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Third Edition

CMOS

Digital Integrated Circuits

Analysis and Design

Sung-Mo Kang
Yusuf Leblebici

TSMC 1111

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Physical and Materials Constants

| | | | |
|--|-----------------|---|------------------|
| Boltzmann's constant | k | 1.38×10^{-23} | J/K |
| Electron charge | q | 1.6×10^{-19} | C |
| Thermal voltage | kT/q | 0.026 (at $T = 300$ K) | V |
| Energy gap of silicon (Si) | E_g | 1.12 (at $T = 300$ K) | eV |
| Intrinsic carrier concentration of silicon (Si) | n_i | 1.45×10^{10} (at $T = 300$ K) | cm^{-3} |
| Dielectric constant of vacuum | ϵ_0 | 8.85×10^{-14} | F/cm |
| Dielectric constant of silicon (Si) | ϵ_{Si} | $11.7 \times \epsilon_0$ | F/cm |
| Dielectric constant of silicon dioxide (SiO ₂) | ϵ_{ox} | $3.97 \times \epsilon_0$ | F/cm |

Commonly Used Prefixes for Units

| | | |
|-------|-------|------------|
| giga | G | 10^9 |
| mega | M | 10^6 |
| kilo | k | 10^3 |
| milli | m | 10^{-3} |
| micro | μ | 10^{-6} |
| nano | n | 10^{-9} |
| pico | p | 10^{-12} |
| femto | f | 10^{-15} |

second edition

CMOS DIGITAL INTEGRATED CIRCUITS

Analysis and Design

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