

# **ECE321 ELECTRONICS I**

## **FALL 2006**

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Lecture 10  
26<sup>th</sup> October, 2006



CHAPTER 4

## **MOS Field-Effect Transistors** **(MOSFETs)**

4.6 Small-signal Amplifiers

4.7 Single Stage Amplifiers

Common-source (CS), CG & CD

2

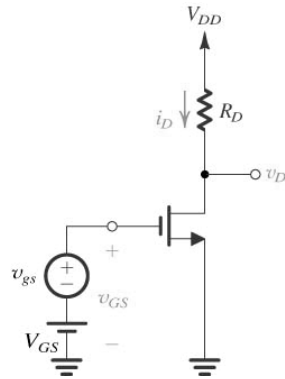


Figure 4.34 Conceptual circuit utilized to study the operation of the MOSFET as a small-signal amplifier.

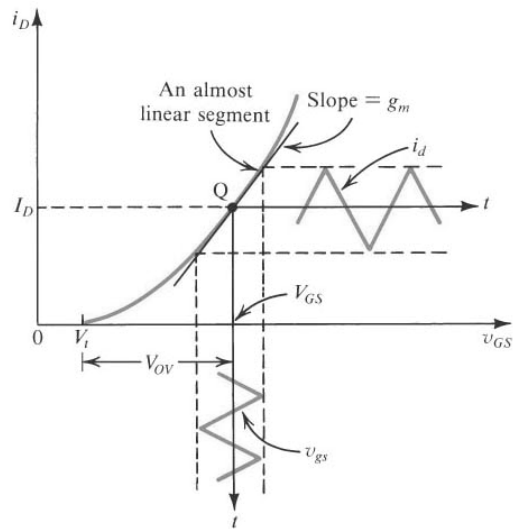


Figure 4.35 Small-signal operation of the enhancement MOSFET amplifier.

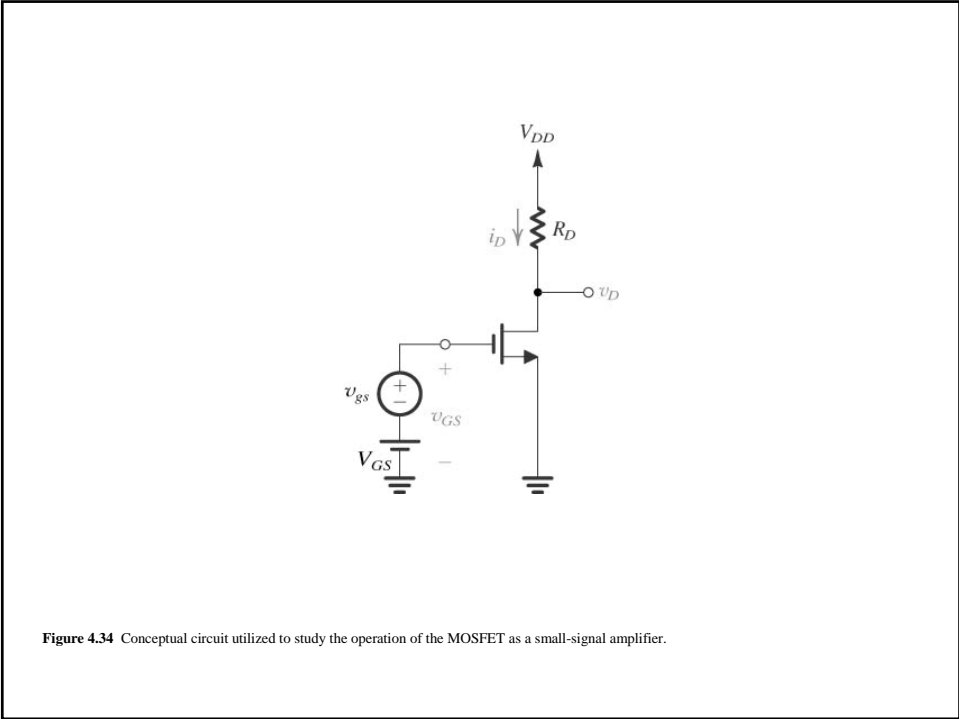


Figure 4.34 Conceptual circuit utilized to study the operation of the MOSFET as a small-signal amplifier.

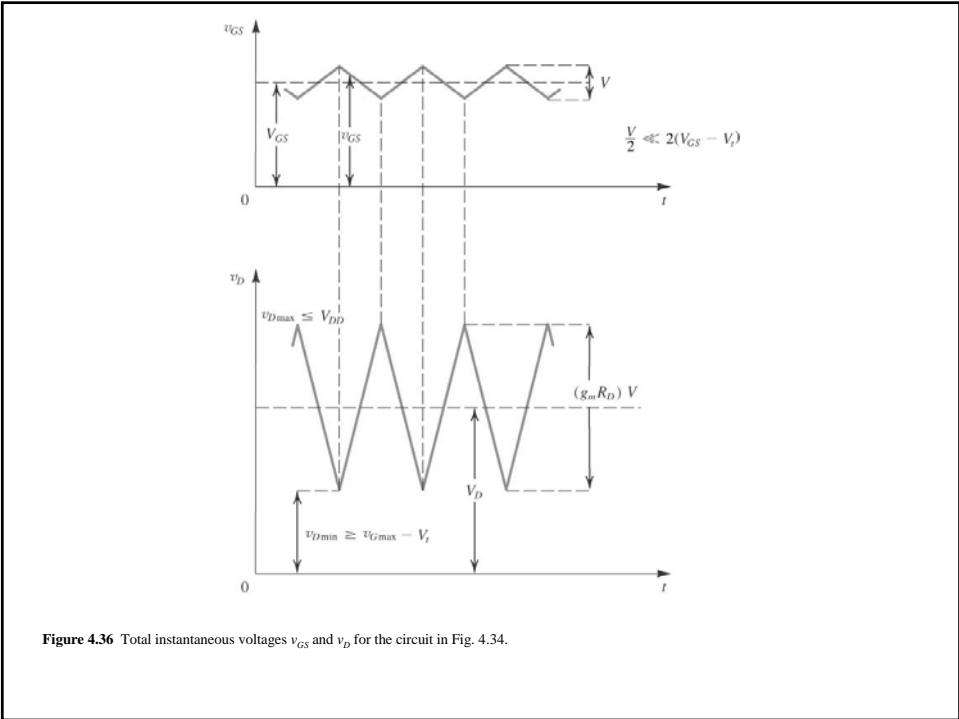


Figure 4.36 Total instantaneous voltages  $v_{GS}$  and  $v_D$  for the circuit in Fig. 4.34.

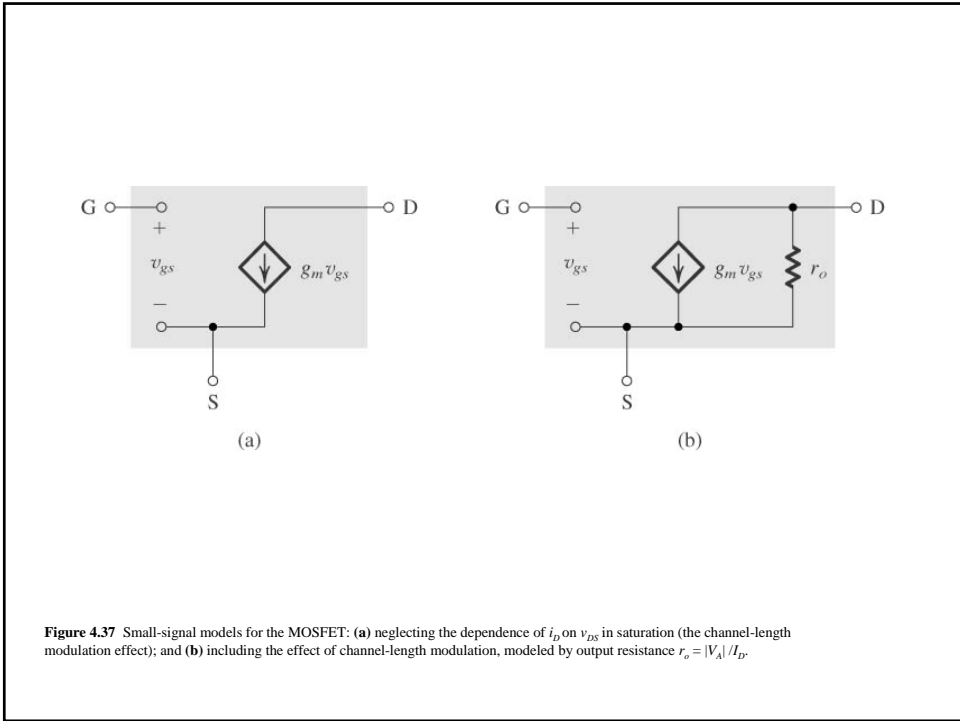


Figure 4.37 Small-signal models for the MOSFET: (a) neglecting the dependence of  $i_D$  on  $v_{DS}$  in saturation (the channel-length modulation effect); and (b) including the effect of channel-length modulation, modeled by output resistance  $r_o = |V_A|/I_D$ .

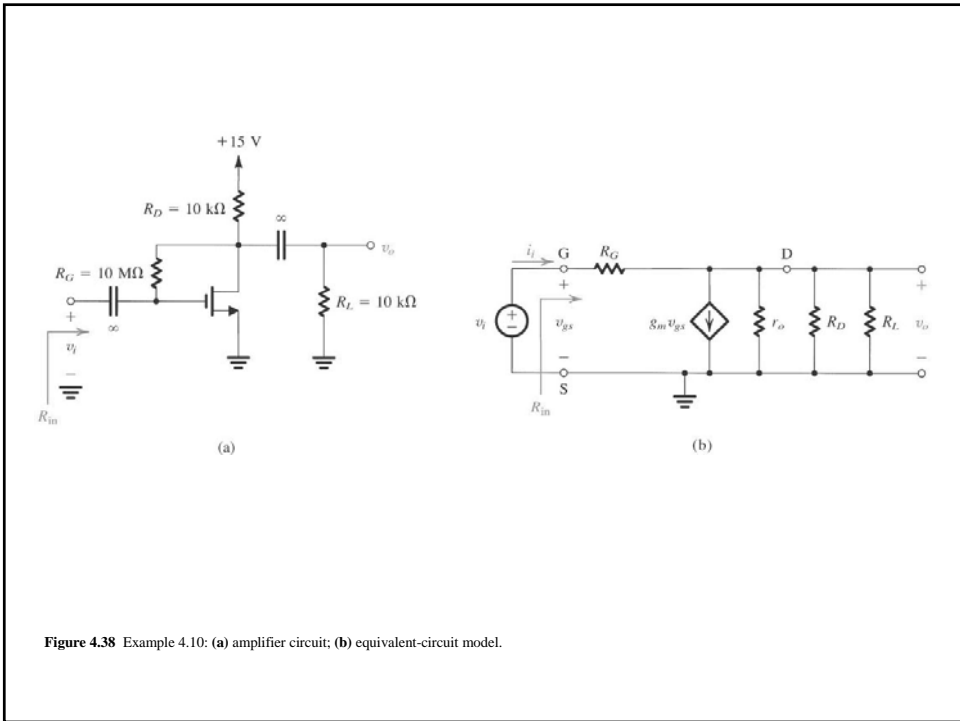
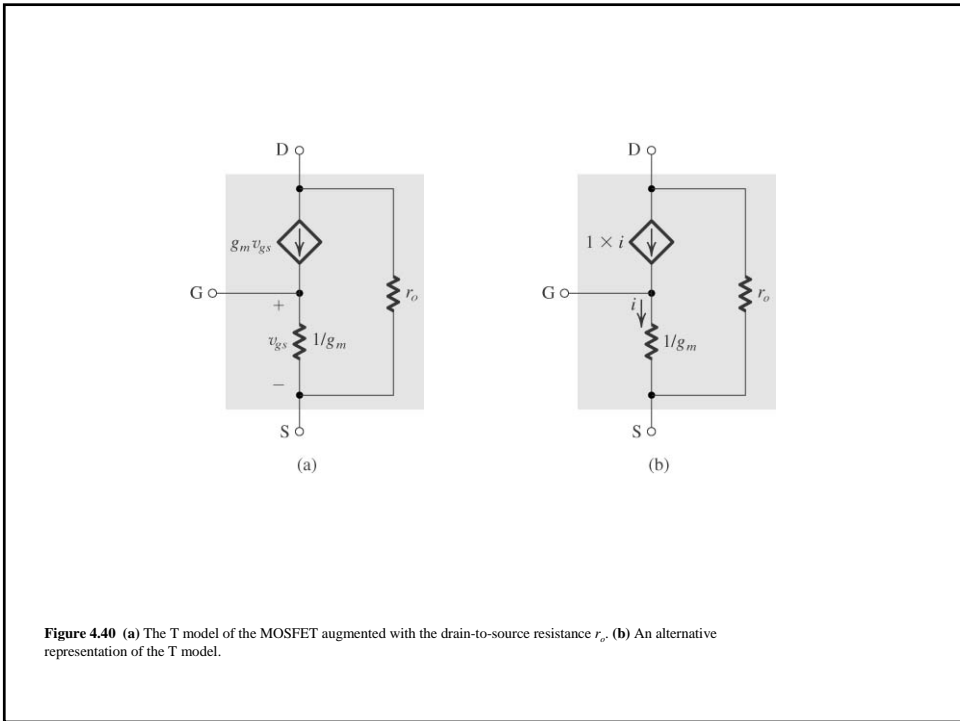
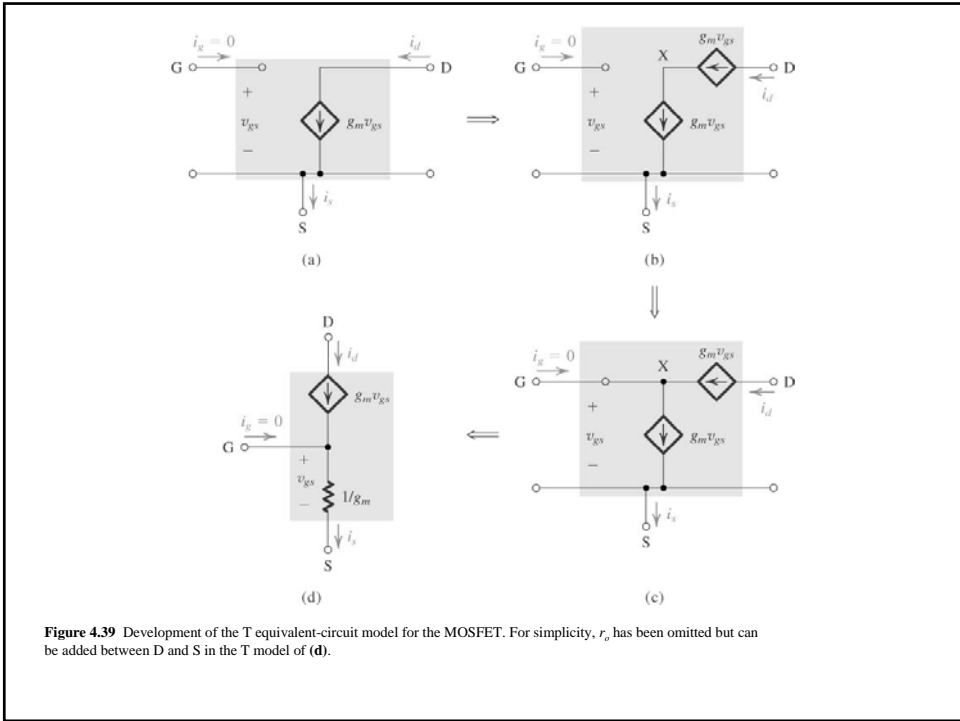
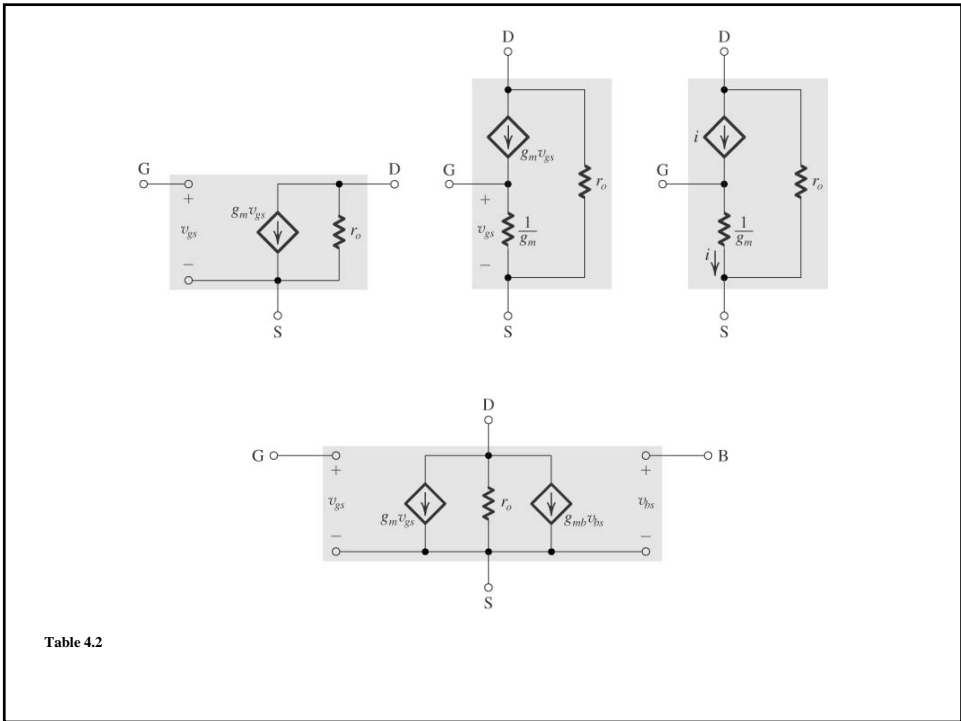
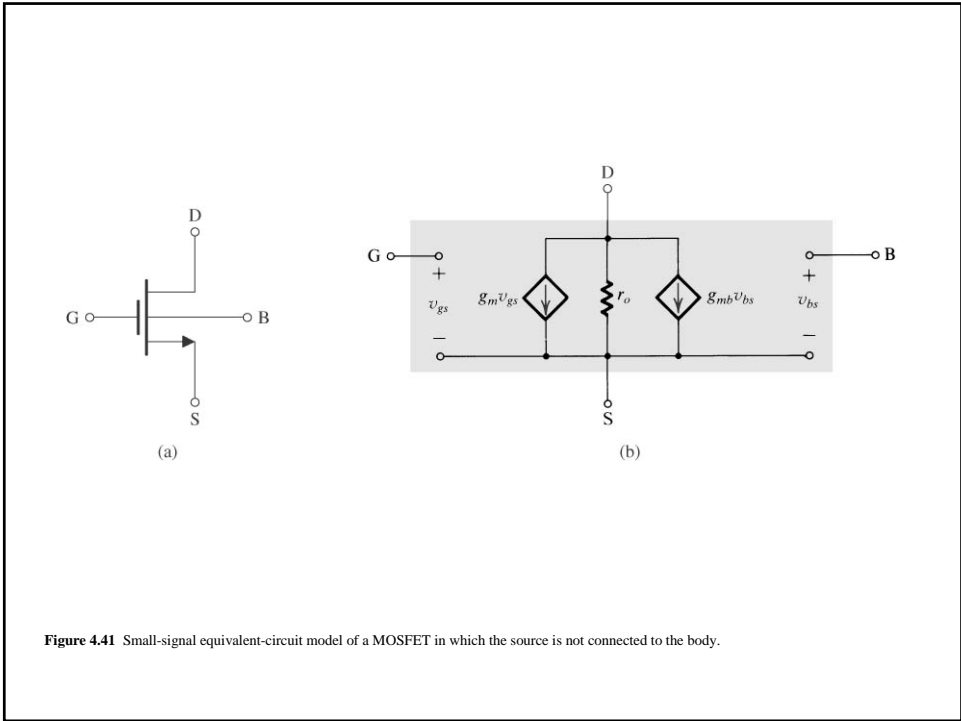


Figure 4.38 Example 4.10: (a) amplifier circuit; (b) equivalent-circuit model.





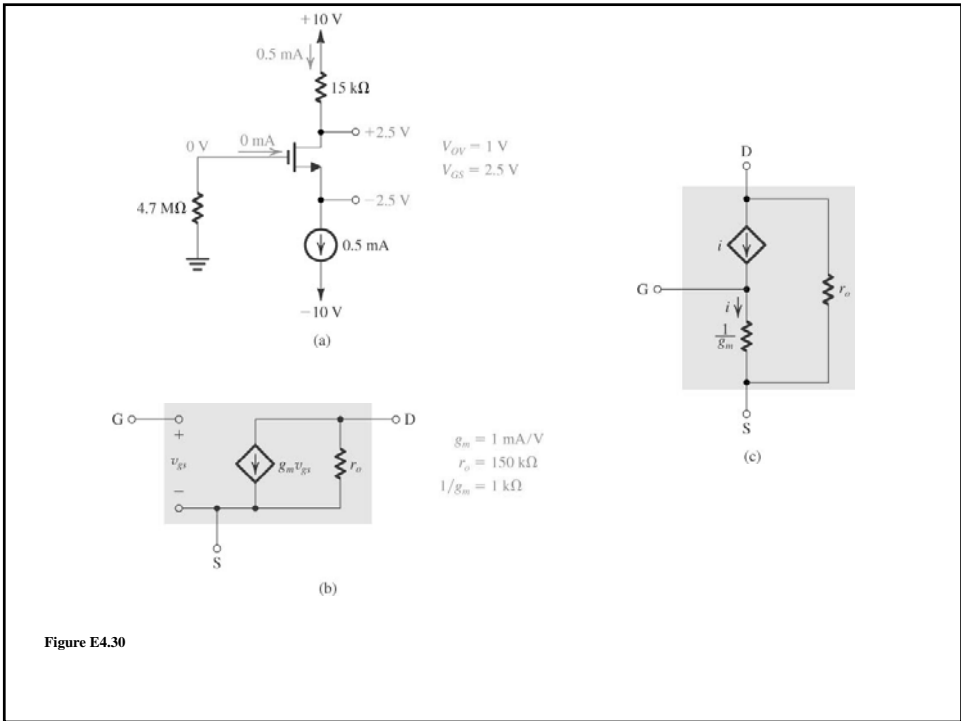
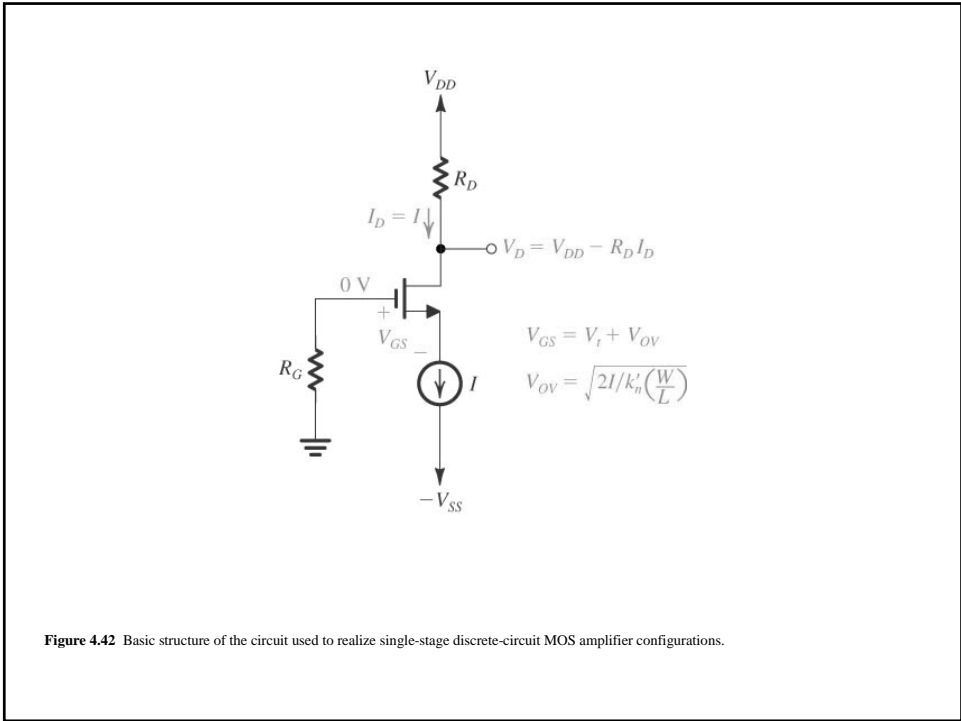
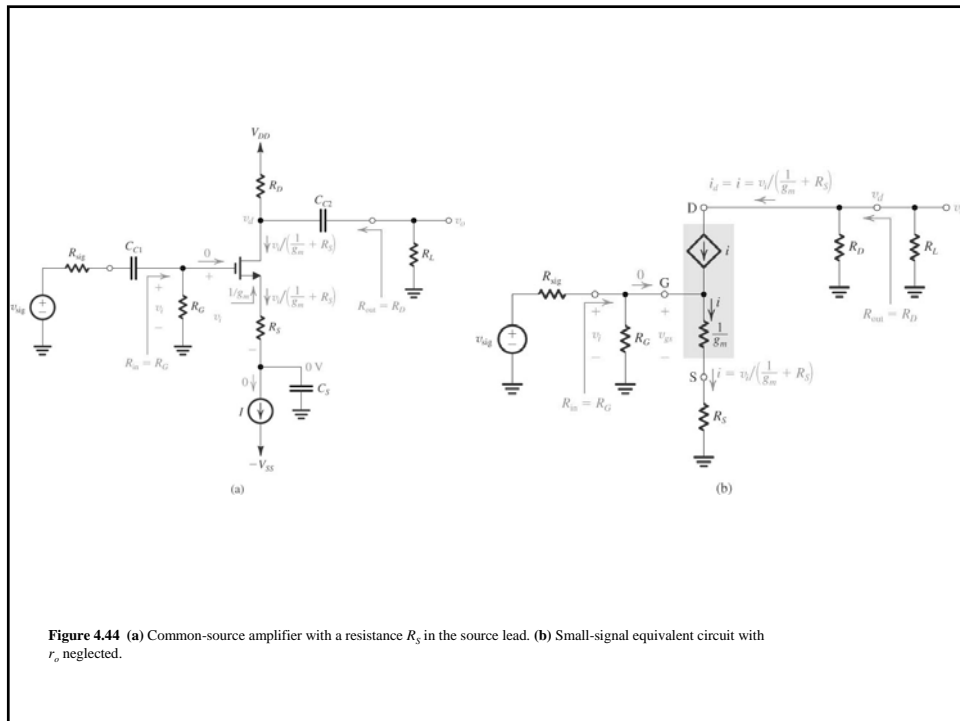
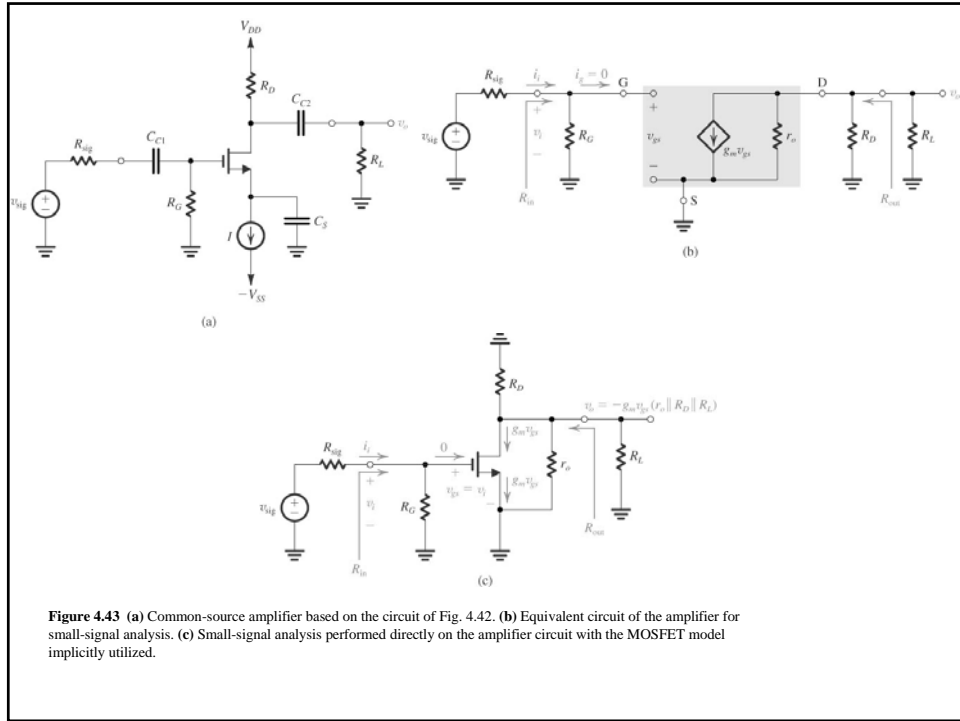


Figure E4.30





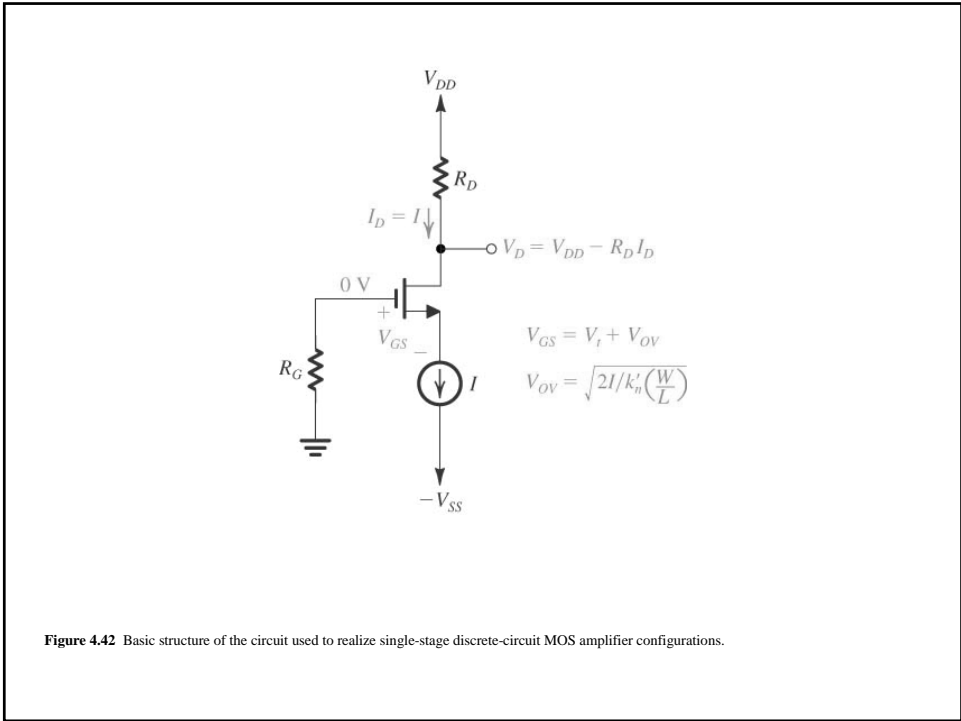


Figure 4.42 Basic structure of the circuit used to realize single-stage discrete-circuit MOS amplifier configurations.

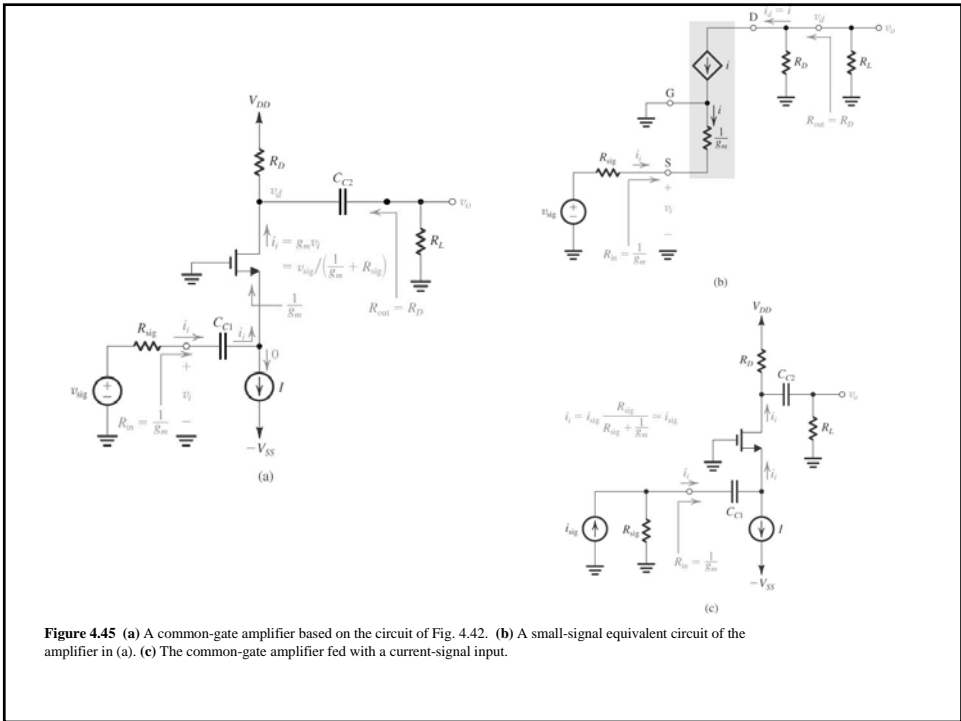


Figure 4.45 (a) A common-gate amplifier based on the circuit of Fig. 4.42. (b) A small-signal equivalent circuit of the amplifier in (a). (c) The common-gate amplifier with a current-signal input.

