ECEN4827/5827

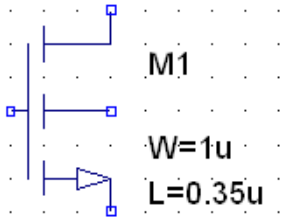
0.35u CMOS

Approximate model parameters for hand calculations

8/22/2008

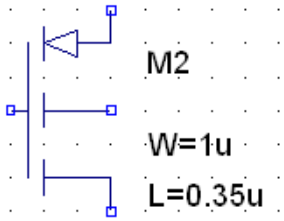
Spice model library: 5827_035.lib

NMOS
nmos_035.asy



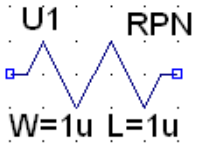
NMOS transistor
B (*p* substrate) must be tied to most negative supply rail

PMOS
pmos_035.asy



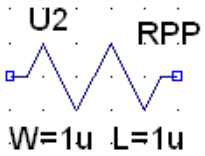
PMOS transistor
B is *n*-well, usually most positive supply rail

RPN
rpn_035.asy



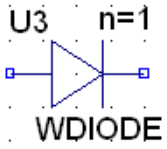
Rsheet = 1.2 kΩ/square, TC = –400 ppm/°C
"square" = L/W

RPP
rpp_035.asy



Rsheet = 50 Ω/square, TC = +830 ppm/°C
"square" = L/W

WDIODE
wdiode.asy

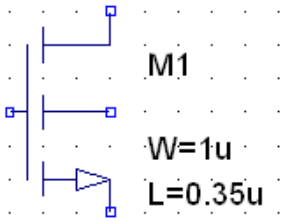


Unit-area (5µ*5µ) *p*+ diffusion to *n*-well diode
n = area multiple. Cathode must be tied to the most negative supply rail

Approximate models for hand calculations

NMOS

nmos_035.asy



$V_{tn} \approx 0.48$ V

$\mu_n C_{ox} \approx 90$ µA/V^2

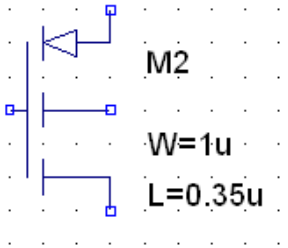
$\lambda_n \approx 0.035$ 1/V (L=1µ)

0.025 1/V (L=2µ)

<0.015 1/V (L>4µ)

PMOS

pmos_035.asy



$V_{tp} \approx -0.62$ V

$\mu_p C_{ox} \approx 36$ µA/V^2

$\lambda_p \approx 0.046$ 1/V (L=1µ)

0.019 1/V (L=2µ)

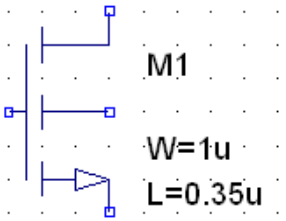
<0.01 1/V (L>4µ)

Beware: do not expect very accurate results using hand calculations, especially for short channel lengths (L < 2 µ)

Approximate models for hand calculations

NMOS

nmos_035.asy



$C_{gs} \approx [3\ \text{fF}/(\mu\text{m})^2]*W*L$

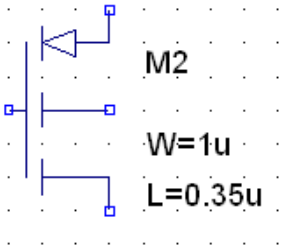
$C_{gd} \approx [0.3\ \text{fF}/(\mu\text{m})]*W$

$C_{db} \approx [1.5\ \text{fF}/(\mu\text{m})]*W$

$C_{sb} \approx [1.5\ \text{fF}/(\mu\text{m})]*W + [0.75\ \text{fF}/(\mu\text{m})^2]*W*L$

PMOS

pmos_035.asy



$C_{gs} \approx [3\ \text{fF}/(\mu\text{m})^2]*W*L$

$C_{gd} \approx [0.15\ \text{fF}/(\mu\text{m})]*W$

$C_{db} \approx [2.5\ \text{fF}/(\mu\text{m})]*W$

$C_{sb} \approx [2.5\ \text{fF}/(\mu\text{m})]*W + [1.25\ \text{fF}/(\mu\text{m})^2]*W*L$

Beware: do not expect very accurate results using hand calculations, especially for short channel lengths ($L < 2\ \mu$)