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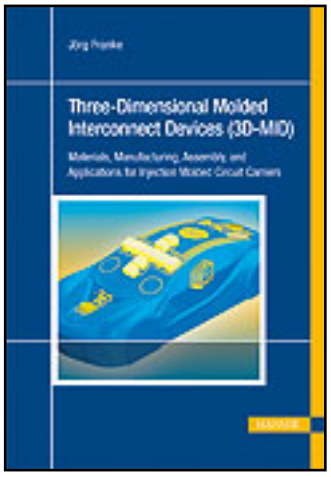

Vorwort

Three-Dimensional Molded Interconnect Devices (3D-MID)

Materials, Manufacturing, Assembly and Applications for Injection Molded Circuit Carriers

Herausgegeben von Jörg Franke

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Preface

A molded interconnect device (MID) is an injection-molded thermoplastic part with structured circuit traces. This definition still applies, although the term 3D-MID has also become common. An extension of the meaning to mechatronic integrated device, moreover, allows for the fact that thermoplastics are not the only materials used, and MID are not necessarily produced by injection molding.

There have recently been major advances in MID development, particularly with regard to substrate materials, the methods of producing the interconnect devices with structuring and metallization, and the various connection technologies. Potential areas of application have therefore expanded and impressive advances have been made in viable optical, fluidic, mechanical, electrical, and thermal functionalities and in amalgamating MID with other technologies. The multiplicity of fascinating applications outlined in the MID Survey 2011 illustrated many of these new fields. As in 2003 and 2006, the 2011 survey was commissioned by Germany's Forschungsvereinigung 3-D MID e.V. With its membership now numbering almost 100, the Research Association Molded Interconnect Devices (3-D MID) is an active network bringing together manufacturers, suppliers, users, and research institutes in Germany and elsewhere. The close link between the industrial and scientific communities and intensive cooperation in innumerable projects afforded an excellent basis for the development of this reference volume for MID technology.

This book is not a revision of the manual originally entitled "3D-MID-Technologie: Räumliche Elektronische Baugruppen; Herstellungsverfahren, Gebrauchsanforderungen, Materialkennwerte" (3D-MID Technology: Molded Interconnect Devices, Manufacturing Processes, Requirements for Use, Material Characteristics), published in 2004. The main fields have changed so much since then and so many new areas of interest have arisen as to render a revision of that kind unnecessary. This book aims at presenting the state of the art in 3D-MID technology along the entire process chain. The individual chapters deal with MID-specific terms of reference, merely touching on the topic of guidelines and standards for conventional technologies.

This book, therefore, addresses experts and newcomers to the field of MID, by providing a comprehensive overview of the very latest developments in research activities. For developers and innovation managers it will be an introduction to the subject matter and a source of inspiration.

In-depth knowledge and determined utilization of the integration potential afforded by MID are crucial when it comes to implementing existing ideas in successful MID projects. Consequently, readers will find inspiration in a comprehensive overview of the strengths of MID technology and numerous case studies. Despite many exciting series-production applications, hurdles remain in the form of the as yet unadapted development and the prototyping of 3D-MID. Implementation as a follow-on from production-oriented and function-optimized conceptualization calls for know-how and experience along the entire process chain. The major methods, software tools, substrate materials, and processes for the manufacture of interconnect devices and application of the conductor traces are described in detail in the individual chapters, which also include discussions of the available systems.

Despite the dynamic of recent years, by no means can technological development be considered to have reached its conclusion. Ongoing research is pushing further miniaturization and expansion across the areas of application, for example by reduction in structure size, enhanced qualification of thermoset materials for the LDS process, and productive print technologies for additive conductor metallization, or the manufacture of thermally conductive materials for LED applications.

I would like to take this opportunity to extend my sincere thanks to my assistants Dr.-Ing. Christian Goth and Dipl.-Wirtsch.-Ing. (FH) Thomas Kuhn, who displayed tremendous commitment and strict management in their organization of the book. My thanks also go to all those who submitted contributions, and to the consulting experts who gave the text its final polish. The tremendous support that was forthcoming from industry, particularly from the members of the Research Association, affords this volume the practical relevance it requires. The English-language version of this book is intended as a vehicle to help promote MID technology in the international community. My thanks to Dr. Ingo Kriebitzsch, BMW AG, for organizing the translation.

It is my hope that everyone who reads this book will extract from it new incentives and new ideas for the future development of mechatronic modules in MID technology.

Erlangen, April 2013

Jörg Franke