

1. Record Nr.	UNINA9910819126403321
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Titolo	System integration : from transistor design to large scale integrated circuits // Kurt Hoffmann
Pubbl/distr/stampa	Chichester, West Sussex, England ; ; Hoboken, NJ, : John Wiley & Sons, c2004
ISBN	1-280-27506-5 9786610275069 0-470-02069-5 0-470-02071-7
Edizione	[1st ed.]
Descrizione fisica	1 online resource (512 p.)
Disciplina	621.3815
Soggetti	Systems on a chip Integrated circuits
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	System Integration; Contents; Preface; Acknowledgments; Physical Constants and Conversion Factors; Symbols; 1 Semiconductor Physics; 1.1 Band Theory of Solids; 1.2 Doped Semiconductor; 1.3 Semiconductor in Equilibrium; 1.3.1 Fermi-Dirac Distribution Function; 1.3.2 Carrier Concentration at Equilibrium; 1.3.3 Density Product at Equilibrium; 1.3.4 Relationship between Energy, Voltage, and Electrical Field; 1.4 Charge Transport; 1.4.1 Drift Velocity; 1.4.2 Drift Current; 1.4.3 Diffusion Current; 1.4.4 Continuity Equation; 1.5 Non-Equilibrium Conditions; Problems; References; Further Reading 2 pn-Junction 2.1 Inhomogeneously Doped n-type Semiconductor; 2.2 pn-Junction at Equilibrium; 2.3 Biased pn-Junction; 2.3.1 Density Product under Non-Equilibrium Conditions; 2.3.2 Current-Voltage Relationship; 2.3.3 Deviation from the Current-Voltage Relationship; 2.3.4 Voltage Reference Point; 2.4 Capacitance Characteristic; 2.4.1 Depletion Capacitance; 2.4.2 Diffusion Capacitance; 2.5 Switching Characteristic; 2.6 Junction Breakdown; 2.7 Modeling the pn-Junction; 2.7.1 Diode Model for CAD Applications; 2.7.2 Diode Model for Static Calculations; 2.7.3 Diode Model for Small-Signal Calculations

ProblemsReferences; 3 Bipolar Transistor; 3.1 Bipolar Technologies; 3.2 Transistor Operation; 3.2.1 Current-Voltage Relationship; 3.2.2 Transistor under Reverse Biased Condition; 3.2.3 Voltage Saturation; 3.2.4 Temperature Behavior; 3.2.5 Breakdown Behavior; 3.3 Second-Order Effects; 3.3.1 High Current Effects; 3.3.2 Base-Width Modulation; 3.3.3 Current Crowding; 3.4 Alternative Transistor Structures; 3.5 Modeling the Bipolar Transistor; 3.5.1 Transistor Model for CAD Applications; 3.5.2 Transistor Model for Static Calculations; 3.5.3 Transistor Model for Small-Signal Calculations 3.5.4 Transit Time DeterminationProblems; References; Further Reading; 4 MOS Transistor; 4.1 CMOS Technology; 4.2 The MOS Structure; 4.2.1 Characteristic of the MOS Structure; 4.2.2 Capacitance Behavior of the MOS Structure; 4.2.3 Flat-Band Voltage; 4.3 Equations of the MOS Structure; 4.3.1 Charge Equations of the MOS Structure; 4.3.2 Surface Voltage at Strong Inversion; 4.3.3 Threshold Voltage and Body Effect; 4.4 MOS Transistor; 4.4.1 Current-Voltage Characteristic at Strong Inversion; 4.4.2 Improved Transistor Equation; 4.4.3 Current-Voltage Characteristic at Weak Inversion 4.4.4 Temperature Behavior4.5 Second-Order Effects; 4.5.1 Mobility Degradation; 4.5.2 Channel Length Modulation; 4.5.3 Short Channel Effects; 4.5.4 Hot Electrons; 4.5.5 Gate-Induced Drain Leakage; 4.5.6 Breakdown Behavior; 4.5.7 Latch-up Effect; 4.6 Power Devices; 4.7 Modeling of the MOS Transistor; 4.7.1 Transistor Model for CAD Applications; 4.7.2 Transistor Model for Static and Dynamic Calculations; 4.7.3 Transistor Model for Small-Signal Calculations; Problems; Appendix A Current-Voltage Equation of the MOS Transistor under Weak Inversion Condition; References; Further Reading 5 Basic Digital CMOS Circuits

Sommario/riassunto

The development of large-scale integrated systems on a chip has had a dramatic effect on circuit design methodology. Recent years have seen an escalation of interest in systems level integration (system-on-a-chip) and the development of low power, high chip density circuits and systems. Kurt Hoffmann sets out to address a wide range of issues relating to the design and integration of integrated circuit components and provides readers with the methodology by which simple equations for the estimation of transistor geometries and circuit behaviour can be deduced. The broad coverage of this uniq
