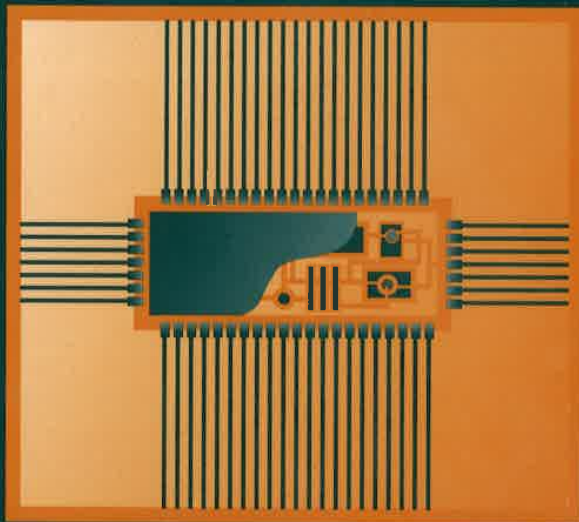

PLASTIC- ENCAPSULATED MICROELECTRONICS



Materials,
Processes,
Quality,
Reliability, and
Applications

Edited by

Michael G. Pecht
Luu T. Nguyen
Edward B. Hakim

The m
encap
techno
materi
reliabi
devel
ceived
cases,
wide r
cations
to be
tive re
now,
detaile
develop
duction
time br
fession
databas

For the
here is a
of the
assemb
most tin
vides pl
scientific
and reli
manufac
special
ment-spe
important

- Encap
tion, st
- Fabric
depth
can oc
produc
- Electro
using
age of
induced
ing asse
- Failure
modes
- Failure
tive str
each typ
- The pro
ing tech
mance a
the defec
- Current
techniqu
simulatin

Plastic-Encap
an indispen
ers and pra
trical engine
ics, aerosp
tries, in s
defense ind

This text is printed on acid-free paper.

Copyright © 1995 by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Section 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If legal advice or other expert assistance is required, the services of a competent professional person should be sought.

Library of Congress Cataloging-in-Publication Data:

Pecht, Michael.

Plastic encapsulated microelectronics: materials, processes, quality, reliability, and applications / Michael G. Pecht, Luu T. Nguyen, Edward B. Hakim.

p. cm.

Includes index.

ISBN 0-471-30625-8 (cloth ; alk. paper)

1. Microelectronic packaging--Materials. 2. Microencapsulation. 3. Plastics in packaging. I. Nguyen, Luu T. II. Hakim, Edward B. III. Title.

TK7874.P428 1995

621.381'046--dc20

94-46528

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

to th

temperature; i.e., the quantity of heat required to raise the temperature of 1 g of a substance by 1°C.

STITCH BOND: A bond in which a capillary tube is used for feeding the wire and forming the bond sequentially in a stitch pattern. The wire is not formed into a ball prior to bonding.

STORAGE TEMPERATURE: The temperature at which a device, without any power applied, is stored.

STRESS: Caused by thermal mismatch between the various materials of construction in the device. In a plastic-encapsulated device, part of the stress is also due to the curing of the epoxy polymer network which shrinks during the polymerization. Also often referred to as packaging stress, shrinkage stress, molding stress, or encapsulating stress.

STRESS RELAXATION: The time-dependent decrease in stress in a solid under given constraint conditions.

SUBSTRATE: A supporting platform for an active or passive electrical or electronic component.

SURFACE-MOUNT TECHNOLOGY (SMT): The general category of expertise for mounting surface mount components onto substrates.

SURFACE RESISTIVITY: The resistance to a current flow along the surface of a material.

TAPE AUTOMATED BONDING (TAB): The utilization of a metal tape material as a support and carrier of a microelectronic component in a gang bonding process.

TEMPERATURE CYCLING: An environmental test in which the specimen is subjected to several changes from one temperature to another over a period of time.

TENSILE STRENGTH: The pulling stress that has to be applied to a material to break it, usually measured in Pa.

THERMAL CONDUCTIVITY: The amount of heat per unit time per unit area that can be conducted through a unit thickness of a material.

THERMAL EXPANSION: The expansion of a material when subjected to temperature change (usually a temperature increase).

THERMAL GRADIENT: The plot of temperature change across the surface or the bulk thickness of a material being heated.

THERMAL MISMATCH: Difference of thermal coefficients of expansion of materials that are bonded together.

GLO

THE
and cTHE
tempeTHE
materTHE
shape
plasticTHE
meansTHRO
are inc
protrusTRAN
holdingTRAN
amountULTRA
join twoUSEFU
to be saVAPOR
The soleVIA: A
made coVIA HO
conductivVISCOS
to a shea
Viscosity