

**2023 24th European
Microelectronics and Packaging
Conference & Exhibition
(EMPC 2023)**

**Cambridge, United Kingdom
11-14 September 2023**



**IEEE Catalog Number: CFP2354H-POD
ISBN: 978-1-6654-8736-8**

**Copyright © 2023, IMAPS-Europe
All Rights Reserved**

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2354H-POD
ISBN (Print-On-Demand):	978-1-6654-8736-8
ISBN (Online):	978-0-9568086-9-1

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

1A: SUBSTRATES: LTCC AND HTCC

HIGH FREQUENCY BANDWIDTH TRANSITION FOR HTCC HERMETIC PACKAGES.....1

Emad Elrifai
EGIDE, France

APPLICATION OF REACTIVE BONDING METHODS ON LTCC SUBSTRATES.....4

Erik Wiss¹, Alexander Schulz², Adam Yuile¹, Jens Müller², Steffen Wiese¹
¹Saarland University, Chair of Microintegration and Reliability,
Germany; ²TU Ilmenau, Electronics Technology Group, Germany

LTCC-BASED CERAMIC SUBSTRATES FOR IDENTIFICATION OF TRUSTWORTHY ELECTRONICS.....10

Uwe Krieger¹, Annett Schroeter¹, Franz Bechtold¹, Gunter Hagen², Adrian Goldberg³
¹VIA electronic GmbH, Germany; ²KMS Technology Center GmbH, Germany; ³Fraunhofer
Institute for Ceramic Technologies and Systems IKTS, Germany

1B: EMBEDDING

CONCEPTS FOR REALIZING HIGH-VOLTAGE POWER MODULES BY EMBEDDING OF SIC SEMICONDUCTORS.....13

Lars Böttcher, Andreas Ostmann, Thomas Löher, Manuel Seckel
Fraunhofer IZM, Germany

CERAMIC EMBEDDING OF SIC-SEMICONDUCTORS USING COFIRING TECHNOLOGY.....19

Steffen Ziesche¹, Jobin Varghese¹, Kathrin Reinhardt¹,
Birgit Manhica¹, Andreas Schletz²

¹Fraunhofer IKTS, Germany; ²Fraunhofer IISB, Germany

CHARACTERIZATION OF EMBEDDED AND THINNED RF CHIPS.....24

Ran Yin^{1,2}, Helmuth P. E. Morath^{1,3}, Christian Hoyer³, Krzysztof Nieweglowski^{1,2},
Karsten Meier², Karlheinz Bock^{1,2}

¹Centre for Tactile Internet with Human-in-the-Loop (CeTI), Germany;

²Institute of Electronic Packaging Technology, TU Dresden, Germany;

³Chair of Circuit Design and Network Theory, TU Dresden, Germany

2A: INTERCONNECT MATERIALS I

DEPOSITION OF FINE-PITCH INDIUM BUMPS ON SINGLE DIE.....30

Andreas Schneider¹, Navid Ghorbanian¹, David Burt², James Hollingham¹, Paul Booker¹, Toby G. Brookes¹, John D. Lipp¹,
Marcus J. French¹

¹STFC-RAL, United Kingdom; ²Kelvin Nanotechnology Ltd., United Kingdom

SILVER BONDING WIRE – AN ALTERNATIVE FOR MECHANICAL SENSITIVE CHIP CONFIGURATIONS IN AUTOMOTIVE ELECTRONICS PACKAGING.....35

Robert Klengel¹, Sandy Klengel¹, Noritoshi Araki², Motoki Eto², Teruo Haibara²,
Takashi Yamada², Jochen Feldmann³, Ralph Binner³, Henk Peters³, Achim Scheer³,
Vincent Chee³

¹Fraunhofer IMWS, Germany; ²Nippon Micrometal Corporation, Japan; ³ELMOS Semiconductor SE, Germany

COPPER PUMPING ANALYSIS FOR CU/SIO₂ HYBRID BONDING USING IN-SITU SPM IMAGING.....41

Ali Roshanghias¹, Jaroslaw Kaczynski¹, Ude Hangen²

¹Silicon Austria Labs GmbH, Austria; ²Bruker Nano GmbH, Germany

UNDERSTANDING THE CONTACT RESISTANCE IN AN ACF BONDING.....45

Helge Kristiansen¹, Knut Eilif Aasmundtveit², Giang Nghiem²,
Molly Bazilchuk³

¹Conpart AS, Norway; ²University of South-Eastern Norway, Norway; ³Ducky AS, Norway

2B: MEMS/SENSORS

MEMS MIRROR IN HERMETIC PACKAGE FOR ENHANCED PERFORMANCES.....50

Luca Maggi¹, Marco Del Sarto¹, Amedeo Maierna¹, Mark Shaw¹, Roberto Carminati¹, Gianluca Mendicino¹, Davide Rotta², Marco Chiesa², Aina Serrano², Antonella Bogoni³

¹STMicroelectronics, Italy; ²CamGraPhIC, Italy;

³Sant'Anna School of Advanced Studies, Italy

INNOVATIVE SILICON-CERAMIC (SICER) TECHNOLOGY FOR HIGH-STRENGTH PRESSURE SENSOR APPLICATION USING DIFFERENT MANUFACTURING METHODS.....55

Cathleen Kleinholz¹, Michael Fischer¹, Nam Gutzeit¹, Andrea Cyriax², Michael Hintz², Thomas Ortlepp², Jens Müller¹

¹Technische Universität Ilmenau, Germany;

²CiS Forschungsinstitut für Mikrosensorik GmbH, Germany

FROM MEMS STRIP TO MEMS UNIT: A COMPREHENSIVE SIMULATION APPROACH TO WARPAGE.....61

Andrea Ratti¹, Daniele Simoncini¹, Annbel Adolfo², Marco Del Sarto¹, Patrick Fedel¹, Alex Gritti¹, Luca Maggi¹, Teresa Napolitano¹, Mark Andrew Shaw¹, Jefferson Talledo²

¹STMicroelectronics, Italy; ²STMicroelectronics, Philippines

GAS PERMEABLE PROTECTION CAPS FOR WAFER LEVEL CHIP SCALE PACKAGING (WLCSP) OF MEMS ENVIRONMENTAL SENSORS.....67

Ole Behrmann, Thomas Lisee, Björn Gojdka
Fraunhofer ISIT, Germany

3A: SUBSTRATES – THICK FILM AND CU INTERCONNECTS

ADDITIVE METALLIZATION OF ALUMINA WITH COPPER-TITANIUM POWDER BLENDS FOR POWER ELECTRONIC APPLICATIONS.....71

Christoph Hecht¹,

Eric Schadow¹, Mario Sprenger¹, Felix Häußler¹, Thomas Stoll², Jörg Franke¹

¹Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg, Germany;

²TUM School of Engineering and Design, Munich, Germany

NEGATIVE-TONE PHOTO-DEFINABLE POLYIMIDE WITH HIGH THERMAL STABILITY AND THICK FILM PROCESSABILITY.....77

Hitoshi Araki, Takayuki Kaneki, Yu Shoji, Chika Hibino

Toray Industries Inc., Japan

3B: ADHESIVES AND ENCAPSULANTS

EPOXY MOLDING COMPOUND BLEEDING REDUCTION ON SURFACE MOUNT SEMICONDUCTOR DEVICE.....81

Federico Leone¹, Fulvio Viviani¹, Hidetoshi Seki², Masami Ishii²

¹STMicroelectronics, Italy; ²Sumitomo Bakelite Singapore Pte. Ltd, Singapore

INFLUENCE OF THERMALLY AGED UNDERFILL ON FLIP-CHIP PACKAGES.....85

Kevin Cox, Ghassan Abu-Hamdeh, Matt Borden

Tektronix Component Solutions, United States of America

ADHESIVE SOLUTIONS FOR CLOSED CAVITY PACKAGING.....91

Patrick Schirmer, Severin Ringelstetter

DELO Industrie Klebstoffe GmbH & Co. KGaA, Germany

4A: INTERCONNECT MATERIALS II

DEVELOPMENT OF A STRETCHABLE AND REMOVABLE ELECTRICAL INTERCONNECTION SOLUTION FOR ULTRA-THIN ELECTRONIC COMPONENTS.....94

Auriane Despax-Ferreres¹, Pascal Tiquet¹, Jean-Charles Souriau², Vincent Jousseau², Julia De Girolamo¹

¹Univ. Grenoble Alpes, CEA, Liten, Grenoble, France;

²Univ. Grenoble Alpes, CEA, Leti, Grenoble, France

UV LASER COPPER PAD SURFACE EXPOSURE FOR LASER DIRECT STRUCTURING (LDS) OF INTERCONNECTION.....100

Guendalina Catalano, Alessandro Mellina Gottardo, Riccardo Villa
ST microelectronics, Italy

FINE PITCH MICRO INDIUM BUMP INTERCONNECT FLIP CHIP BONDING.....106

Travis Scott

Finetech GmbH & Co.KG, Germany

4B: MEDICAL

INITIAL LIFE TEST OF SILICONE ENCAPSULATED FR4 PRINTED CIRCUIT BOARDS FOR PRE-CLINICAL ACTIVE IMPLANTS.....111

Ishpa Ali¹, Fei Xue¹, Carlos Perez Henriquez¹, Thomas Niederhoffer¹,
Ahmad Shah Idil¹, Dai Jiang², Henry Thomas Lancashire¹

¹Department of Medical Physics and Biomedical Engineering, University College London, London, UK.; ²Department of Electronic and Electrical Engineering, University College London, London, UK.

VOIDING IN PARYLENE-C ENCAPSULATION OF SURFACE MOUNT LEDS FOR AN OPTOGENETIC EPILEPSY NEUROPROSTHESIS.....115

Ahmad Shah Idil¹, Richard Bailey², Johannes Gausden², Antony O'Neill²,
Nick Donaldson¹

¹University College London, UK; ²Newcastle University, UK

ASSEMBLY OF PRINTED INTERCONNECTS FOR IMMOBILIZED PROTEIN MICROFLUIDIC ASSAYS.....120

Qianwen Xu¹, Jeffery C. C. Lo¹, Yusong Guo¹, S. W. Ricky Lee^{1,2,3}

¹The Hong Kong University of Science and Technology, Hong Kong, PRC;
²HKUST Shenzhen-Hong Kong Collaborative Innovation Research Institute, PRC;
³HKUST LED-FPD Technology R&D Center at Foshan, PRC

FLEXIBLE HYBRID ELECTRONICS ON WEARABLE HEALTHCARE APPLICATION.....124

Ming-Hung Chen
ASE, Taiwan

POSTER SESSION

- 01 TESTING OF ELECTROMIGRATION RESISTANCE OF COPPER AND SILVER THICK FILMS129**
Jiri Hlina¹, Jan Reboun¹, Marek Simonovsky², Ales Hamacek¹
¹University of West Bohemia, Faculty of Electrical Engineering, Czech Republic; ²Elceram a.s., Hradec Kralove, Czech Republic
- 02 RELIABILITY TESTING OF RECYCLED SMD COMPONENTS REUSED IN E-TEXTILES AFTER AGEING BY WASHING CYCLES134**
Martin Hirman, Jiří Navrátil, Andrea Benešová, František Steiner
University of West Bohemia, Czech Republic
- 03 PROCESS WINDOW OF MINI-LED DISPLAY PANEL PACKAGING USING LASER ASSISTED BONDING TECHNOLOGY139**
Yong Sung Eom, Gwang-Mun Choi, Ki-Seok Jang, Ji-Ho Joo, Chan-Mi Lee, Jin-Heuk Oh, Seok-Hwan Moon, Kwang-Seong Choi
ETRI, Republic of South Korea
- 04 EFFECT OF SURFACE MICROSTRUCTURE ON JOINTS USING NANOPOROUS CU SHEET FOR POWER DEVICES143**
Hiroshi Nishikawa¹, Byungho Park², Mikiko Saito³, Jun Mizuno³
¹Joining and Welding Research Institute, Osaka University, Japan; ²Graduate School of Engineering, Osaka University, Japan; ³Research Organization for Nano & Life Innovation, Waseda University, Japan
- 05 INVESTIGATION OF ALUMINUM AND GOLD FLIP-CHIP BONDING FOR QUANTUM DEVICE INTEGRATION147**
Imants Cirulis¹, Uwe Zschenderlein², Silvia Braun¹, Moritz Radestock¹, Remi Pantou¹, Klaus Vogel¹, Franz Selbmann¹, Steffen Kurth¹, Bernhard Wunderle^{1,2}, Harald Kuhn^{1,2}
¹Fraunhofer Institute for Electronic Nano Systems, Germany; ²Technical University Chemnitz, Germany

- 06 ADHESION COPPER/MOLDING COMPOUND: MODELING AND CHARACTERIZATION152**
Marco Rovitto¹, Samuele Zalaffi¹, Carlo Passagrilli¹, Claudio Maria Villa¹, Luca Andena², Stefano Mariani²
¹STMicroelectronics, Italy; ²Polytechnic University of Milan, Italy
- 07 A HIGH-DENSITY ORGANIC PACKAGE SOLUTION TO W-BAND SIGE FLIP-CHIP APPLICATIONS158**
Firat Altuntas, Nihan Öznazlı, Olcay Kalkan, Emrah Koç
Aselsan A.Ş., Turkey
- 08 THERMAL DESIGN OF STACKED POWER MODULES FOR ELECTRIC DRIVE APPLICATIONS..... 162**
Jianfeng Li, Yuekang Du, Xingzhi Wang, Liangjie Liu, Yong Pang, Feixiang Liu
Zhuzhou CRRC Times Electric UK Innovation Centre, United Kingdom
- 09 LAMINATION OF CAPACITIVE MICROMACHINED ULTRASONIC TRANSDUCER ON A PIEZOELECTRIC ARRAY: PROCESS AND EVALUATION168**
Duy Hoang Le, Tung Manh, Lars Hoff
University of South-Eastern Norway (USN), Norway
- 10 ASSEMBLY OF ULTRA-THIN MEMS DEVICE ON DRIVER CHIP USING ANISOTROPIC CONDUCTIVE FILM172**
Hoang-Vu Nguyen, Knut Eilif Aasmundtveit
University of South-Eastern Norway, Norway
- 11 AN INNOVATIVE CONFORMAL ELECTRONICALLY SCANNED ARRAY ANTENNA FOR FULL 360° STEERABILITY IN THE KA-BAND177**
Peter Uhlig, Aline Friedrich, Markus Kregel, Winfried Simon, Oliver Litschke
IMST GmbH, Germany
- 12 THERMALLY CONDUCTIVE POLYMER COMPOSITES WITH HEXAGONAL BORON NITRIDE FOR MEDICAL DEVICE THERMAL MANAGEMENT181**
Nu Bich Duyen Do¹, Kristin Imenes¹, Knut E. Aasmundtveit¹, Hoang-Vu Nguyen¹, Erik Andreassen^{1,2}
¹University of South-Eastern Norway, Norway; ²SINTEF Industry, Norway

- 13 MICROSTRUCTURAL BASED RELIABILITY INVESTIGATION OF WATER- AND SUSPENSION FREE PREPARED INTEGRATED ELECTRONIC PACKAGES189**
Sandy Klengel, Robert Klengel, Tino Stephan
Fraunhofer IMWS, Germany
- 14 NUMERICAL STUDY ON THE INFLUENCE OF POLYIMIDE THICKNESS AND CURING TEMPERATURE ON WAFER BOW IN WAFER LEVEL PACKAGING.....194**
Prashant Kumar Singh^{1,2}, Patrick Rohlf¹, Gunther Sandmann¹, Kashi Vishwanath Machani¹, Dirk Breuer¹, Karsten Meier², Frank Kuechenmeister¹, Marcel Wieland¹, Karlheinz Bock²
¹GlobalFoundries Dresden Module One LLC & Co. KG, Germany; ²Technische Universität Dresden, Institute of Electronic Packaging Technology, Germany
- 15 IMPROVEMENT OF BONDING STRENGTH AND THERMAL SHOCK RELIABILITY FOR AG SINTER JOINING DIRECT ON AL SUBSTRATE200**
Chuantong Chen¹, Ran Liu¹, Koji Kobayashi², Hideyo Osanai², Zheng Zhang¹, Katsuaki Suganuma¹
¹Osaka University; ²DOWA POWER DEVICE Co., Ltd
- 16 INTERCONNECT STRESS TESTING AS A TOOL FOR ASSESSMENT OF RELIABILITY OF MODERN PCB'S.....204**
Marek Koscielski, Krzysztof Gliniski, Dariusz Ostaszewski, Tomasz Klej, Jan Oklej, Aneta Cholaj, Wojciech Steplewski, Stefan Galinski
Łukasiewicz Research Network - Tele and Radio Research Institute, Poland
- 17 HIGH SPEED TRANSMISSION CHARACTERISTICS ON GLASS BASED INTERPOSERS.....209**
Satoru Kuramochi, Masaya Tanaka, Takahiro Tai
Dai Nippon Printing, Japan
- 18 DESIGN, FABRICATION, AND CHARACTERIZATION OF A 4H-SIC CMOS READOUT CIRCUIT FOR MONOLITHIC INTEGRATION WITH SIC SENSORS.....215**
Romina Sattari, Henk van Zeijl van Zeijl, Guoqi Zhang
Department of Microelectronics, Delft University of Technology, The Netherlands

5A: SINTERING I

RELIABILITY OF COPPER SINTERED INTERCONNECTS UNDER EXTREME THERMAL SHOCK CONDITIONS.....218

Sri Krishna Bhogaraju¹, Francesco Ugolini², Alessio Greci²,
Gordon Elger¹

¹Technische Hochschule Ingolstadt, Germany; ²AMX Automatrix srl, Italy

RAPID SINTERING OF INKJET PRINTED CU COMPLEX INKS USING LASER UNDER AIR223

Nihesh Mohan¹, Sri Krishna Bhogaraju¹, Juan Ignacio Ahuir-Torres², Hiren Kotadia^{2,3},
Gordon Elger¹

¹Institute of Innovative Mobility, Technische Hochschule Ingolstadt, Germany;

²School of Engineering, Liverpool John Moores University, UK;

³WMG, University of Warwick, UK

IMPROVING SEMICONDUCTOR RELIABILITY OF SILVER SINTER DIE ATTACH MATERIALS FOR LARGE DIE ON LEAD FRAME APPLICATIONS.....230

Ruud De Wit¹, Edsger Smits²

¹Henkel Nederland BV, The Netherlands; ²Chip Integration Technology Center (CITC), The Netherlands

5B: EQUIPMENT / INSPECTION

PICK AND PLACE OF SENSITIVE CHIPS WITH VACUUM-FREE GECOMER® TOOLS.....238

Lukas Lorenz¹, Thomas Ludewig¹, Kai Swiecinski¹, Henrik Ollmann², Amirabbas Razkordanisharahi², Volker Bock¹

¹Fraunhofer IPMS, Germany; ²INNOCISE GmbH, Germany

RESEARCH OF CHIP PLACEMENT ACCURACY FOR FAN-OUT WLP USING A NOVEL SELF-ASSEMBLY STAGE.....244

Tadatomo Yamada, Ken Takano, Toshiaki Menjo, Shinya Takyu
LINTEC Corporation, Japan

ONE-PROBE NANOPROBING OF POWER DEVICES AND ELECTRONIC PACKAGES.....250

Chengliang Huang¹, Vignesh Viswanathan¹, Greg M. Johnson², Andreas Rummel³, Heiko Stegmann⁴, Elliott Andrew⁵

¹Carl Zeiss Pte Ltd, Singapore; ²Zeiss Microscopy, United States of America;

³Kleindiek Nanotechnik, Germany; ⁴Zeiss Microscopy, Germany;

⁵Zeiss Microscopy, UK

6A: PHOTONICS AND OPTICS

STUDY OF SPATIAL DISTORTION IN INP NANOPHOTONIC MEMBRANES ON DIFFERENT CARRIER SUBSTRATES255

Salim Abdi¹, Aleksandr Zozulia¹, Jeroen Bolk², Erik Jan Geluk², Yuqing Jiao¹, Kevin Williams¹

¹Eindhoven Hendrik Casimir Institute (EHCI), Eindhoven University of Technology;

²Nanolab@tu/e, Eindhoven University of Technology

LASER-ASSISTED BONDING APPROACH FOR PHOTONIC INTEGRATION PROCESSES260

Aleksandr Vlasov, Topi Uusitalo, Evgenii Lepukhov, Heikki Virtanen, Samu-Pekka Ojanen, Jukka Viheriälä, Mircea Guina
Tampere University, Finland

INTEGRATION OF MULTI-LITHOGRAPHY TECHNOLOGIES FOR THE FABRICATION OF FLEXIBLE OPTICAL LINK264

Akash Sunilkumar Mistry, Krzysztof Kamil Nieweglowski, Karlheinz Bock

Technical University of Dresden, Germany

HYBRID LITHOGRAPHY FABRICATION OF SINGLE MODE OPTICS FOR SIGNAL REDISTRIBUTION AND COUPLING269

David Weyers, Krzysztof Nieweglowski, Karlheinz Bock

Technological University Dresden, Germany

6B: SOLDER / SOLDERING

COMPARING THE SOLDERABILITY OF DIFFERENT SAC0307 COMPOSITE SOLDER PASTES.....277

Balázs Illés^{1,2}, Halim Choi¹, Agata Skwarek²

¹Budapest University of Technology and Economics, Hungary;

²Łukasiewicz Research Network - IMiF, LTCC Technology and Printed Electronics Research Group, Poland

ANISOTROPIC SOLDER PASTE (ASP) MATERIAL SOLUTION FOR LASER ASSISTED BONDING (LAB) PROCESS.....282

Ki-Seok Jang, Yong-Sung Eom, Gwang-Mun Choi, Ji-Ho Joo, Jin-Hyuk Oh,

Chan-Mi Lee, Yoon-Hwan Moon, Seok-Hwan Moon, Kwang-Seong Choi

Electronics and Telecommunication Research Institute, Republic of South Korea

DURABILITY OF LEAD-FREE SOLDER INTERCONNECTIONS FOR PRINTED CIRCUIT BOARD APPLICATIONS: COMPARING ENERGY-BASED THERMO-MECHANICAL FATIGUE MODELS.....286

Chien-Ming Huang, Jeffrey W. Herrmann

University of Maryland, United States of America

7A: SINTERING II

AN EXPERIMENTAL INVESTIGATION OF A FLEXIBLE SINTERED SILVER JOINT FOR MICRO-JOINING BASED ON A DESIGN OF EXPERIMENTS.....292

Laurent Vivet¹, Lahouari Benabou², Olivier Simon²

¹VALEO, THS Material Laboratory, France;

²UVSQ, University of Paris-Saclay, France

UNDERSTANDING CU SINTERING AND ITS ROLE ON CORROSION BEHAVIOUR FOR HIGH-TEMPERATURE MICROELECTRONIC APPLICATION.....297

Juan Ignacio Ahuir-Torres¹, Sri Krishna Bhogaraju², Geoff West³, Gordon Elger², Hiren Kotadia^{1,3}

¹Liverpool John Moores University, UK;

²Technische Hochschule Ingolstadt, Germany; ³The University of Warwick, UK

INSPECTION TECHNIQUES USING SCANNING ACOUSTIC MICROSCOPY FOR SILVER SINTERING APPLICATIONS IN POWER ELECTRONIC MODULES.....302

Heaklig Ayala^{1,2}, Jose Ortiz-Gonzalez¹, Mohamed-Amer Karout¹, James Cotty², Tim Rumney², Philip Mawby¹

¹University of Warwick, United Kingdom; ²Custom Interconnect Limited, United Kingdom

7B: HERMETIC/CONFORMAL COATINGS/TIMS

CHARACTERIZATION OF A NOVEL COST-EFFICIENT AND ENVIRONMENTALLY FRIENDLY GRAPHENE-ENHANCED THERMAL INTERFACE MATERIAL309

Sihua Guo¹, Kristoffer Harr (Martinsen)², Amos Nkansah², Jijia Chen¹, Zhiyang Shen¹, Murali Murugesan², Hongfeng Zhang², Lars Almh em², Arto Ahtonen², Jin Chen³, Johan Liu^{1,4,5}

¹SMIT Center, Shanghai University, PRC; ²SHT Smart High-Tech AB, Sweden;

³Shanghai Ruixi New Materials High Tech Co. Ltd., PRC; ⁴Electronics Materials and Systems Laboratory, Chalmers University of Technology, Sweden;

⁵School of Energy and Materials Science, Shanghai Poly-Tech University, PRC

EVOLUTION OF GETTER TECHNOLOGY IN ELECTRONIC HERMETIC PACKAGING313

Luca Mauri, Giovanni Zafarana, Enea Rizzi, Alessio Corazza
SAES Getters, Italy

ADVANCES IN PARYLENE ADHESIVE BONDING FOR THE REALIZATION OF BIOCOMPATIBLE MICROSYSTEMS.....319

Franz Selbmann^{1,2}, Frank Roscher¹, Maik Wiemer¹, Harald Kuhn^{1,3}, Yvonne Joseph²

¹Fraunhofer Institute for Electronic Nano Systems ENAS, Germany;

²TU Bergakademie Freiberg, Institute for Electronic and Sensor Materials, Germany;

³TU Chemnitz, Center for Microtechnologies, Germany

8A: FLIP CHIP

FLIP-CHIP INTERCONNECTS BASED ON SINGLE METAL-COATED POLYMER SPHERES.....325

Van Long Huynh, Knut Eilif Aasmundtveit, Hoang-Vu Nguyen
University of South-Eastern Norway, Norway

20 μ M COPPER MICRO-BUMP BONDING THROUGH A SILVER METALLIZATION FOR ADVANCED PACKAGING UNDER A LOW-PRESSURE CONDITION.....330

Zheng Zhang¹, M.-C. Hsieh¹, A. Suetake¹, H. Yoshida¹, R. Okumuara¹, N. Kagami¹, Kazamasa Okamoto¹, Chuantong Chen¹, Kei Hashizume², N. Hasegawa², R. Yoshida², H. Homma², K. Suganuma¹
¹SANKEN, Osaka University, Japan; ²Okuno Chemical Industries Co. Ltd.

PRACTICAL RESULTS TO DEMONSTRATE AN INCREASE IN THE RELIABILITY OF FLIP CHIP CONNECTIONS BY ADDING NANOPARTICLES TO SOLDER.....333

David Harvey¹, Teresa Manzanera², Kangkana Baishya³, Guangming Zhang¹, Mohd Arif Anuar⁴, Y. C. Chan¹, Nduka Ekere¹, Derek Braden⁵
¹Liverpool John Moores University, Liverpool, UK; ²University of Liverpool, Liverpool, UK; ³Assam Engineering College, Guwahati, India; ⁴UniMAP, Perlis, Malaysia; ⁵Aptiv, Coventry, UK

DEVELOPMENT AND CHARACTERIZATIONS OF FINE PITCH FLIP-CHIP INTER-CONNECTION USING SILVER SINTERING.....337

Julie Gougeon^{1,2}, Céline Feautrier¹, Laurent Mendizabal¹, Jean-Charles Souriau¹, Mona Tréguer-Delapierre²
¹CEA Leti, France; ²ICMCB, France

8B: RELIABILITY AND SUSTAINABILITY

ANALYSIS OF THE IMPACT OF ENVIRONMENTAL CONDITIONS ON THE RELIABILITY IN 5G PCB ASSEMBLIES.....341

Hans Walter¹, Marius van Dijk¹, Julia-Marie Köszegi¹, Saskia Huber¹, [Olaf Wittler](#)¹, Michael Kaiser¹, Martin Schneider-Ramelow^{1,2}

¹Fraunhofer IZM, Germany; ²Technische Universität Berlin, Germany

EVALUATION OF THE ENVIRONMENTAL IMPACT WITHIN SEMICONDUCTOR PACKAGING MATERIALS348

Andrew Bainbridge, Lewis Clark, Kathleen Grant, [Jeff Kettle](#)

University of Glasgow, United Kingdom

MEASUREMENT AND SIMULATION OF MECHANICAL STRENGTH OF BACK-END-OF-LINE LAYER IN ADVANCED CMOS DIES352

[Bart Vandeveld](#)¹, Kevin Cox², Reza Moloudi¹, Riet Labie¹, Jason Krantz², Matt Borden², Kris Vanstreels¹, Mario Gonzalez¹

¹imec, Belgium; ²Tektronix, United States of America

9A: MACHINE LEARNING

APPLICATION OF MACHINE LEARNING METHODS FOR PROCESS OPTIMIZATION IN ELECTRONIC PACKAGING PROCESSES357

Corinna Niegisch¹, Sabine Haag¹, Tanja Braun², Ole Hölck²,
Martin Schneider-Ramelow³

¹Robert Bosch GmbH, Germany; ²Fraunhofer IZM Berlin, Germany;

³Technical University Berlin, Germany

PARTIAL DISCHARGE CHARACTERIZATION OF CERAMIC POWER ELECTRONICS CIRCUIT CARRIERS ASSISTED BY MACHINE LEARNING363

Johannes Drechsel, Lars Rebenklau, Henry Barth

Fraunhofer IKTS, Germany

9B: SOLAR / SENSORS

IMPACT OF PAD LAYOUTS AND SOLDER VOLUME ON SELF-ALIGNMENT OF MICRO SOLAR CELLS.....373

Elisa Kaiser¹, Maïke Wiesenfarth¹, Victor Vareilles², Henning Helmers¹

¹Fraunhofer ISE, Germany; ²Université Grenoble Alpes, CEA LITEN, France

NOVEL LOW TEMPERATURE AND LOW PRESSURE SINTERING OF ADAS RADAR SENSOR ANTENNA STACK.....378

Sri Krishna Bhogaraju¹, Dirk Busse², Alexander Dahlbüdding², Philipp Hadrava³, Hüseyin Erdogan³, Gordon Elger¹

¹Technische Hochschule Ingolstadt, Germany; ²Budatec GmbH, Germany;

³Conti Temic microelectronics GmbH, Germany

10A: HIGH FREQUENCY

CHARACTERIZATIONS FOR EWLB (EMBEDDED WAFER LEVEL BALL GRID ARRAY) ANTENNA IN MOLDED PACKAGE INTEGRATIONS IN 77GHZ AUTOMOTIVE APPLICATIONS.....384

M.-C. Hsieh¹, F. Zhang², F. Zhu², K. Liu², L. Chua³, Y. Lin³, J. Damalerio³, Hin Hwa Goh³, Kai Chong Chan³, Zihao Chen⁴

¹JCET Group Co. Ltd., Singapore; ²Andar Technologies Co., Ltd.; ³JCET Group Co. Ltd., Singapore; ⁴Harbin Institute of Technology, Shenzhen, PRC

A DUAL-BAND DUAL-POLARIZED 2X2 ANTENNA ARRAY WITH BEAMFORMING FOR 5G AIP AND MMWAVE APPLICATIONS.....389

Sheng-Chi Hsieh, Wen-Chun Hsiao, Hong-Sheng Hong-Sheng, Cheng-Yu Ho, Chen-Chao Wang

ASE group /Advanced Semiconductor Engineering, Taiwan

ANALYSIS AND CHARACTERIZATION OF CASTELLATED HOLES AS RF INTERCONNECTS FOR MODULAR MILLIMETER-WAVE DEVICES.....394

Paul Perlwitz^{1,2}, Christian Tschoban¹, Ivan Ndip¹, Harald Pötter¹, Martin Schneider-Ramelow^{1,2}

¹TU Berlin; ²Fraunhofer IZM, Germany

HIGH-Q KU-BAND MICROSTRIP SPIRAL RESONATOR IN FAN-OUT WAFER-LEVEL PACKAGING TECHNOLOGY FOR VCO APPLICATIONS.....401

M. Chernobryvko¹, M. P. Kaiser¹, K. S. Murugesan¹, D. Kuylenstierna², J.-M. Köszegi¹, R. Gernhardt¹, T. Braun¹, I. Ndip¹, M. Schneider-Ramelow¹

¹Fraunhofer IZM Berlin, Germany; ²Chalmers University of Technology, Sweden

10B: POWER MODULES

THERMAL-MECHANICAL ANALYSIS OF A POWER MODULE WITH PARAMETRIC MODEL ORDER REDUCTION.....405

Sheikh Rokibul Hassan¹, Pushparajah Rajaguru¹, Stoyan Stoyanov¹,
Christopher Bailey²

¹University of Greenwich, United Kingdom; ²School of Electrical, Computer
and Energy Engineering, Arizona State University, USA

THICKNESS EFFECT OF COPPER CLIPS ON POWER MODULE PACKAGING DESIGN.....411

H. Wan¹, N. Iosifidis¹, X. Zhang¹, R. Rong², M. Antoniou¹, P. Mawby¹

¹University of Warwick, United Kingdom; ²MacMic Science & Technology Co., Ltd,
China

HIGH FREQUENCY THIN FILM MAGNETICS-ON-SILICON WITH IMPROVED INDUCTANCE AND RESISTANCE416

Martin Sittner

Würth Elektronik eiSos Group, Germany

ENHANCED RELIABILITY FOR POWER MODULES VIA A NEW AG/SI SINTER JOINING STRATEGY421

Y. Liu¹, C. Chen¹, Koji S. Nakayama¹, Minoru Ueshima², Takeshi Sakamoto²,
Takuya Naoe³, Hiroshi Nishikawa³, Katsuaki Suganuma¹

¹Flexible 3D System Integration Laboratory, Osaka University, Japan;

²Daicel Corporation, Japan; ³Joining and Welding Research Institute,

Osaka University, Japan