

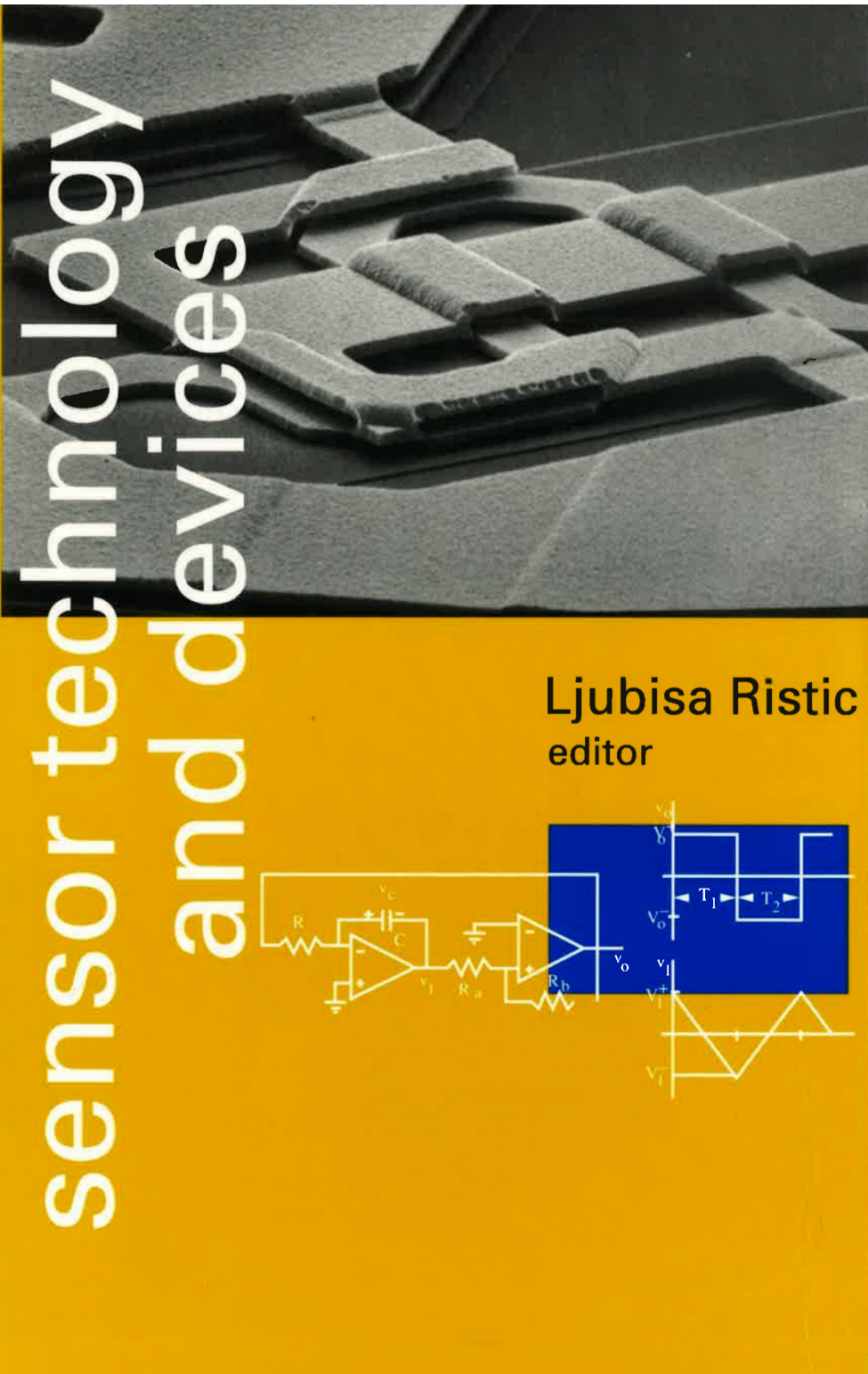
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Preface

In the last several years I have taught a sequence of graduate-level courses in solid-state sensors at the University of Alberta. During these endowments, I struggled to find a comprehensive text book on sensor technology. My graduate students, who had to deal with a number of technical papers, wondered why there was no unified text book on this subject. The most probable reason is the novelty of the field. Interest in microsensors has grown dramatically only in the last decade because of the wide range of applications for them. At the same time, sensor technology has become one of the most rapidly changing fields today. Another reason stems from the very nature of sensor devices; solid-state sensors are so diversified that this area can truly be described as a “multidisciplinary field.” Thus, it is difficult for any single person to follow up on all the activity in this field. These are the reasons that I have asked some of my colleagues, experts on sensors, to join me in writing on relevant and specific topics that could be combined into an integral book. The result is this new book on sensor technology and devices.

All of the fourteen authors are intimately familiar with the field, and they bring an enormous amount of personal experience to this book. Without them, writing this book would have been impossible, and I am truly indebted to them. I would also like to acknowledge many other people who have contributed directly or indirectly to this book. My special thanks go to previous graduate students T. Smy, M. T. Doan, M. Paranjape, M. Parameswaran, K. Chau, A. C. Dhaded, T. Q. Troung, T. R. Sych, A. Nathan, and D. R. Briglio, whose presence in the Sensor Group at the University of Alberta made life so enjoyable. Their excitement about new ideas and their healthy skepticism strongly motivated me to endure as a researcher and pedagogue. I also express my appreciation to my colleagues, Drs. W. Allegretto, H. P. Baltes, M. Brett, I. Filanovsky, D. J. Harrison, and W. B. Joerg, professors and cofounders of the Sensor and Material Group at the University of Alberta, for many inspiring discussions. I benefited greatly from their wisdom and sincerity. My special thanks go also to Dr. R. Popovic for many open discussions on magnetic

field sensors as well as sensors in general. Finally, I thank R. C. Wells for suggestions on the wafer-bonding material.

I am also grateful to Motorola for creating a stimulating environment for development of sensor technology and sensor products. My current work at Motorola is one of my most enjoyable professional experiences. Motorola's constant support of me and my colleagues made this book possible.

The book is intended for practicing engineers, scientists, and advanced graduate students who seek a broader understanding on important subjects in the sensor field. Many of the presented topics are considered crucial in today's sensor technology. The topics in the book are arranged in logical order in the form of five sections. Besides the introduction to a sensor world, four other important areas are covered: modeling, sensor technology, devices and applications, and specific circuits for sensors. Each chapter is self-contained, and readers interested in a particular subject will be able to find the needed information easily.

The first chapter provides introductory information on sensors and sensing systems. The second chapter describes basic models and existing problems in the simulation of sensors and actuators. Chapters 3 through 6 cover the key aspects of modern sensor technology; bulk and surface micromachining, direct wafer bonding, and sensor packaging. Chapters 7 through 11 deal with the device theory of different sensors and their applications. Examples include magnetic field sensors, thermal sensors, photosensors, CCDs, and sensors for automotive applications. Finally, Chapters 12 and 13 describe specific circuits for sensor applications.

It is my sincere wish that the combination of the variety of topics and depth offered in this book will make it a valuable reference as well as a useful teaching text.

Lj. Ristic
Phoenix, Arizona
September 1993