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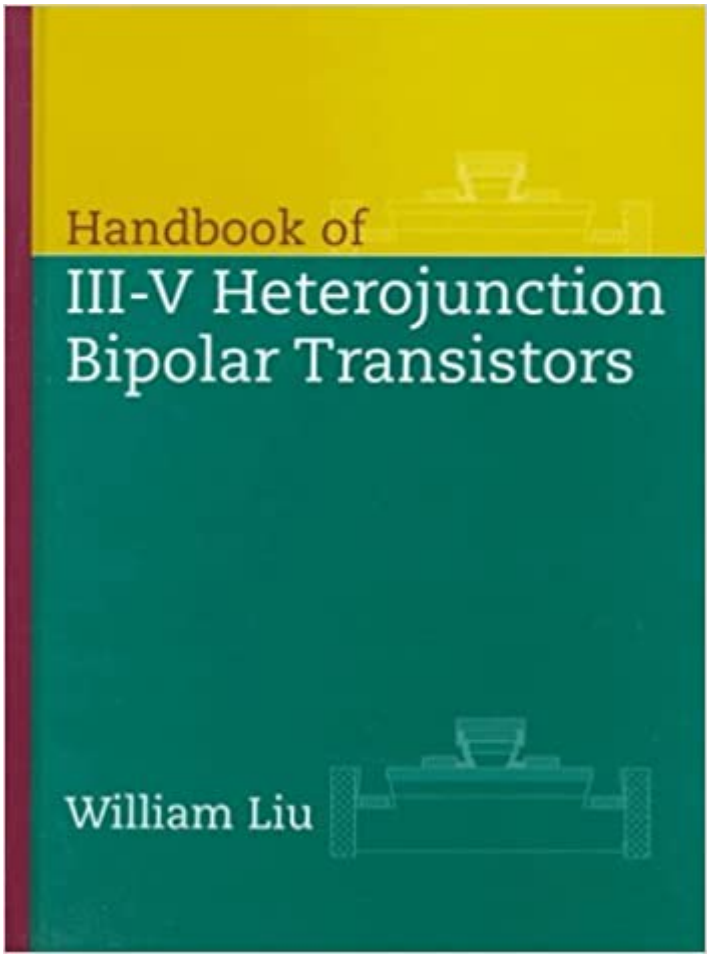

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Synopsis

The definitive hands-on guide to heterojunction bipolar transistors In recent years, heterojunction bipolar transistor (HBT) technology has become an intensely researched area in universities and industry worldwide. Boasting superior performance over silicon bipolar transistors with its combined high speed, high linearity, and high power requirements, the III-V HBT is fast becoming a major player in wireless communication, power amplifiers, mixers, and frequency synthesizers. Handbook of III-V Heterojunction Bipolar Transistors presents a comprehensive, systematic reference for this cutting-edge technology. In one self-contained volume, it covers virtually every HBT topic imaginable--introductory and advanced, theoretical and practical--from device physics, to design issues, to HBT performance in digital and analog circuits. It features: * A user-friendly, integrated approach to HBTs and circuit design that can be applied in diverse disciplines * A discussion of factors determining transistor operation, including thermal properties, failure mechanisms, high-frequency measurements and models, switching characteristics, noise and distortion, and modern device fabrications * Over 800 illustrations, showing how to use concepts and equations in the real world * An introduction to device physics and semiconductor basics * Many worked-out examples and end-of-chapter problem sets * Fully developed mathematical derivations Handbook of III-V Heterojunction Bipolar Transistors is an important reference for practicing engineers and researchers in cellular wireless communication and microwave-millimeter electronics as well as for wireless circuit design engineers. It is also extremely useful for advanced undergraduate and graduate students studying advanced semiconductor and microwave circuits.

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Heterojunction bipolar transistors (HBT) offer substantial improvements in performance over the silicon bipolar transistor. HBTs will permit performance improvements by combining high speeds with low power requirements. Important applications are found in such fields as wireless communications, power amplifiers, mixers and frequency synthesizers.

The definitive hands-on guide to heterojunction bipolar transistors In recent years, heterojunction bipolar transistor (HBT) technology has become an intensely researched area in universities and industry worldwide. Boasting superior performance over silicon bipolar transistors with its combined high speed, high linearity, and high power requirements, the III-V HBT is fast becoming a major player in wireless communication, power amplifiers, mixers, and frequency synthesizers. Handbook of III-V Heterojunction Bipolar Transistors presents a comprehensive, systematic reference for this cutting-edge technology. In one self-contained volume, it covers virtually every HBT topic imaginableÃ¢â ¬â •introductory and advanced, theoretical and practicalÃ¢â ¬â •from device physics, to design issues, to HBT performance in digital and analog circuits. It features: A user-friendly, integrated approach to HBTs and circuit design that can be applied in diverse disciplines A discussion of factors determining transistor operation, including thermal properties, failure mechanisms, high-frequency measurements and models, switching characteristics, noise and distortion, and modern device fabrications Over 800 illustrations, showing how to use concepts and equations in the real world An introduction to device physics and semiconductor basics Many worked-out examples and end-of-chapter problem sets Fully developed mathematical derivations Handbook of III-V Heterojunction Bipolar Transistors is an important reference for practicing engineers and researchers in cellular wireless communication and microwave-millimeter electronics as well as for wireless circuit design engineers. It is also extremely useful for advanced undergraduate and graduate students studying advanced semiconductor and microwave circuits.

This is an excellent advanced reference of HBTs covering in great detail GaAs/AlGaAs, GaAs/InGaP and fair coverage of InGaAs/InAlAs HBTs. Despite being an old book (published in 1998) in a very dynamic field it is almost impossible to be outdated any time soon for at least the following reasons:1- It covers working concepts of HBTs in meticulous detail making very clever and

extensive use of Mathematics without eclipsing the underlying physics.2- Excellent strategy of applying Poisson equation for heterostructures and then using that knowledge for drawing the band diagrams (Kroemer will love it!)3- Complete chapter on Electrical-thermal modelling solving heat conduction equation again in a manner which is both intuitive and rigorous followed by extensive real-world data and its analysis.4- Complete chapter with examples on failure mechanisms in HBTs of different material systems.5- Extensive discussion of different components of base current, their idealities and their dependence on device layout followed by their role in carrier transport and hence their effect on the gain of an amplifier.6- Complete, unabridged derivations of small signal models starting from basic drift-diffusion equations all the way to getting Y, S and other parameters and then leading to the expressions for cut-off (fT) and maximum oscillation (fmax) frequency.7- Very thorough coverage of parasitics covering extrinsic resistances and capacitances and their effect on transistor performance. Complete worked out examples starting from solving Poisson equation for heterojunctions to deriving fT and fmax values.8- Very good coverage of Ebers-Moll and Gummel-Poon models with very valuable details of the measurement setup for Vector Network Analyzer or other parameter analyzers.9- Excellent set of problems to apply and master the concepts discussed in the main text.The omission of SiGe HBTs is logical as the book's title is III-V HBTs and any effort to include it in subsequent editions will probably render this book too thick to be used frequently and conveniently and especially as a graduate textbook. The only downside of the book is that it has some and rather insidious typos. In short it is a must-read for any research student or professional in the area of HBTs.

I am William Liu, the author. People ask me about the content of the book enough times that, I'd like to put it here.Chapter 1: Basic Properties and Device Physics of III-V Materials1-1 semiconductor crystalline properties1-2 molecular beam epitaxy1-3 metalorganic chemical vapor deposition1-4 lattice-mismatched layers1-5 basic device physics1-6 continuity equations and quasi-neutrality assumption1-7 material parametersChapter 2 Two-Terminal Heterojunctin Devices2-1 p+-N heterojunction under termal equilibrium2-2 p+-N heterojunction under external bias2-3 p-N+, P+-n, and P-n+ heterojunctions2-4 graded heterojunctins2-5 diode current-voltage characteristics2-6 space charge recombination and generation currents2-7 isotype heterojunctionsChapter 3 DC Current Gain3-1 basic transistor operation3-2 base current components3-3 collector current ideality factor3-4 current gain flattening3-5 surface passivation3-6 surface current ideality factor3-7 base contact recombination3-8 temperature dependence3-9 base quasi-electric field3-10 analytical solution of the continuity equation3-11 critical base-emitter contact spacing3-12 minority-carrier

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It is a good book for HBTs with a lot of details in it.

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