

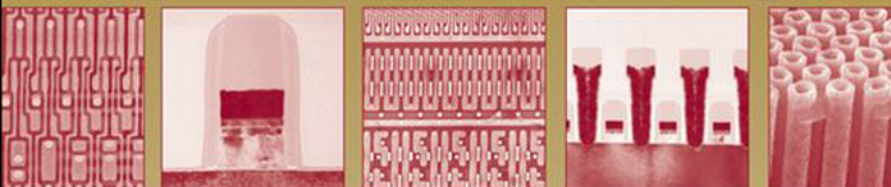
# EXHIBIT C

WINNER OF THE  
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*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	$\mu$ (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	$\epsilon_0$	8.85 aF/ $\mu\text{m}$
Silicon dielectric constant	$\epsilon_{\text{si}}$	$11.7\epsilon_0$
SiO <sub>2</sub> dielectric constant	$\epsilon_{\text{ox}}$	$3.97\epsilon_0$
SiN <sub>3</sub> dielectric constant	$\epsilon_{\text{Ni}}$	$16\epsilon_0$
Boltzmann's constant	k	$1.38 \times 10^{-23}$ J/K
Electronic charge	q	$1.6 \times 10^{-19}$ C
Temperature	T	Kelvin
Thermal voltage	$V_T$	$kT/q = 26$ mV @ 300K

**CMOS**

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