

65nm CMOS Process Data Sheet for the Analog IC Design Course

Note: The parameters in this sheet are representative for a 65nm CMOS process, and are intended for teaching purposes only.

Transistor Parameters			
Parameter	NMOS	PMOS	Unit
Gain factor	$k_n = 440$	$k_p = 140$	$\mu\text{A}/\text{V}^2$
Threshold voltage	$V_{t0n} = 0.3$	$V_{t0p} = -0.3$	V
Body effect factor	$\gamma_n = 0.24$	$\gamma_p = -0.20$	\sqrt{V}
Surface potential	$2\phi_m = 1.3$	$2\phi_{fp} = -1.0$	V
Channel length modulation	$\left \frac{dX_{d,n}}{dV_{DS}} \right = 0.2$	$\left \frac{dX_{d,p}}{dV_{DS}} \right = 0.2$	$\mu\text{m}/\text{V}$
Subthreshold current	$I_{tn} = 1.7$	$I_{tp} = -0.45$	μA
Subthreshold slope factor	$n_n = 1.7$	$n_p = 1.5$	

Capacitances (layer to substrate)		
	Area (fF/ μm^2)	Perimeter (fF/ μm)
Gate oxide capacitance	$C_{ox} = 12$	
Gate-diffusion overlap		$C_{ol}/W = 0.3$
N+ diffusion (0V)	$C_{j0n} = 1.4$	$C_{jswn} = 0.04$
P+ diffusion (0V)	$C_{j0p} = 1.8$	$C_{jswp} = 0.06$
Poly	$C_p = 0.11$	$C_{pp} = 0.018$
Metal 1	$C_{m1} = 0.098$	$C_{m1p} = 0.018$
Metal 2	$C_{m2} = 0.062$	$C_{m2p} = 0.018$
Metal 3	$C_{m3} = 0.033$	$C_{m3p} = 0.016$
Metal 4	$C_{m4} = 0.022$	$C_{m4p} = 0.015$
Metal 5	$C_{m5} = 0.017$	$C_{m5p} = 0.015$
Metal 6	$C_{m6} = 0.014$	$C_{m6p} = 0.015$
Metal 7	$C_{m7} = 0.009$	$C_{m7p} = 0.016$
Metal 8	$C_{m8} = 0.007$	$C_{m8p} = 0.018$

Resistances			
Sheet resistances (Ω/\square)		Contact resistances (Ω)	
Poly	$R_{sp} = 15$	Contact Metal1 to below	$R_{ct} = 38$
Metal 1	$R_{sm1} = 0.13$	Via MetalX to X+1, X=1..5	$R_{via1-5} = 1.0$
Metal2-5	$R_{sm2-5} = 0.11$	Via MetalX to X+1, X=6..7	$R_{via6-7} = 0.50$
Metal6	$R_{sm6} = 0.040$		
Metal7-8	$R_{sm7-8} = 0.024$		

Maximum currents			
Current densities (mA/ μm)		Contact currents (mA)	
Poly	$J_p = 1.5$	Contact Metal 1 to below	$I_{ct} = 0.14$
Metal1	$J_{m1} = 1.5$	Via MetalX to X+1, X=1..4	$I_{via1-4} = 0.16$
Metal2-5	$J_{m2-5} = 1.8$	Via Metal5 to 6	$I_{via5} = 0.80$
Metal6	$J_{m6} = 4.4$	Via MetalX to X+1, X=6..7	$I_{via6-7} = 3.0$
Metal7-8	$J_{m7-8} = 8.0$		