

Preface

The widespread growth and acceptance of microsystem technology in diverse applications from consumer electronics to space and military hinges on products achieving a suitable balance of quality and cost. Quality essentially implies that a product performs as specified in the datasheet, which essentially means that it performs reliably. The fundamental approach to MEMS device reliability employs some of the same basic concepts and methodologies established in high volume automotive and IC manufacturing; including FMEA (failure mode and effects analysis – root cause), DfM (Design for Manufacturability), DfR (design-for-reliability) and lifetime prediction. A major challenge in MEMS is the sheer diversity of potential applications, novel materials and processes, unique sensing and actuation principles, and manufacturing techniques, and hence the focus of this book is on reliability techniques and methodologies as applied to MEMS devices.

MEMS Reliability, especially the study of reliability physics, is a vast area that is still in its infancy in academic coursework. University research, government laboratory research, and consortia studies have been and continue to contribute invaluable advances in MEMS reliability physics. However, working in industry and mass producing hundreds of millions of reliable MEMS devices, some of which are intended for safety critical applications, provides a very different perspective. The authors of this textbook all have multiple years of academic and industry experience in MEMS design, fabrication, production, and reliability, and each have their own areas of expertise that have been brought together to produce a book that is scientific in its approach and coherent in its structure, with topics from all worlds of MEMS reliability study as well as case studies of successful product reliability development. Our hope is that this text will serve as a useful guide for setting up a reliability programs for real-world products and to spur further interest in solving some of the fundamentally challenging problems in the field.

This is not an edited book, and is therefore unique in MEMS Reliability texts because the book can be used by academia in preparing the student for industry work, and by industry engineers as a reference guide for the reliable manufacture of MEMS in any volume. Bringing together reliability statistics, acceleration testing, manufacturing failure modes, design for reliability, in-use physics of failure,

root cause analysis, failure analysis, testing methods for MEMS, qualifications of MEMS, and continuous improvement methodologies was key to presenting this challenging subject in a synergistic manner.

Wilmington, Massachusetts
Wilmington, Massachusetts
Neuchatel, Switzerland

Allyson L. Hartzell
Mark G. da Silva
Herbert R. Shea



<http://www.springer.com/978-1-4419-6017-7>

MEMS Reliability

Hartzell, A.L.; da Silva, M.G.; Shea, H.

2011, XIII, 291 p., Hardcover

ISBN: 978-1-4419-6017-7