Journal of Electronic Packaging

Foreword

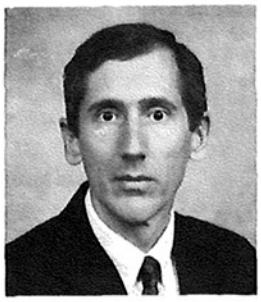
With the advance of very large scale integration technologies, thousands to tens of thousands of devices can be fabricated on a silicon chip. At the same time, demands to further reduce packaging signal delay and increase packaging density between communicating circuits have led to the use of very high power dissipation single-chip modules and multi-chip modules. The result of these developments has been a rapid growth in module level heat flux within the personal, workstation, midrange, mainframe, and super computers. Thus, thermal (temperature, stress, and strain) management is a vital aspect of microelectronics packaging designs and analyses.

In recognition of the growing importance of thermal and mechanical response in electronics packaging systems, The American Society of Mechanical Engineers (ASME) Electrical and Electronic Packaging Division (EEPD) sponsored four symposia at the 1992 ASME Winter Annual Meeting (WAM), November 8–13, in Anaheim, CA. These symposia are on: (1) Computer Aided Design in Electronic Packaging; (2) Mechanics of Surface Mount Assemblies; (3) Manufacturing Aspects in Electronic Packaging: CAE/CAD/CAM and testing; and (4) Structural Analysis: Thermal-Mechanical Modeling, Mechanical Behavior of Materials, and Reliability. Scientists and engineers converged together to share their problems, findings, and solutions in applying the principles of mechanics to electronics packaging and interconnections.

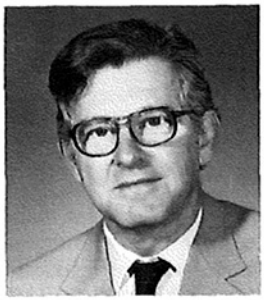
There were five technical sessions and 24 papers presented at the **Symposium on Mechanics of Surface Mount Assemblies**. Seventeen papers have been chosen for the ASME Transactions, JOURNAL OF ELECTRONICS PACKAGING. This special volume of the Transactions contains 13 peer-reviewed papers. The other four papers are not in time for this publication because of the review/revision processes. They may be published in a later issue.

The papers included in this volume represent a cross section of the topics of the symposium and reflect the state of the art in mechanical, thermal, and electrical design, modeling, analysis, and testing of surface mount systems. The collection begins with predicting the equilibrium shapes of solder joints by finite element methods. The next five papers deal with the fundamental aspects of bulk solders and surface mount component/connector solder joints. These include: constitutive equations, thermal cycling, isothermal cycling, fatigue crack growth, creep and stress relaxation, cycling frequency, wave shape, and computer simulation. The next two papers present the state-of-the-art modeling results for surface mount assemblies subjected to vibrations. The last four papers deal with the design and analysis of electronics components and printed circuit boards. These include: predicting the electrical properties of plain-weave fabric reinforced composites, a new chip bonding technique using gold-based alloys formed by multilayers of gold and a low-melting alloy, and thermal stresses in an inclined free edge of a laminate structure and in a cylindrical plate due to polynomial radial temperature distributions.

The multiplicity of disciplines involved in designing, analyzing, testing, and solving the problems associated with mechanical, thermal, and electrical characterization of electronics



Donald Barker



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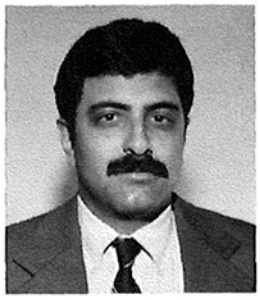

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packaging and interconnection is evident in the papers presented in the volume. The EEP Division, and more generally ASME, provide a common meeting ground for mutual education and enlightenment. It is hoped that the present collection of papers will stimulate the reader to the challenges and opportunities presented by mechanical and thermal phenomena in electronics packaging. We thank the attendees, reviewers, session chairs, and especially the authors for their suggestions, support, contributions, and cooperation in preparing this issue. It is through their efforts that our JOURNAL OF ELECTRONIC PACKAGING remains a dynamic and interesting publication. Please join us this year at the ASME WAM, November 28–December 3, 1993, in New Orleans, LA, USA. More than 80 papers in applying the principles of mechanics to electronics packaging systems will be presented.

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