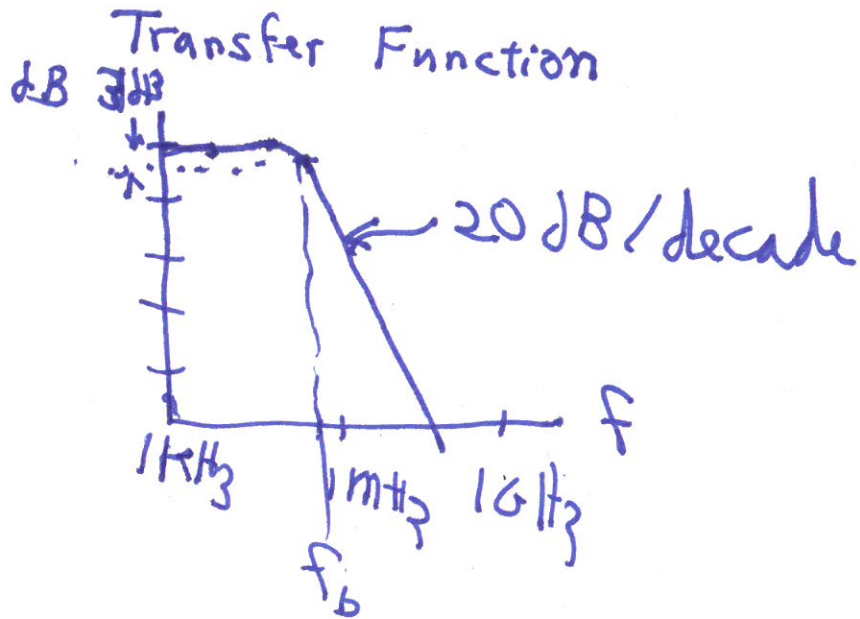


11 Oct 2016
(Review)

80

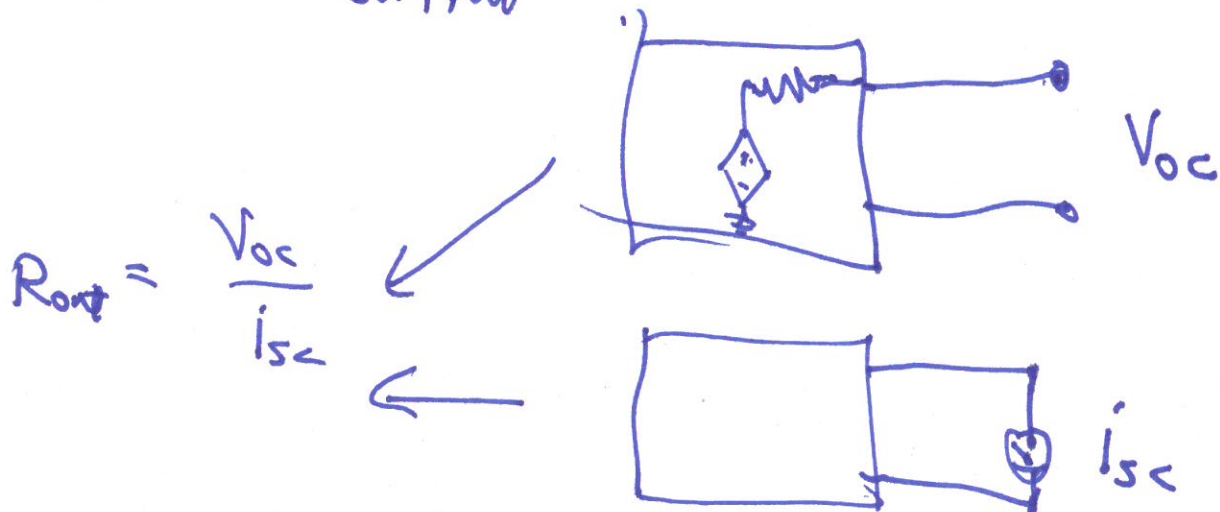
OP AMPS

Gain (Voltage, Current, Power)
dB
Phase
 $20 \log |A_v|$

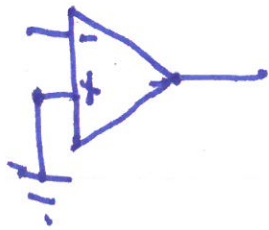


Impedance (why?)
input + output

output



61 ~~62~~

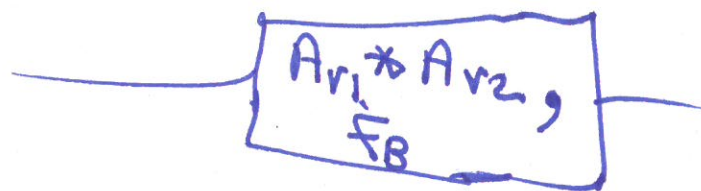
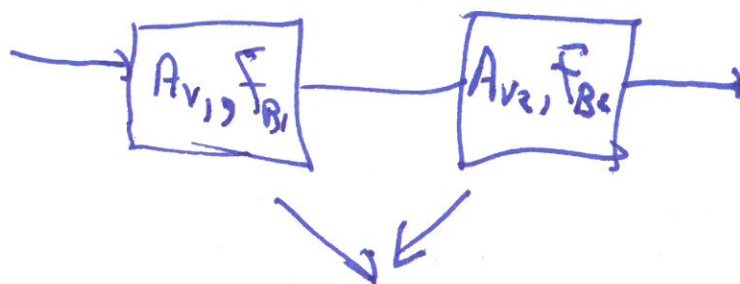


virtual ground

Voltage Limits

Gain - Bandwidth Product

$$\underbrace{A_{VOL} f_B}_{\text{for my circuit with this opamp}} = \underbrace{A_{OL} f_{BOL}}_{\text{for the opamp}}$$



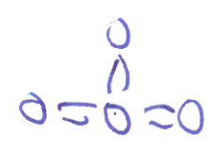
if $f_{B1} \ll f_{B2}$
 $f_B = f_{B1}$

if $f_{B1} = f_{B2}$

$f_B = 0.64 f_{B1}$

Diodey

Physics



N_A acceptors

N_D donors

$n_i = p_i$
(intrinsic)

$$N_A + n = N_D + p$$

$$np = n_i p_i = (n_i)^2$$

Drift velocity in E field

Diffusion (just because...)

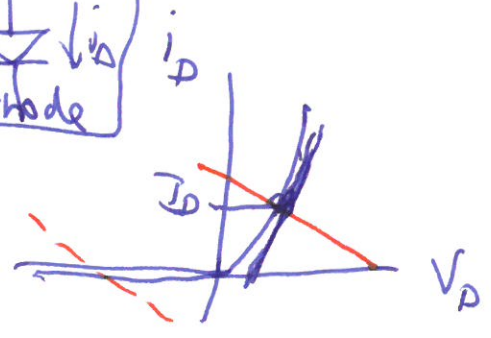
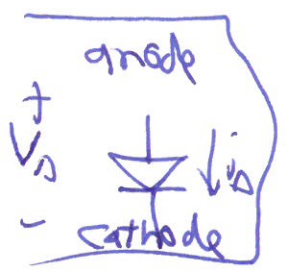
Shockley Equation

$$I_D = I_S (e^{V_D / (n V_T)} - 1)$$

Approximation

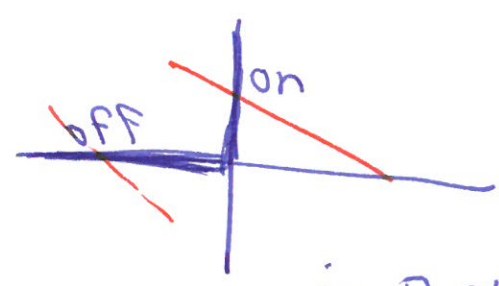
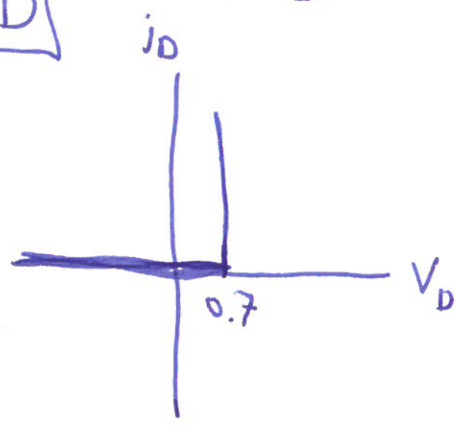
$V_D < 0 \quad I_D = 0 \quad \text{off}$

$V_D \geq 0 \quad I_D > 0 \quad \text{on}$

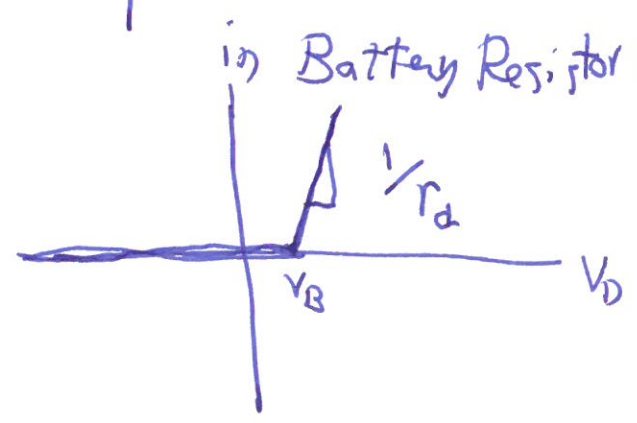


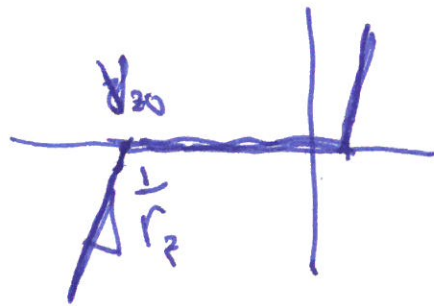
$$r_d = \frac{V_T}{I_D}$$

CVD

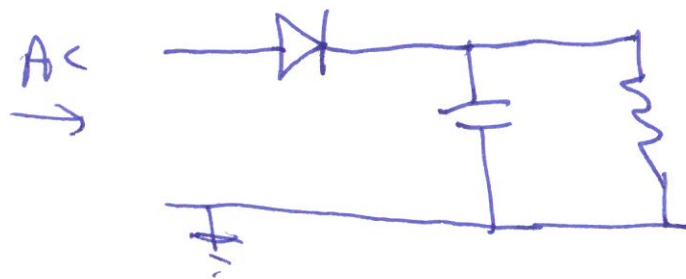


Battery Resistor model





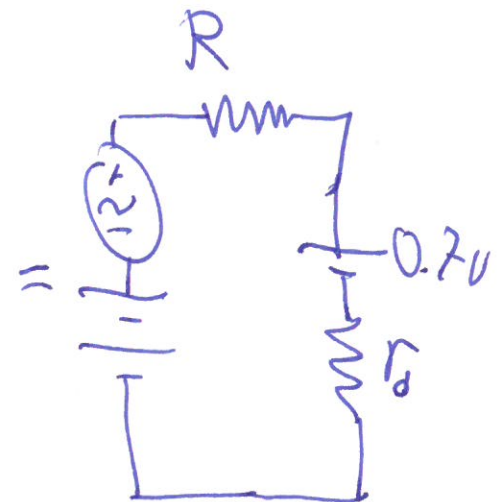
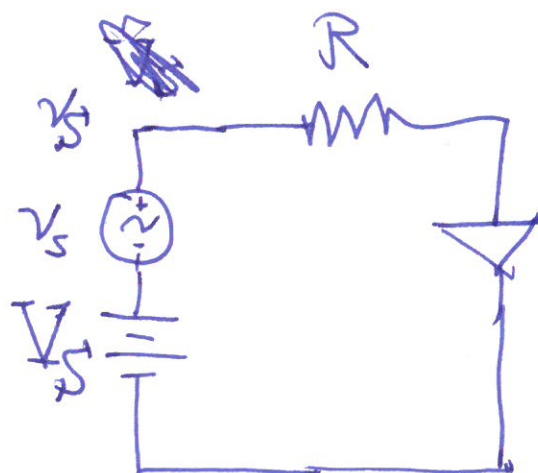
Rectifier



Charge (diode on)
Discharge

Limiter

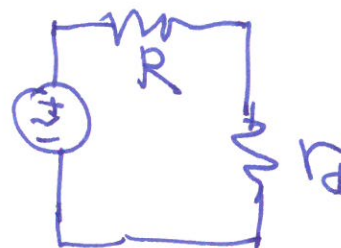
AC $\rightarrow$ DC



DC model



AC model



Diode Logic

