

Preface

As a successful fruit of semiconductor band gap engineering, silicon-germanium (SiGe) heterojunction bipolar transistor (HBT) has already made considerable progress in wireless communication applications, especially in the past decade. Due to the special device structure and band gap engineering in base region, SiGe HBT technology has been demonstrated with multi-Mrad total dose tolerance and can be used as a strong candidate in space electronics. This book mainly relates to radiation effects and device model of bipolar transistor, and it is intended for a number of different audiences and venues. My purposes are as follows:

1. To introduce some new research achievement about the radiation effects of SiGe HBTs, including the total dose effect and single-event effects
2. To provide some new research results about the device model and parameter-extraction method for heterojunction bipolar transistor

This book starts with a brief introduction of research status about the radiation effects and compact model of SiGe HBTs. Then various aspects of radiation effect are covered; the corresponding performance degradations and physics mechanisms for each radiation effect are discussed in detailed. Finally, the equivalent circuit model parameter-extraction techniques are introduced and applied to the transistor exposed to extreme environments. The presentation of this book assumes that the reader has some modest background in semiconductor physics and semiconductor devices.

This book can be intended to provide a hands-on reference for researchers and engineers working on various aspects of SiGe HBT technology, including radiation effects, radiation hardening, device model and simulation, and parameter extraction. This book should also be useful as a hands-on research resource for graduate students in electrical engineering and computer science who require knowledge about the advanced SiGe HBT technologies. The references listed at the end of each chapter are elaborate and useful for readers using this book. I hope my efforts please you!

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of SiGe HBT

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