ELECTRONIC COMPONENTS, PACKAGING AND PRODUCTION

by

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PREFACE

The present book is primarily meant for university education in introductory electronic packaging technology. We attempt to give an overview that encompasses aspects of material technology, metallurgy, chemistry, physical properties, and mechanical properties. An understanding of the interplay of all these basic fields is necessary for choosing and using the available technologies in a best possible way in combination with a good design to get a product with the right quality. We describe component technologies, basic processing methods, design guidelines, the production of printed circuit boards and the common hybrid technologies, including multichip modules.

The book is primarily based on a course developed at the University of Oslo during the last 6 years. Parts of it have also been used at Norwegian Institute of Technology, Trondheim, Møre og Romsdal ingeniørhøgskole, Ålesund, Narvik ingeniørhøgskole, Narvik and the Defence Research Establishment, Kjeller, and a number of seminars.

When we started the course, there were practically no textbooks on the topic of packaging technology. Now there is an abundance of very good books, review articles, conference proceedings. Still we hope this presentation is found worthwhile, attempting to give a view of a broader area than what is common.

The course at University of Oslo has included some 40 lectures, starting with a video, made especially for the course, introducing the topic. Demonstrations of "hardware", i.e. numerous examples of products that illustrate the different technologies discussed, have been important as part of the lectures, bringing the principles "down to earth".

Three "projects" or lab experiments were part of the course:

- Design and manufacturing of a surface mounted printed circuit board
- Thermal simulation of a circuit (PCB) by a thermal CAD system
- High frequency calculations of characteristic impedance and losses.

Finally, 3 - 5 visits were made, to electronic companies producing advanced electronics with various types of modern technology (highly automated surface mounting, printed wiring board manufacturing, thick film and thin film hybrid circuits, monolithic silicon circuits), with generous attention from the key technical and managerial people in the companies.

We believe this combination of classroom teaching, lab work and a look inside the practical reality in industry is a key for the students to understand the important issues in packaging technology. They will not be skilled designers after this introduction, but hopefully it will be easier for their later employer to make them good designers or production specialists.

Thanks are due to the following people, among many others:

Markus Bayegan, Are Bjørneklett, Jan Brun Johansen, David Wormald, Henrik Jakobsen, Thor-Erik Hansen, Benjamin Baraas, Helge Osvold, Ernest Skontorp, Per Ohlckers, Helge Kristiansen, Agnar Grødal, Kjell Kristiansen, Torstein Gleditsch, Jørgen Andersen, Øystein Ra, Ole Flesaker.

Their help is gratefully acknowledged, for good discussions, reading parts of the manuscript, providing suggestions for contents, running labs, donations of illustrative products even before they were on the market, etc.

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Oslo, September 1993

Leif Halbo

The most important change in this revised edition from 1995 is an additional chapter on micromachined devices. (Chapter 9) The other chapters have only minor changes. Figures and tables are integrated in the text, and page references are included in the table of contents. These and other modifications should improve readability. To keep in pace with new developments in electronic packaging technology, we recommend that the book is supplemented with an appropriate choice of recent published literature in emerging fields. For example, multichip technology and ball grid array technology are emerging fields with new developments frequently published these days.

This textbook is now in regular use at several places. Examples are: University of Oslo, Norwegian Institute of Technology in Trondheim, Oslo College, Faculty of Engineering, Royal Institute of Technology in Stockholm and Ericsson Components in Sweden.

The course at the University of Oslo has a web site:

http://www.fys.uio.no/kurs/fys317

Please refer to this page for updates, downloads and other information.

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Oslo, December 1995

Leif Halbo Per Ohlckers

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