ELECTRONIC COMPONENTS, PACKAGING AND PRODUCTION

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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, More 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.

Please contact Per Ohlckers by e-mail for ordering of the book or other additional information or communication:

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Oslo, December 1995

Leif Halbo Per Ohlckers
# TABLE OF CONTENTS

## Chapter 1: INTRODUCTION

1.1 ELECTRONIC PRODUCTS, TECHNOLOGIES AND PACKAGING

1.2 PHASES IN THE DEVELOPMENT OF A PRODUCT

1.3 LEVELS OF INTERCONNECTION

REFERENCES

## Chapter 2: TECHNOLOGIES FOR ELECTRONICS - OVERVIEW

2.1 INTRODUCTION

2.2 HOLE MOUNTING TECHNOLOGY ON PRINTED WIRING BOARDS

2.3 SURFACE MOUNT TECHNOLOGY

2.4 CHIP ON BOARD

2.5 THICK FILM HYBRID TECHNOLOGY
   - 2.5.1 High temperature thick film hybrid technology
   - 2.5.2 Polymer thick film hybrid technology

2.6 THIN FILM HYBRID TECHNOLOGY

2.7 MULTICHIIP MODULES
   - 2.7.1 Multilayer ceramic modules
   - 2.7.2 Multilayer thin film modules, silicon as a substrate
   - 2.7.3 Wafer scale integration
   - 2.7.4 Silicon sensor technology

2.8 APPLICATION SPECIFIC INTEGRATED CIRCUITS
   - 2.8.1 PROM, PAL, GAL, field programmable gate arrays
   - 2.8.2 Custom design lcs

2.9 OPTOELECTRONICS PACKAGING TECHNOLOGY

2.10 TECHNOLOGY TRENDS

2.11 SELECTING THE OPTIMAL TECHNOLOGY

2.12 FUTURE TRENDS FOR USERS AND DESIGNERS OF ELECTRONIC SYSTEMS

REFERENCES
Chapter 3: MATERIALS AND BASIC PROCESSES

3.1 INTRODUCTION

MATERIALS

3.2 INORGANIC MATERIALS
  3.2.1 Metals
  3.2.2 Semiconductors
  3.2.3 Inorganic insulators: ceramics and glasses

3.3 ORGANIC MATERIALS, PLASTICS
  3.3.1 Basic composition
  3.3.2 The polymerization process
  3.3.3 Electrical properties
  3.3.4 Mechanical, physical and chemical properties
  3.3.5 Glass transition temperature
  3.3.6 Specific materials

BASIC PROCESSES

3.4 TRANSFER OF PATTERNS BY PHOTOLITHOGRAPHY

3.5 SCREEN PRINTING AND STENCIL PRINTING

3.6 ETCHING
  3.6.1 Wet, chemical etching
  3.6.2 Dry etching

3.7 PLATING
  3.7.1 Electrolytic plating
  3.7.2 Chemical plating

3.8 VACUUM DEPOSITION AND SPUTTERING
  3.8.1 Vacuum deposition
  3.8.2 Sputtering

METHODS FOR ELECTRICAL AND MECHANICAL CONTACT

3.9 GENERAL

3.10 SOLDERING
  3.10.1 Wetting
  3.10.2 Solder metal
  3.10.3 Flux and cleaning

3.11 GLUING

3.12 MOUNTING OF SEMICONDUCTOR CHIPS: DIE BONDING
Chapter 4: COMPONENTS FOR ELECTRONIC SYSTEMS 4.1

4.1 INTRODUCTION 4.1

4.2 RESISTORS 4.1
4.2.1 Hole mounted resistors 4.1
4.2.2 Surface mounted resistors 4.2

4.3 CAPACITORS 4.3
4.3.1 Electrical model 4.4
4.3.2 The main types of capacitors 4.5
4.3.3 Multilayer ceramic capacitors 4.6
4.3.4 Electrolytic capacitors 4.10

4.4 DIODES AND TRANSISTORS 4.12

4.5 MONOLITHIC INTEGRATED CIRCUITS 4.15
4.5.1 Plastic or ceramic packaging 4.15
4.5.2 Standard packages for hole mounted ICs 4.16
4.5.3 Standard packages for SMD 4.18
4.5.4 TapePak and moulded carrier ring packages 4.24
4.5.5 High performance packages 4.25
4.5.6 Future trends 4.28

4.6 VARIOUS COMPONENTS 4.29

4.7 TERMINAL METALLIZATION, SOLDERABILITY AND RELIABILITY 4.29
4.7.1 Passive components 4.29
4.7.2 Integrated circuits 4.30

4.8 ELECTROSTATIC DISCHARGES - COMPONENT DAMAGE AND PRECAUTIONS 4.31
Chapter 5: PRINTED WIRING BOARD

5.1 INTRODUCTION

5.2 PRINTED WIRING BOARDS, GENERAL

5.3 GENERATION OF DESIGN DATA, PHOTO- OR LASER PLOTTING

5.4 FABRICATION OF GLASS/EPOXY WIRING BOARD LAMINATES

5.5 SINGLE SIDED WIRING BOARDS

5.6 DOUBLE SIDED, THROUGH HOLED PLATED BOARDS
   5.6.1 Process
   5.6.2 Choice of surface metallization and solder resist

5.7 MULTILAYER PRINTED WIRING BOARDS

5.8 FINE LINE WIRING BOARDS, ADDITIVE PROCESS
   5.8.1 Limitations in dimension control due to etching
   5.8.2 Fine line wiring board
   5.8.3 Additive process

5.9 METAL CORE BOARDS

5.10 NEW MATERIALS FOR DEMANDING WIRING BOARDS

5.11 WIRING BOARDS FOR HIGH FREQUENCIES
   5.11.1 Demands on high frequency circuit boards
   5.11.2 Important properties and parameters, new materials
   5.11.3 Commercial products

5.12 FLEXIBLE PRINTED WIRING BOARDS
   5.12.1 Regular flexible boards
   5.12.2 Membrane switch panels

5.13 MOULDED BOARDS IN THREE DIMENSIONS

REFERENCES
CHAPTER 6: PCB DESIGN

6.1 INTRODUCTION

6.2 GENERAL GUIDELINES
  6.2.1 Right quality
  6.2.2 Design for producibility
  6.2.3 Electromagnetic compatibility

6.3 HOLE AND SURFACE MOUNT PCBs
  6.3.1 Minimum dimensions
  6.3.2 Different PCBs and limitations on components and solder processes
  6.3.3 Some general rules
  6.3.4 Dimensions of solder lands
  6.3.5 Design of printing screens for solder paste

6.4 DESIGN FOR TESTABILITY
  6.4.1 Functional test
  6.4.2 In-circuit test
  6.4.3 Design for improved testability
  6.4.4 Guidelines

6.5 MATERIALS CONSIDERATIONS FOR THERMAL COMPATIBILITY

6.6 THERMAL DESIGN
  6.6.1 Why thermal design?
  6.6.2 Heat transport
  6.6.3 Thermal modelling and material properties
  6.6.4 TCE design of metal core boards
  6.6.5 Convection and improved cooling
  6.6.6 Thermal simulation and measurement
  6.6.7 Selection of cooling methods

6.7 HIGH FREQUENCY DESIGN

6.8 DESIGN OF FLEXIBLE PRINTED CIRCUITS

6.9 DESIGN OF MEMBRANE SWITCH PANELS

6.10 SYSTEM LEVEL DESIGN

REFERENCES
Chapter 7: PRODUCTION OF PRINTED CIRCUIT BOARDS

7.1 INTRODUCTION

7.2 PRODUCTION OF HOLE MOUNTED PCBs

7.2.1 Component mounting
7.2.2 Wave soldering
7.2.3 Cleaning
7.2.4 Repair
7.2.5 ESD precautions

7.3 PRODUCTION OF SURFACE MOUNTED PCBs

7.3.1 Glueing and wave soldering of SMD components
7.3.2 Solder paste deposition and reflow soldering
7.3.3 Component mounting
7.3.4 Repair
7.3.5 Solder faults

7.4 ROBOT MOUNTING

7.4.1 The components of the robot system
7.4.2 Programming
7.4.3 Auxillary equipment in the system
7.4.4 Areas of application for robot mounting

7.5 SEQUENCE IN THE PROCESS OF MIXED SMD/HOLE MOUNTED PCB’s

7.6 TESTING OF PCB’s

7.6.1 Component testing
7.6.2 Mechanical parts for the testing
7.6.3 "Zero defect" philosophy

REFERENCES

Chapter 8:
HYBRID TECHNOLOGY AND MULTICHIP MODULES

8.1 INTRODUCTION

8.2 THICK FILM HYBRID TECHNOLOGY

8.2.1 Substrates
8.2.2 Materials for conductors, resistors, dielectrics
8.2.3 Production process
8.2.4 Component mounting, encapsulation
8.2.5 Design rules
Chapter 9: MICRO STRUCTURE TECHNOLOGY AND MICROMACHINED DEVICES

ABSTRACT

9.1 INTRODUCTION AND MOTIVATION: DEFINITIONS, AN EXAMPLE OF A MICROMACHINED DEVICES AND THE MAIN DRIVING FORCES

9.2 KEY FACTORS TO SUCCESSFUL INDUSTRIAL INNOVATION OF MICROMACHINED DEVICES

9.3 BATCH PROCESSES ADAPTED FROM MICROELECTRONICS/IC TECHNOLOGY WITH NO OR MINOR MODIFICATIONS

9.4 BATCH PROCESSES MODIFIED FROM MICROELECTRONICS/IC TECHNOLOGY PROCESSES

9.5 BATCH PROCESSES ADAPTED OR MODIFIED FROM OTHER TECHNOLOGIES THAN MICROELECTRONICS/IC TECHNOLOGY

9.6 BATCH PROCESSES MAINLY DEVELOPED FOR MICROMACHINED DEVICES