\left(\frac{V_{in}^{\circ}}{V_S}\right)$$




$V_{in}^{\circ} = V_{gs}$

## Small-Signal AC equivalent ckt of MOSFET amplr (CS)

KCL at 'D' node, $g_m V_{gs} + \frac{V_{out}}{R_D} + \frac{V_{out}}{r_d} + \frac{V_{out}}{R_L} = 0$

($V_{gs} = V_{in}^{\circ}$)

$$-V_{out}\left(\frac{1}{r_d} + \frac{1}{R_D} + \frac{1}{R_L}\right) = g_m V_{in}^{\circ}$$

$r_d = \infty$

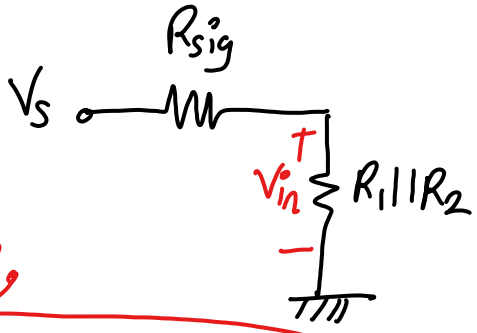
$$A_V = \frac{V_{out}}{V_{in}^{\circ}} = -g_m (r_d \| R_D \| R_L)$$

$A_V = -g_m(R_D \| R_L)$ ---- $r_d = \infty$

$A_V = -g_m R_D$ ---- $R_L = \infty$

81, 98, 93, 88, 82
95, 97, 85, 67, 41
25, 44, 58, 6, 26, 4, 45,
16, 55, 64, 78

AEC Lec 19 attendance dated 25.8.23




By VDR,

$$\frac{V_{in}^{\circ}}{V_S} = \frac{(R_1 \| R_2)}{(R_1 \| R_2) + R_{sig}^{\circ}}$$

$$A_{V_T} = -g_m(r_d \| R_D \| R_L)\left[\frac{(R_1 \| R_2)}{(R_1 \| R_2) + R_{sig}^{\circ}}\right]$$

→ Voltage gain for CS amplr

o/p & i/p are out of phase

If $R_{sig}=0$ $\rightarrow$ $A_{VT} = -g_m(r_d \| R_D \| R_L)$

$A_{VT} = -g_m R_D$ ---- $r_d = R_L = \infty$

$R_{in}$ & $R_{out}$
derivation — refer CS amplr. pdf

—x—