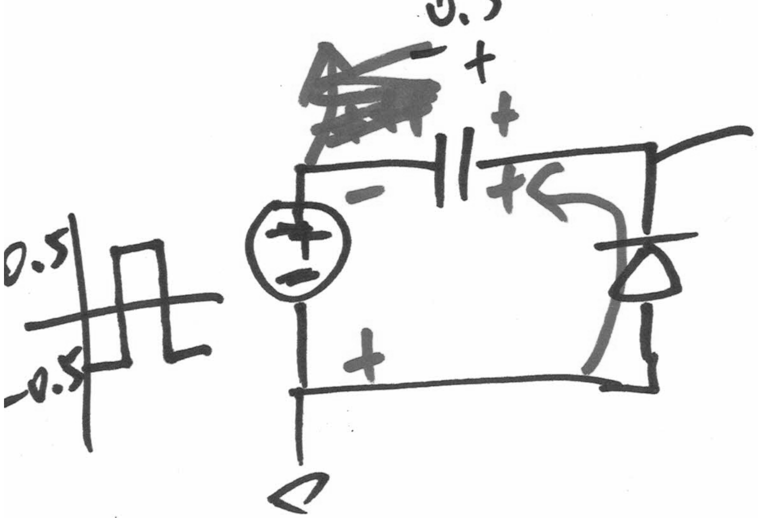
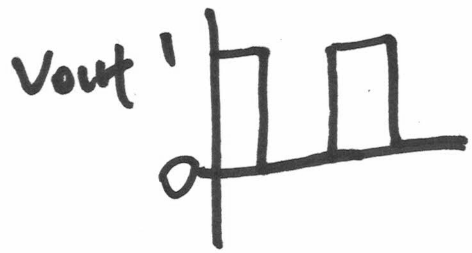
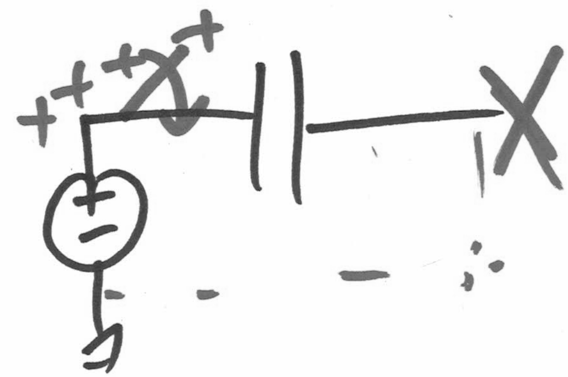
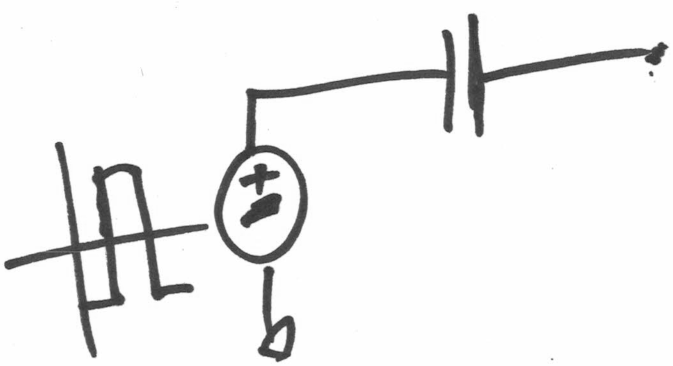
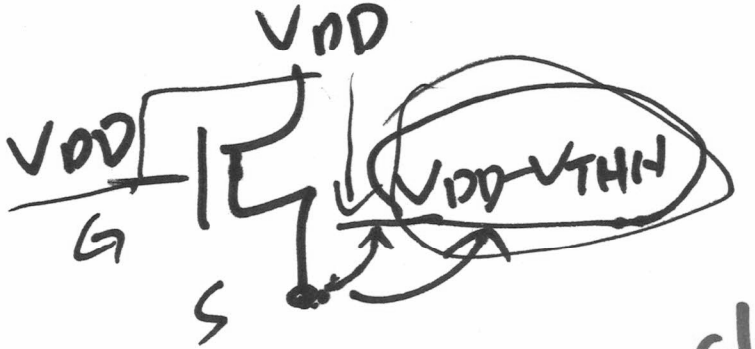
Voltage Doublers / charge Pump









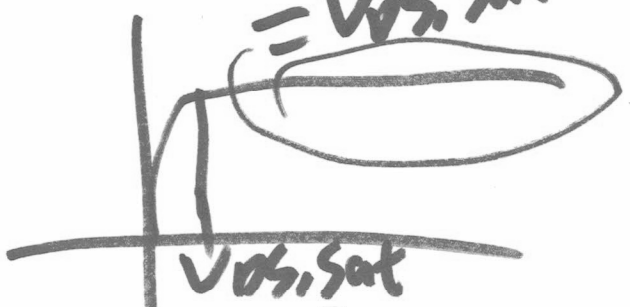


Diode Connection

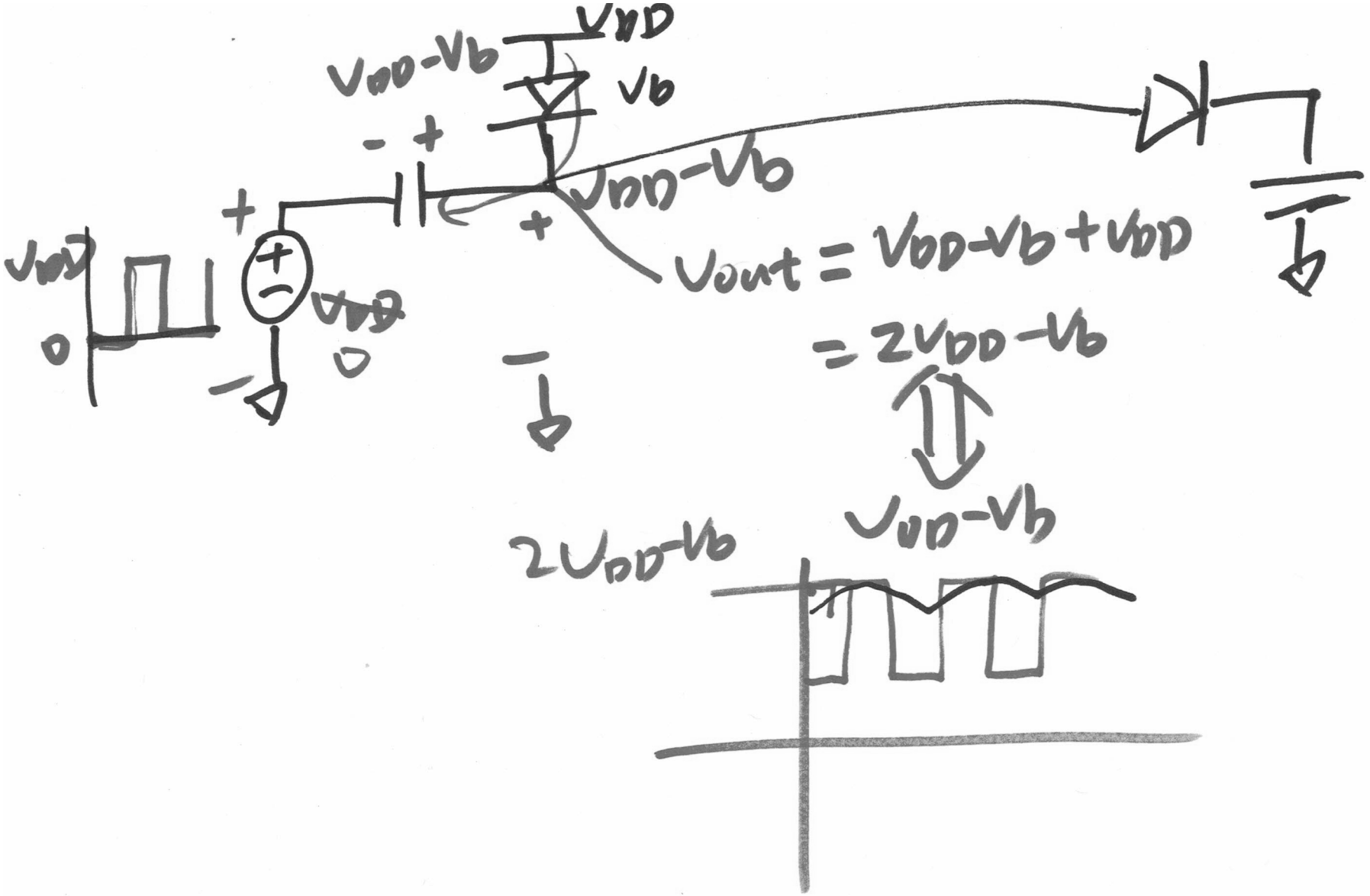
always in saturation because $V_{DS} > V_{GS} - V_{THN}$

$$\begin{cases} V_G = V_{DD} \\ V_S = V_{DD} - V_{THN} \end{cases}$$

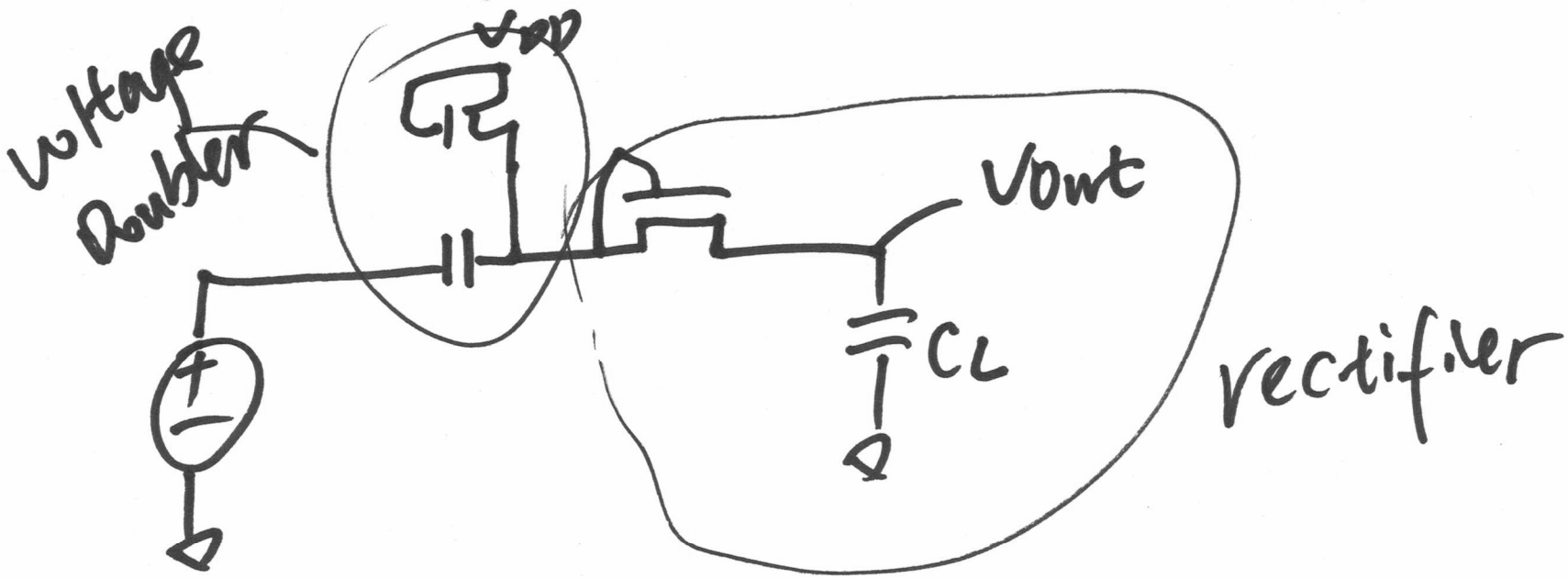
$$V_{GS} = V_{DD} - (V_{DD} - V_{THN}) = V_{THN}$$



△ Is the Drain and the Source interchangeable?

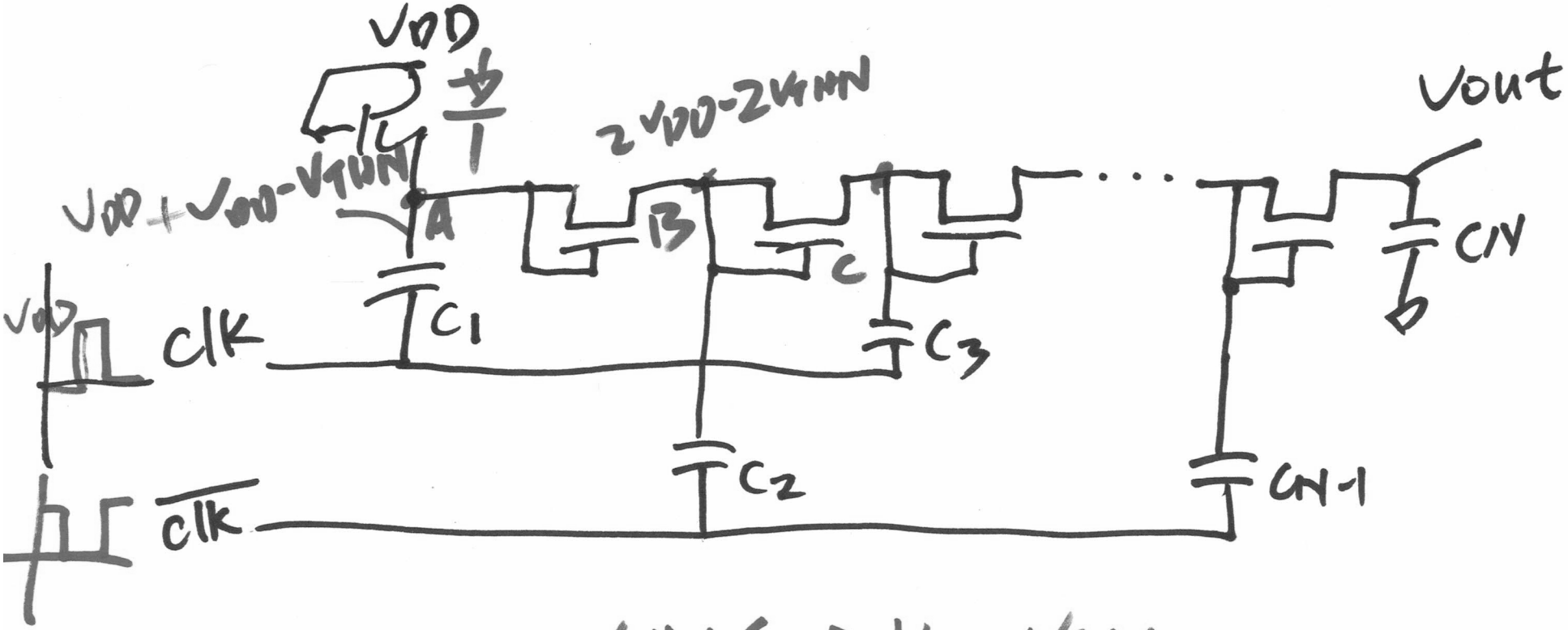

VDD
VDD-Vb
Vb
VDD-Vb
Vout = VDD-Vb+VDD
= 2VDD-Vb
VDD-Vb
2VDD-Vb

The charge Pump



chapter:
Special IC Design.

△ The Dickson Charge Pump



A: $2V_{DD}-V_{tHN} \longleftrightarrow V_{DD}-V_{tHN}$

B: $3V_{DD}-2V_{tHN} \longleftrightarrow 2V_{DD}-2V_{tHN}$

C: $4V_{DD}-3V_{tHN} \longleftrightarrow 3V_{DD}-3V_{tHN}$