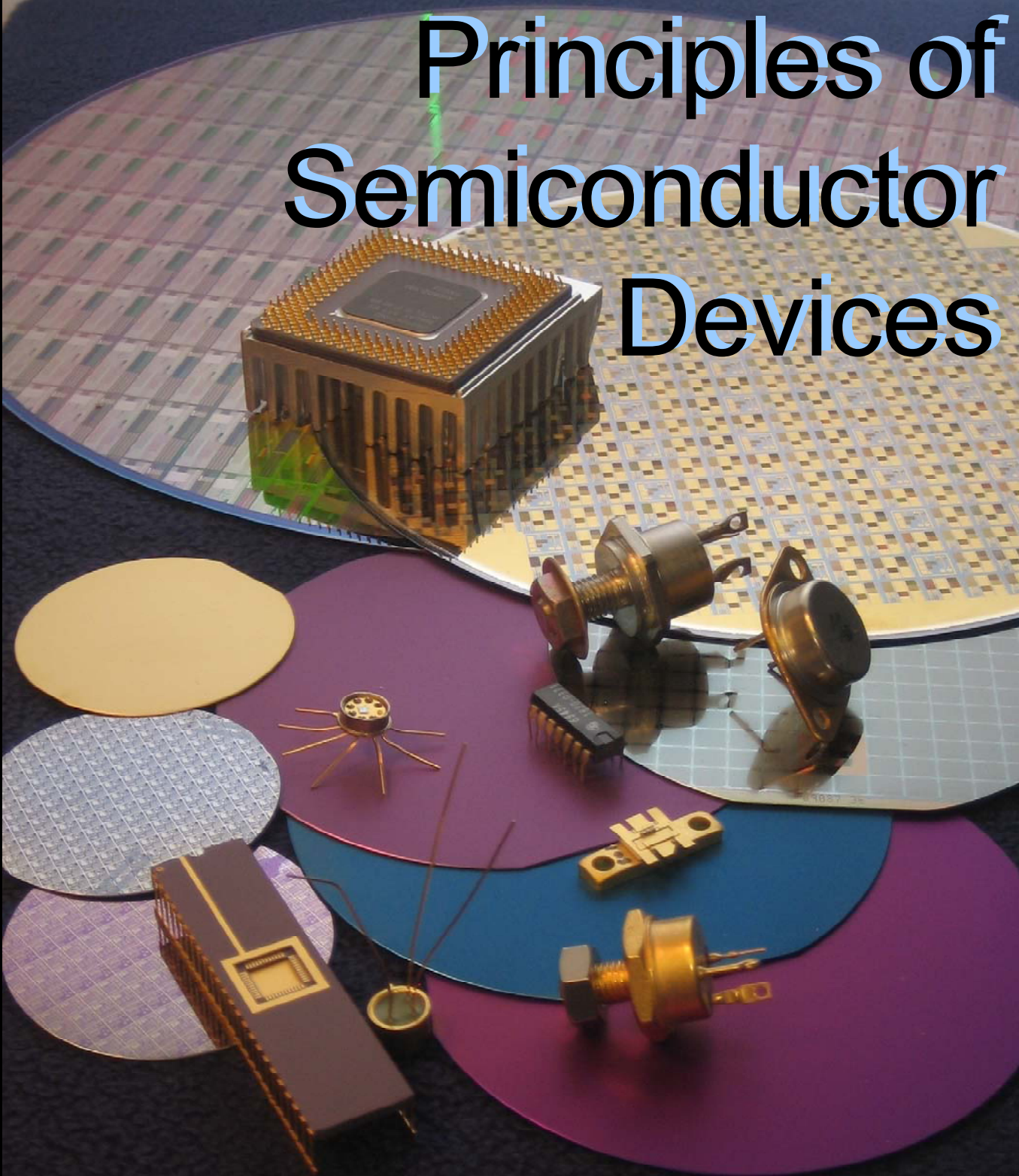


Principles of Semiconductor Devices

A collage of semiconductor devices. At the top is a large, circular silicon wafer with a grid of small, square dies. In the center, a large, square, gold-colored chip is mounted on a metal heat sink. Below this, several smaller, circular and square chips are shown, some with intricate patterns. To the right, there are several electronic components, including a diode, a resistor, and a small integrated circuit. The background is a dark, textured surface.


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Preface

This textbook aims to introduce the principles of semiconductor devices. While there are many good textbooks on the topic, I choose to create a web-based textbook, which benefits from navigation by mouse click for quick reference and can easily be complemented with spreadsheets and pdf print files. This web-based text has evolved from a series of hyperlinked pages, with concise descriptions of individual topics, into a complete textbook, containing both introductory material and advanced topics. The numerous requests for a hard copy have prompted me to create a book/CDROM combination, to handle the quantity of information and to preserve the interactive features of the web-based text.

This textbook was written as a junior level introduction to semiconductor devices. Chapter one provides a quick review of relevant physics and serves to provide the link between this course and the students' prior knowledge. This chapter can be skipped or covered section by section as needed, without loss of continuity. Chapter two develops the tools needed to analyze semiconductor devices. Chapter three and four are dedicated to two-terminal devices, metal-semiconductor junctions and p-n junctions. Chapter five covers the bipolar junction transistor. Chapter six and seven introduce Metal-Oxide-Semiconductor structures: the MOS capacitor and the MOS Field Effect Transistor. Most of this material can be covered in a one-semester course.

The CDROM contains the full text as well as several derivations, advanced topics including heterojunctions, a complete chapter on Optoelectronic devices and several additional appendices, all fully integrated into one larger text. The CDROM text is provided in a browser format, with numerous hyperlinks. It also provides access to the additional spreadsheets and pdf print files. All additional CDROM-only material is marked throughout the text with the  icon. Pdf print files are available so that students can independently create their own hard copy. Pdf print files are also provided for all examples, problem sets, review questions, equation sheets and all appendices.

The split between the material provided in the textbook and the CDROM-only material was designed to create a more readable, less intimidating junior level text with a clear focus on diodes and transistors. Long tedious derivations are typically only provided on the CDROM as are the Chapter on Optoelectronic Devices and the numerous related sections on quantum

structures and heterojunctions. Instructors are encouraged to use this additional material as they see fit, to broaden the scope of their course or to adjust the level of their class. The CDROM contains enough additional material for an introductory graduate level course with a focus on heterojunctions and/or optoelectronic devices.

This text has benefited from interactions with numerous undergraduate and graduate students at the University of Colorado in Boulder spanning over more than one decade. I am also grateful for the feedback I have received by email from those who browsed the web-based version. Finally, I like to thanks colleges and fellow authors, especially those who frequently asked me when this book would be published.

Bart Van Zeghbroeck

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