

EXHIBIT C

WINNER OF THE
1036

Frederick Emmons Terman Award in Electrical & Computer Engineering

THIRD EDITION

CMOS



Circuit Design, Layout, and Simulation

R. JACOB BAKER

IEEE Series on Microelectronic Systems

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Multipliers

Name	Symbol	Value
terra	T	10^{12}
giga	G	10^9
mega	M (MEG in SPICE)	10^6
kilo	k	10^3
milli	m	10^{-3}
micro	μ (or u)	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a (not used in SPICE)	10^{-18}

Physical Constants

Name	Symbol	Value/Units
Vacuum dielectric constant	ϵ_0	8.85 aF/ μm
Silicon dielectric constant	ϵ_{si}	$11.7\epsilon_0$
SiO ₂ dielectric constant	ϵ_{ox}	$3.97\epsilon_0$
SiN ₃ dielectric constant	ϵ_{ni}	$16\epsilon_0$
Boltzmann's constant	k	1.38×10^{-23} J/K
Electronic charge	q	1.6×10^{-19} C
Temperature	T	Kelvin
Thermal voltage	V_T	$kT/q = 26$ mV @ 300K

CMOS

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