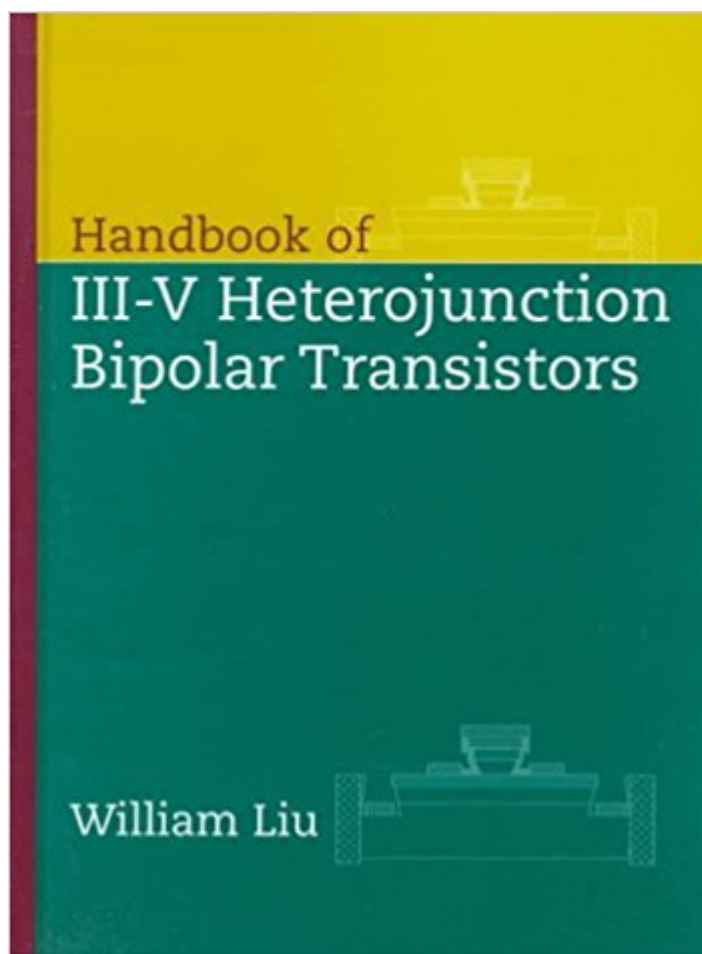


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# Handbook Of III-V Heterojunction Bipolar Transistors



## 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.

## Book Information

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## Customer Reviews

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 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.

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 ( $f_T$ ) and maximum oscillation ( $f_{max}$ ) 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  $f_T$  and  $f_{max}$  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 Materials

1-1 semiconductor crystalline properties

1-2 molecular beam epitaxy

1-3 metalorganic chemical vapor deposition

1-4 lattice-mismatched layers

1-5 basic device physics

1-6 continuity equations and quasi-neutrality assumption

1-7 material parameters

Chapter 2 Two-Terminal Heterojunction Devices

2-1 p+-N heterojunction under thermal equilibrium

2-2 p+-N heterojunction under external bias

2-3 p-N+, P+-n, and P-n+ heterojunctions

2-4 graded heterojunctions

2-5 diode current-voltage characteristics

2-6 space charge recombination and generation currents

2-7 isotype heterojunctions

Chapter 3 DC Current Gain

3-1 basic transistor operation

3-2 base current components

3-3 collector current ideality factor

3-4 current gain flattening

3-5 surface passivation

3-6 surface current ideality factor

3-7 base contact recombination

3-8 temperature dependence

3-9 base quasi-electric field

3-10 analytical solution of the continuity equation

3-11 critical base-emitter contact spacing

3-12 minority-carrier

lateral diffusion length<sup>3-13</sup> device simulator results<sup>3-14</sup> parasitic conduction in the passivation ledge

Chapter 4 Nonideal DC Characteristics<sup>4-1</sup> current gain fall-off mechanisms<sup>4-2</sup> emitter crowding<sup>4-3</sup> d.c. intrinsic base resistance<sup>4-4</sup> emitter doping effects<sup>4-5</sup> Kirk effects<sup>4-6</sup> self-heating effects<sup>4-7</sup> two-dimensional current flow<sup>4-8</sup> avalanche breakdown<sup>4-9</sup> leakage current<sup>4-10</sup> knee voltage and offset voltage<sup>4-11</sup> current gain oscillation

Chapter 5 Thermal-Electrical Properties<sup>5-1</sup> the heat conduction equation<sup>5-2</sup> steady-state junction temperature due to self-heating<sup>5-3</sup> thermal-electrical coupling<sup>5-4</sup> temperature-dependent thermal conductivity<sup>5-5</sup> experimental determination of steady-state junction temperature<sup>5-6</sup> transient thermal response<sup>5-7</sup> temperature at the metal strip line<sup>5-8</sup> thermal resistance in a dot structure<sup>5-9</sup> heat conduction through electrical carriers

Chapter 6 Collapse of Current Gain<sup>6-1</sup> basic characteristics<sup>6-2</sup> collapse loci, regression loci, and s-factor loci<sup>6-3</sup> gain collapse in one-finger HBT<sup>6-4</sup> thermal coupling<sup>6-5</sup> numerical model<sup>6-6</sup> prevention techniques<sup>6-7</sup> base ballasting<sup>6-8</sup> substrate temperature effects<sup>6-9</sup> interaction with avalanche breakdown<sup>6-10</sup> constant  $V_{be}$  and common-base operations<sup>6-11</sup> collapse inverter<sup>6-12</sup> gain collapse in GaInP/GaAs HBTs<sup>6-13</sup> gain collapse in InP/InGaAs HBTs<sup>6-14</sup> Newton-Raphson numerical technique

Chapter 7 Failure Mechanisms and Reliability Issues<sup>7-1</sup> failure mechanisms of AlGaAs/GaAs HBTs<sup>7-2</sup> Si BJTs versus AlGaAs/GaAs HBTs<sup>7-3</sup> safe operating area<sup>7-4</sup> failure mechanisms of InP/InGaAs HBTs<sup>7-5</sup> reliability basics<sup>7-6</sup> degradation characteristics<sup>7-7</sup> degradation mechanisms

Chapter 8 Small-Signal Properties<sup>8-1</sup> a simple circuit model<sup>8-2</sup> intrinsic common-base y-parameters<sup>8-3</sup> intrinsic common-emitter y-parameters<sup>8-4</sup> r.f. intrinsic base impedance<sup>8-5</sup> hybrid- $\pi$  model<sup>8-6</sup> intrinsic z- h- and s-parameters<sup>8-7</sup> base quasi-electric field<sup>8-8</sup> epitaxial resistances<sup>8-9</sup> contact resistances<sup>8-10</sup> cutoff frequency ( $f_T$ )<sup>8-11</sup> maximum oscillation frequency ( $f_{max}$ )<sup>8-12</sup> second-order small-signal model<sup>8-13</sup> second-order expression for  $f_T$ <sup>8-14</sup> second-order expression for  $f_{max}$ <sup>8-15</sup> inductance effects

Chapter 9 Epitaxial Layer Design<sup>9-1</sup> example: calculation of  $f_T$  and  $f_{max}$ <sup>9-2</sup> emitter layer design<sup>9-3</sup> collector layer design<sup>9-4</sup> double collector and inverter-field collector designs<sup>9-5</sup> subcollector layer design<sup>9-6</sup> base layer design<sup>9-7</sup> dopant-graded base

Chapter 10 Geometrical Layout Design<sup>10-1</sup> emitter width design<sup>10-2</sup> base contact width design<sup>10-3</sup> contact spacing and collector contact width design<sup>10-4</sup> emitter length design (base metal resistance consideration)<sup>10-5</sup> emitter length design (thermal consideration)<sup>10-6</sup> dot geometry transistor design<sup>10-7</sup> comparison of stripe and dot geometries

Chapter 11 Power Amplifier<sup>11-1</sup> sinusoidal power<sup>11-2</sup> small-signal power amplifier<sup>11-3</sup> large-signal power amplifier<sup>11-4</sup> power gain and power-added-efficiency<sup>11-5</sup> overdriven and selectively tuned amplifiers<sup>11-6</sup> sources of undesirable power dissipations<sup>11-7</sup> emitter inductance<sup>11-8</sup> unit-cell design

Chapter 12 Distortion and Noise<sup>12-1</sup> harmonic distortion<sup>12-2</sup> intermodulation distortions and two-tone characteristics<sup>12-3</sup>

mixer12-4 differential pair12-5 noise characteristics12-6 noise figureChapter 13 Switching Characteristics and SPICE Models13-1 basic charge-control model13-2 second-order analysis13-3 rise time and fall time13-4 switching of transistors in saturation13-5 storage charge13-6 junction capacitive charges13-7 Ebers-Moll SPICE model13-8 Gummel-Poon SPICE model13-9 area and temperature dependences and noise models13-10 extraction of SPICE parametersChapter 14 Transistor Fabrication14-1 d.c. fabrication process14-2 single-finger-device r.f. fabrication process14-3 GaInP (InP) and InGaAs processing14-4 MMIC r.f. fabrication process14-5 ashing effectsChapter 15 Measured Transistor Performances15-1 d.c. characteristics15-2 small-signal characteristics15-3 high-frequency performance at high current15-4 emitter doping effects15-5 Pnp HNTs15-6 d.c. current gain and cutoff frequency15-7 electron saturation velocity in GaIP15-8 InP based HBTs15-9 unit-cell large-signal results15-10 GaInP/GaAs/GaInP DHBT characteristics15-11 linearity characteristics15-12 MMIC amplifier performance15-13 laterally etched undercut results15-14 1/f noise characteristics15-15 HBT-on-Si15-16 conductive substrate and leaky subcollector

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

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