

2015 European Microelectronics Packaging Conference (EMPC 2015)

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14-16 September 2015**



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conference program

sunday

AT A GLANCE

2:00 –
6:00 pm

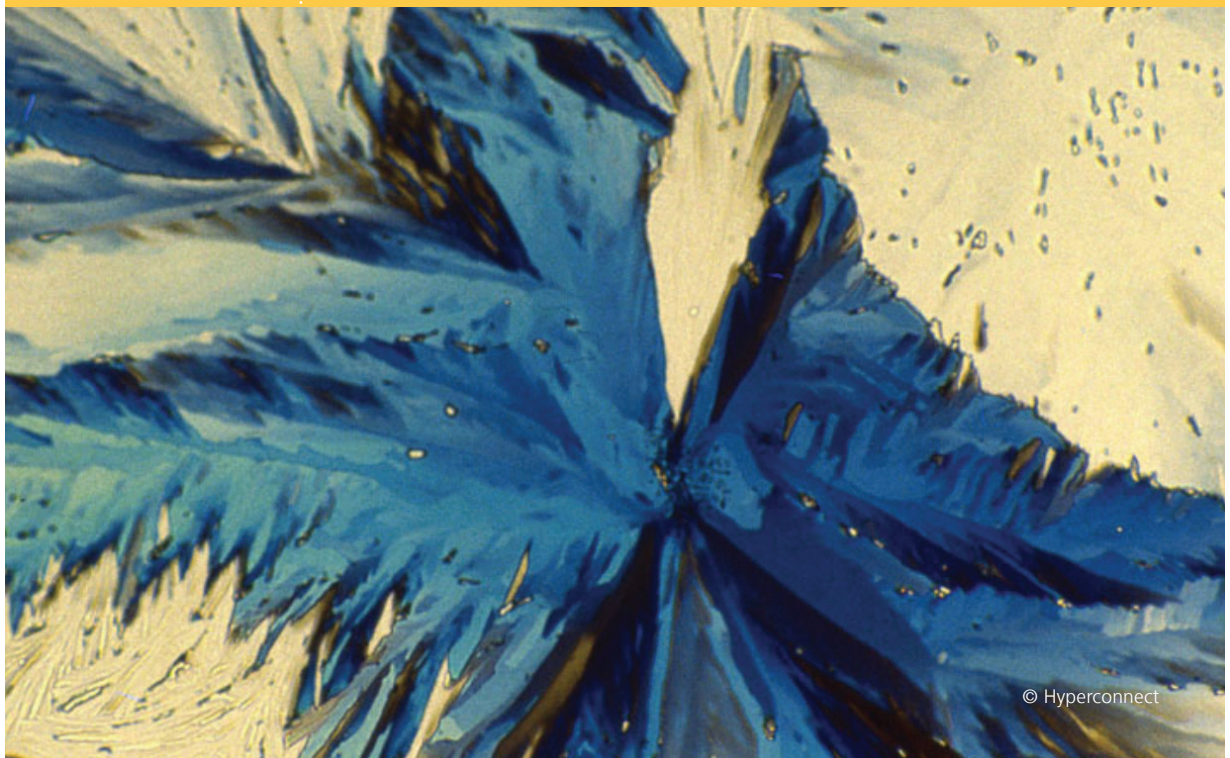
Early Registration

6:00 –
7:30 pm

Welcome Reception sponsored by Dupont
Location: Exhibition area



Polarized optical micrograph of multi-layers of microparticles.

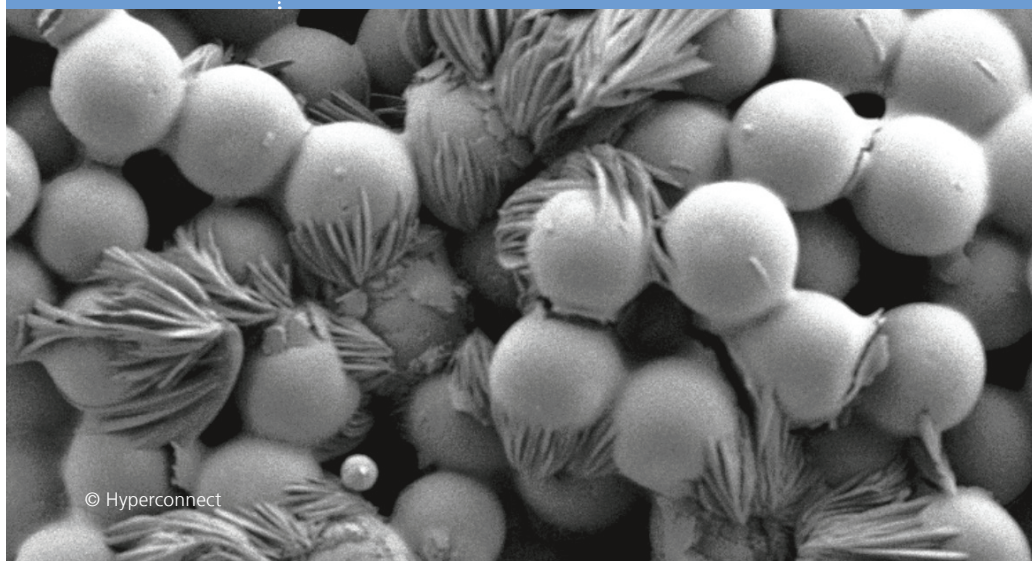


© Hyperconnect

monday

AT A GLANCE

8:30 am	Registration
9:30 am	Opening session
9:50 am	Keynote 1
10:25 am	Keynote 2
11:00 am	Exhibition opening & coffee break
11:40 am	Session 1.1: Si Substrate Technologies Session 1.2: Thermal Design & Materials
12:55 pm	Lunch break sponsored by iNEMI
2:00 pm	Session 2.1: Bonding Materials and Processes Session 2.2: MEMS Packaging
3:40 pm	Coffee break & Poster Session A
4:50 pm	Session 3.1: PCB Technology Session 3.2: Progress in LED Packaging



Organic crystals within a Microparticle bed

Monday 14.9. 8:30 am – 11:40 am

**8:30 –
9:30 am**

Registration

**9:30 –
9:50 am**

Opening session

• **Welcome to EMPC 2015**

General Chair: Martin Schneider-Ramelow

• **Facts & Figures of EMPC 2015**

Technical Chair: Markus Detert

• **Welcome Address**

State Secretary Günther Leßnerkraus / Ministry of Finance and Economy Baden-Württemberg

Location: Hugo-Eckener-Hall

**9:50 –
10:25 am**

Keynote 1:

Changes Along the Electronics Value Chain – Packaging as a Key Enabler 1

Dr. Michael Alexander, Roland Berger Strategy Consultants GmbH

Location: Hugo-Eckener-Hall

**10:25 –
11:00 am**

Keynote 2:

**Industry Consortium for New Era of Automotive Electronics with Entire
System-on-Package Vision at Georgia Tech** 19

Prof. Rao Tummala & Prof. Klaus Wolter

Microsystems Packaging Research Center (PRC) Georgia Tech, USA

Location: Hugo-Eckener-Hall

**11:00 –
11:40 am**

Exhibition opening & coffee break

Location: Exhibition area

Monday 14.9. 11:40 am – 3:40 pm



1 . 1

Si Substrate Technologies

Session Chairs: Markku Tilli, Okmetic Oyj | Jürgen M. Wolf, Fraunhofer IZM

Location: Hugo-Eckener-Hall

11:40 am

Ultra-Thin High Density Capacitors for Advanced Packaging Solutions 24

Konrad Seidel¹, Wenke Weinreich¹, Mathias Böttcher², Stephan Dobritz², Malte Czernohorsky¹

¹Fraunhofer IPMS-CNT, Germany; ²Fraunhofer IZM-ASSID, Germany

12:05 pm

Development of a Statistical Approach for DNA-based Nanowires Electrical Study 29

Christophe Brun¹, Cheikh-Tidiane Diagne¹, Corentin Carmignani¹, Simona Torrenco², Pierre-henri Elchinger³, Patrick Reynaud¹, Aurelie Thuaire¹, Didier Gasparutto², Raluca Tiron¹, Arianna Filoramo⁴, Xavier Baillin¹

¹CEA DRT/LETI, MINATEC Campus, France; ²CEA DSM/INAC, France; ³CEA DSV/IRTSV, France;

⁴CEA DSM/IRAMIS, France

12:30 pm

Advanced Interposers with Metalized Through Via 35

Satoru Kuramochi¹, Sumio Koiwa¹, Takamasa Takano¹, Miyuki Akazawa¹, Hiroshi Mawatari¹, Kousuke Suzuki¹, Yoshitaka Fukuoka²

¹Dai Nippon Printing Ltd, Japan; ²Worldwide Electronic Integrated Substrate Technology, Japan

12:55 –
2:00 pm

Lunch Break sponsored by iNEMI

Location: Exhibition area



2 . 1

Bonding Materials and Processes

Session Chairs: Martin Schneider-Ramelow, Fraunhofer IZM | Karl-Heinz Drüe, Ilmenau University of Technology

Location: Hugo-Eckener-Hall

2:00 pm

"Non-piercing" – a Must for Flip Chips! 57

Matthias Lorenz

AEMtec, Germany

2:25 pm

Ni-Sn Solid-liquid Interdiffusion (SLID) for Thermo-electric Elements in Extreme Environments – Bond Layer Thickness 61

Andreas Larsson^{1,2}, Torleif A Tollefsen³, Ole Martin Løvvik⁴, Knut E Aasmundtveit²

¹TECHNI AS, Borre, Norway; ²HBV – Buskerud and Vestfold University College,

Borre, Norway; ³TEGma AS, Kristiansand, Norway; ⁴SINTEF Materials & Chemistry, Oslo, Norway

2:50 pm

Analysis of Soldering Processes Using In-Situ X-Ray Observations 67

Alexander Klemm, Martin Oppermann, Thomas Zerna

Technische Universität Dresden, Germany

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Assembly and Packaging of Micro Systems by Using Reactive Bonding Processes 73

Axel Schumacher¹, Ulrike Gaiß¹, Stephan Knappmann¹, Georg Dietrich², Stefan Braun², Erik Pflug², Frank Roscher³, Klaus Vogel³, Dirk Kähler⁴, Wolfgang Reinert⁴

¹Hahn-Schickard-IMIT, Villingen-Schwenningen, Germany; ²Fraunhofer IWS, Dresden,

Germany; ³Technical University Chemnitz, Germany; ⁴Fraunhofer ISIT, Itzehoe, Germany



Thermal Design & Materials

Session Chairs: Jens Müller, Ilmenau University of Technology | Klaus-Jürgen Wolter, Microsystems Packaging Research Center (PRC) Georgia Tech, USA

Location: Ludwig-Dürr-Hall

Thermally Enhanced Power Fan-Out WLP Demonstrator 41

Steffen Kroehnert¹, André Cardoso¹, Mariana Pires¹, Raquel Pinto¹, Gusztáv Hantos²

¹NANIUM S.A., Portugal; ²EET BME, Hungary

Cutting the Cost of Packaging with Nano-ceramic Substrates 49

Giles Humpston

Cambridge Nanotherm Ltd, United Kingdom

Quantifying the Thermal Conductivity Enhancement of Percolating Thermal Underfills 53

Brian R. Burg, Jonas Zürcher, Gerd Schlottig, Xi Chen, Thomas Brunschweiler

IBM Research - Zurich, Switzerland



MEMS Packaging

Session Chairs: Bertram Schmidt, OVGU Magdeburg | Gilles Poupon, CEA-Leti Minatec

Location: Ludwig-Dürr-Hall

Challenges of Wafer-Level MEMS Packaging 79

Sebastian Schuler-Watkins, Ralf Reichenbach, Uwe Hansen

Robert Bosch GmbH, Germany

Flexible Packaging by Film Assisted Molding for Microintegration of MEMS Based Sensors 83

D. Hera¹, J. D. Schulze Spüntrup², T. Günther¹, A. Berndt², C. Reuter², C. Harendt², K.-P. Fritz¹,

H. Kück¹, A. Zimmermann¹

¹Hahn-Schickard-IMAT e.V., Stuttgart, Germany; ²Institute for Microelectronic, Stuttgart, Germany

Flip-Chip MEMS Microphone Package with Small Front and Large Back Volume 89

Sebastian Walser¹, Christian Siegel², Matthias Winter², Wolfgang Pahl², Anton Leidl², Gregor Feiertag^{1,2},

¹University of Applied Sciences Munich, Germany; ²EPCOS AG, Germany

Influence of Sensor-Package Hermeticity-Level on Long-Term Drift for a Piezoresistive MEMS Pressure-Sensor 94

Åsmund Sandvand^{1,2}, Einar Halvorsen¹, Knut E. Aasmundtveit¹, Henrik Jakobsen¹

¹HBV – Buskerud and Vestfold University College, Borre, Norway; ²Memscap AS, Skoppum, Norway

Monday 14.9. 3:40 pm–6:30 pm

3:40 –
4:50 pm

Coffee break & Poster Session A

Session Chairs: Nihal Sinnadurai, IMAPS Europe ELC | Karl-Heinz Drüe, Ilmenau University of Technology

Location: Poster area



3.1

PCB Technology

Session Chairs: Artem Ivanov, University of Applied Sciences Landshut
Lutz-Günter John, VDI VDE IT

Location: Hugo-Eckener-Hall

4:50 pm

Nickel-free Final Surface Finishes in the Electronics Industry 99

Norbert Sitte, Andreas Gross

Umicore Galvanotechnik GmbH, Schwäbisch Gmünd, Germany

5:15 pm

Thin Film Based LCP Multi Layer Circuits: Manufacturing Technology and Characterization 103

Alexander Kaiser¹, Karin Ruess¹, Paul Matej¹, Christian Herbort¹, Carlos Maximilian Bee¹, Günther Bauböck¹, Sebastian Löffler², Karl-Heinz Fritz³

¹*Cicor Advanced Microelectronics & Substrates, Ulm, Germany*; ²*Cicor Advanced Microelectronics & Substrates, Radeberg, Germany*; ³*Cicor Advanced Microelectronics & Substrates, Boudry, Switzerland*

5:40 pm

Combining Organic and Printed Electronics in Hybrid System in Foil (HySiF) Based Smart Skin for Robotic Applications 109

Mahadi-UI Hassan¹, Christine Harendt¹, Jürgen Keck⁴, Hagen Klauk⁵, Jan Kostelnik³, Stefan Saller², Alina Schreivogel³, Tarek Zaki¹, Joachim N. Burghartz¹

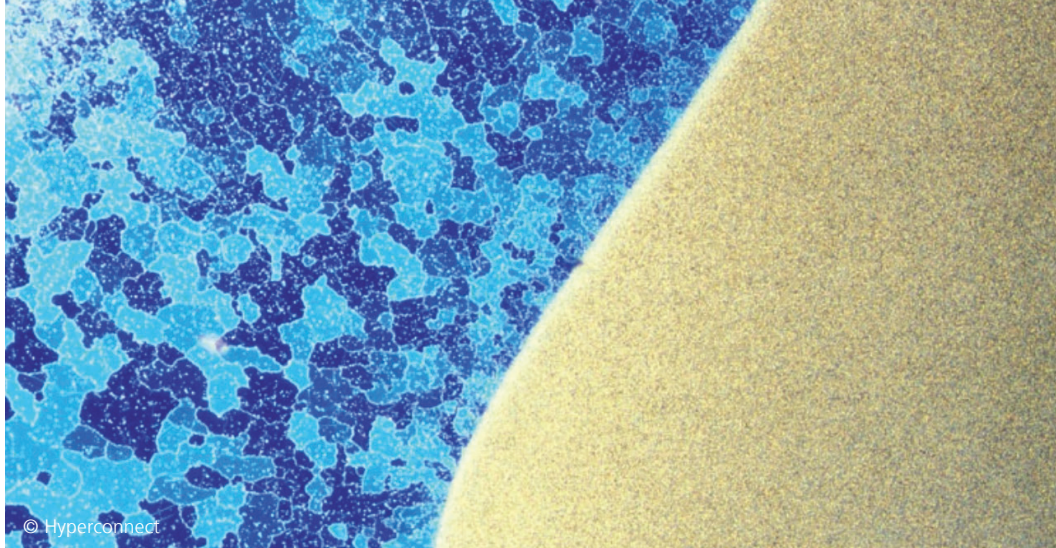
¹*Institute für Mikroelektronik Stuttgart, Germany*; ²*Festo AG & Co. KG, Esslingen, Germany*; ³*Würth Elektronik GmbH & Co. KG, Rot am See, Germany*; ⁴*Hahn-Schickard-Gesellschaft, Institut für Mikroaufbautechnik, Stuttgart, Germany*; ⁵*Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany*

6:05 pm

Innovative Solutions for Systems Based on Embedding of Thin Components into Flexible Printed Circuit Boards 115

Jürgen Wolf¹, Muhammad Samir Alshahed², Thomas Gneiting³, Christine Harendt², Jan Kostelnik¹, Andreas Kugler⁴, Enno Lorenz⁴

¹*Würth Elektronik GmbH & Co. KG, Rot am See, Germany*; ²*Institut für Mikroelektronik Stuttgart, Stuttgart, Germany*; ³*AdMOS GmbH, Frickenhausen, Germany*; ⁴*Robert Bosch GmbH, Renningen, Germany*



Polarized optical micrograph of a single layer of microparticles

3.2

Progress in LED Packaging

Session Chairs: David Whalley, Loughborough University | Krzysztof Nieweglowski, TU Dresden, Electronics Packaging Laboratory

Location: Ludwig-Dürr-Hall

Direct Attach LED Soldering by New Printable AuSn Paste 119

Abdenacer Ait Mani, Manon Arch
CEA Grenoble, France

A Micro-display Consisting of 90×90 LED Pixels on an 80µm Pitch 124

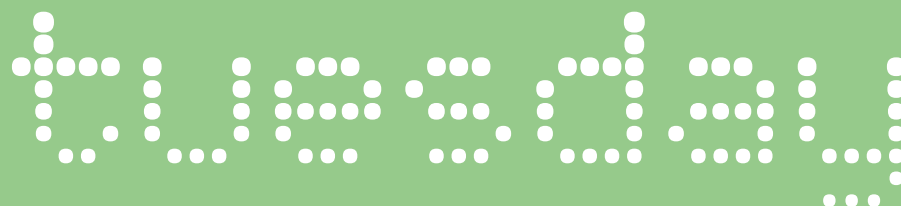
Sarkar Mahbub Akhter¹, Jun Su Lee¹, Pleun Maaskant¹, Marc Rensing¹, Noreen Nudds¹, Peter O'Brien¹, Patrick Degenaar², Brian Corbett¹
¹Tyndall National Institute, Cork, Ireland; ²Newcastle University, Newcastle, UK

Highly Reliable Thick Film Solutions for Power LEDs and Electronics 129

Paul Gundel¹, Melanie Bawohl¹, Mark Challingsworth², Christoph Czwickla¹, Ilias Nikolaidis¹, Virginia Garcia², Christina Modes¹, Ryan Persons², Jessica Reitz¹
¹Heraeus Deutschland GmbH & Co. KG, Hanau, Germany;
²Heraeus Precious Metals North America Conshohocken LLC, USA

Thermal Simulations and Design Propositions for LEDs Used in Automotive Applications 133

Guillaume Thin¹, Zdravko Zojceski¹, Jean-Baptiste Millet², Y. Alayli^{2,1}
¹Valeo Lighting Systems, Paris, France; ²LISV, Velizy, France



AT A GLANCE

8:30 am	Session 4.1: Solder Joint Reliability Session 4.2: Advanced Adhesive Materials Session 4.3: Innovative Ceramic based Circuit Platforms and Technologies for Telecommunication Satellites I
10:10 am	Coffee break
10:45 am	Session 5.1: Ag Sintering Session 5.2: Design for Reliability and Functionality Session 5.3: Innovative Ceramic based Circuit Platforms and Technologies for Telecommunication Satellites II
12:25 pm	Lunch break sponsored by ASE Group
1:35 pm	Session 6.1: Embedding for Power Modules Session 6.2: Optoelectronic Packaging Session 6.3: Hyperconnect Workshop: Percolating Thermal Underfill
2:50 pm	Coffee break & Poster Session B
3:55 pm	Session 7.1: Packaging and Encapsulation Session 7.2: Advances in Wirebonding Session 7.3: Hyperconnect Workshop: Neck-based Electrical Interconnects
5:15 pm	Keynote 3
7:00 pm	Gala Dinner and Three Country Boat Trip

Tuesday 15.9. 8:30 am – 10:45 am



4.1

Solder Joint Reliability

Session Chairs: Vesa Vuorinen, Aalto University | Mathias Nowottnick, Universität Rostock

Location: Hugo-Eckener-Hall

8:30 am

Solder Paste Residue Corrosivity Assesment: Bono Test 137

Emmanuelle Guene, Celine Puechagut, Anne Marie Laugt, Richard Anisko
INVENTEC Performance Chemicals, Paris, France

8:55 am

The Effect of Thermal Stress on the Reliability of low Ag Solder Joints in High Power LEDs 144

Miriam Rauer¹, Timo Schreck¹, Stefan Härter², Michael Kaloudis¹

¹University of Applied Sciences Aschaffenburg, Germany; ²University of Erlangen-Nuremberg, Germany

9:20 am

Comparative Tests for Lead-Free Solder Bumps 150

René P. Zingg¹, Ricardo Geelhaar², Chan Myat³, Armin Struwe³, Evstatin Krastev³

¹Zinan GmbH, Ismaning, Switzerland; ²Pactech GmbH, Nauen, Germany; ³Nordson Dage Ltd, UK

9:45 am

Effects of Component Stand-off Height on Reliability of Solder Joints in Assembled Electronic Component 153

Jude E Njoku¹, Sabuj Mallik¹, Raj Bhatti¹, Emeka H Amalu², B Ogunsemi²

University of Greenwich, London, UK; ²University of Wolverhampton, UK

4.3

Workshop: Innovative Ceramic based Circuit Platforms and Technologies for Telecommunication Satellites I

Session Chair: Jens Müller, Ilmenau University of Technology

Location: Alfred-Colsman-Hall

8:30 am

Needs and Approaches for Flexible Modules of Future Telecommunication Satellites N/A

Michael Schneider
Airbus DS GmbH, Germany

8:55 am

An Analog Optical Transmitter Module with a Passive Aligned Fiber Based on a Flip Chip Mounted VCSEL N/A

Tilo Welker, Sumy Mathew, Steffen Spira, Ralf Stephan, Nam Gutzeit, Jens Müller, Matthias A. Hein
Ilmenau University of Technology, Ilmenau, Germany

9:20 am

Barium Hexaferrite Thin-Films for Self-Biased Nonreciprocal Devices N/A

Frauke Gellersen, Arne Jacob
Technical University Hamburg-Harburg, Germany

9:45 am

Tolerance-Optimized Microwave Power Dividers in LTCC N/A

Peter Uhlig, Tobias Klein, Carsten Günner, Reinhard Kulke, Jordi Balcells
IMST GmbH, Kamp-Lintfort, Germany

4.2

Advanced Adhesive Materials

Session Chairs: Jan Felba, University of Wroclaw | Gregor Feiertag, Hochschule München

Location: Ludwig-Dürr-Hall

Assembly of Transducer Array Using Anisotropic Conductive Film for Medical Imaging Applications 157

Hoang-Vu Nguyen¹, Trym Eggen², Knut Aasmundtveit¹

¹Buskerud and Vestfold University College, Borre, Norway; ²GE Vingmed Ultrasound AS, Norway

Improvement of Connectivity in CU/OSP Flip Chip Package Using Slow Cure NCP 163

Masaaki Hoshiyama, Yuusuke Kamata, Makoto Kobayashi, Hiromi Sone, Hiroki Myodo, Toyokazu Hocchi

Namics Corporation, Niigata, Japan

New MEMS DA Adhesives for Screen Printing 167

Tobias Königer, Ralf Kmeth

DELO Industrial Adhesives, Windach, Germany

Development of Bimodal Electrically Conductive Pastes with Ag Micro- and Nano-fillers for Printing Stretchable E-textile Systems 173

Masahiro Inoue, Yosuke Itabashi, Yasunori Tada

Gunma University, Kiryu, Japan

10:10 –
10:45 am

Coffee break

Location: Exhibition area

Fluorescent liquid trapped in the HyperConnect logo



Tuesday 15.9. 10:45 am – 1:35 pm



5.1

Ag Sintering

Session Chairs: Martin Schneider-Ramelow, Fraunhofer IZM | Luigi Calligarich, IMAPS Italy

Location: Hugo-Eckener-Hall

10:45 am

Electrical, Thermal and Mechanical Characterization of Low Temperature, Pressure-less Sintered Silver Bond Interfaces 178

Tilo Welker¹, Jens Müller¹, Frank Krämer², Steffen Wiese²

¹Ilmenau University of Technology, Ilmenau, Germany; ²Saarland University, Saarbrücken, Germany

11:10 am

A Novel Approach in Silver Sintering for Reliable High Temperature Die-Attach in Power Electronics Through Aerosol-Jet Printing Technology 185

Aarief Syed-Khaja, Christopher Gruber, Johannes Hoerber, Joerg Franke

Friedrich-Alexander-University of Erlangen Nürnberg, Germany

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Failure Analysis of Ag Sintered Joints after Power Cycling Under Harsh Temperature Conditions from +30°C up to +180°C 191

Constanze Weber¹, Matthias Hutter¹, Christian Ehrhardt², Klaus-Dieter Lang²

¹Fraunhofer IZM, Berlin, Germany; ²Technical University Berlin, Germany

12:00

Investigations on Power Cycling Induced Fatigue Failure of IGBTs with Silver Sintered Interconnects 198

Rainer Dudek¹, R. Döring¹, S. Rzepka¹, C. Erhardt², M. Hutter², J. Rudzki³, F. Osterwald³, R. Eisele⁴, S. Stegmeier⁵, K. Weidner⁵, M. Rittner⁶

¹Fraunhofer ENAS, Chemnitz, Germany; ²Fraunhofer IZM, Berlin, Germany; ³Danfoss Silicon Power GmbH; ⁴University of Applied Sciences Kiel, Germany; ⁵Siemens AG, Corporate Technology; ⁶Robert Bosch GmbH, CR/APJ³

5.3

Workshop: Innovative Ceramic based Circuit Platforms and Technologies for Telecommunication Satellites II

Session Chair: Charles E. Bauer, TechLead Corporation

Location: Alfred-Colsman-Hall

10:45 am

Enhancement Activities for LTCC Manufacturing N/A

Dieter Johann Schwanke, Jürgen Pohlner, Thomas Rittweg

Micro Systems Engineering GmbH, Berg, Germany

11:10 am

Advanced LTCC Processes for Microwave Structures and Components in LTCC N/A

Jens Müller, Tilo Welker, Alexander Schulz

Ilmenau University of Technology, Ilmenau, Germany

11:35 am

Hybrid Integration of Solid State Amplifier (SSPA) N/A

Sebastian Löffler, Egon Reppe, Uwe Krämer

Cicor RHe Microsystems GmbH, Radeberg, Germany

12:00

Sol Gel Thin Films on LTCC Ceramic Multilayers Enable their Use as Thin Film Substrates 229

Heike Bartsch, Ulrike Brokmann, Robert Weiss, Edda Rädlein, Jens Müller, Boris Goj

Ilmenau University of Technology, Ilmenau, Germany

5.2

Design for Reliability and Functionality

Session Chairs: Matthias Petzold, Fraunhofer IWM | Markus Detert, Otto-von-Guericke Universität Magdeburg.

Location: Ludwig-Dürr-Hall

The Role of Molding Compound Microstructure for Packaging Reliability 206

Sander Gielen¹, Hartmut Fischer¹, Hasan Sadat Nabi², Laurens Weiss³

¹TNO Eindhoven, Netherlands; ²Infineon Technologies AG, Regensburg, Germany;

³Infineon Technologies AG, Neubiberg, Germany

CCGA Solder Column - Reliable Solution for Absorbing Large CTE Mismatch 212

Martin Hart

TopLine, Milledgeville, USA

Influence of Humidity on Reliability of Plastic Packages 217

Tanja Braun¹, Jörg Bauer¹, Karl-Friedrich Becker¹, Ole Hölck¹, Hans Walter¹, Marius van Dijk¹, Rolf Aschenbrenner¹, Klaus-Dieter Lang²

¹Fraunhofer IZM, Berlin, Germany; ²Technical University Berlin, Germany

Design for Reliability of Au-Sn and Cu-Sn Based SLID Bond 223

Vesa Vuorinen, Antti Rautiainen, Mervi Paulasto-Kröckel

Aalto University, Helsinki, Finland

12:25 –
1:35 pm

Lunch break sponsored by ASE Group

Location: Exhibition area



ASE GROUP

Tuesday 15.9. 1:35 pm – 3:55 pm



6.1

Embedding for Power Modules

Session Chairs: Rainer Dudek, Fraunhofer ENAS | Aarief Syed-Khaja, Friedrich Alexander University of Erlangen Nürnberg

Location: Hugo-Eckener-Hall

1:35 pm

Thermal Improvement of Plastic Laminate Based LED Modules with Embedded Chips 235

Andreas Munding¹, Martin Gruber¹, Tino Both¹, Michael Herfurth¹, Thomas Hammer¹, Dirk Schweitzer¹, Klaus Pressel¹, Andreas Waldschik², Elmar Baur², Axel Kaltenbacher²

¹Infinion Technologies AG, Munich, Germany; ²Osram GmbH, Regensburg, Germany

2:00 pm

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Mike Morianz, Hannes Stahr

AT&S AG, Austria

2:25 pm

Development of Advanced Power Modules for Electric Vehicle Applications 246

Dionysios Manassis¹, Lars Boettcher², Andreas Ostmann², Simon Whalley³

¹Technical University Berlin, Germany; ²Fraunhofer IZM, Berlin, Germany;

³ILFA Feinstleitertechnik GmbH, Hannover, Germany

6.3

Hyperconnect Workshop: Percolating Thermal Underfill

Session Chair: Thomas Brunschwiler, IBM Research - Zurich

Location: Alfred-Colsman-Hall

1:35 pm

Enhanced Thermal Underfills by Bridging Nanoparticle Assemblies in Percolating Microparticle Beds N/A

Jonas Zürcher¹, Severin Zimmermann¹, Brian R. Burg¹, Rahel Strässle¹, Xi Chen¹, Grzegorz Potasiewicz², Piotr Warszyński², Christian Hofmann³, Mario Baum³, Thomas Brunschwiler¹

¹IBM Research - Zurich, Switzerland; ²ICSC, Poland; ³Fraunhofer ENAS, Chemnitz, Germany

2:00 pm

Advanced Mixed-Mode Bending – A Powerful Method for Fracture Mechanical Interface Characterization of Electronic Packages N/A

Juergen Keller¹, Gerd Schlottig², Thomas Brunschwiler², Martin Schulz¹, Bernhard Wunderle³

¹AMIC Angewandte Micro-Messtechnik GmbH, Berlin, Germany; ²IBM Research, Zurich, Switzerland; ³Technical University of Chemnitz, Germany

2:25 pm

Numerical Failure Prediction of Percolating Thermal Underfills N/A

Sridhar Ganesh Kumar¹, Uwe Zschenderlein¹, Florian Schindler-Saefkow², Brian R. Burg³, Gerd Schlottig³, Severin Zimmermann³, Mario Baum⁴, Thomas Brunschwiler³, Bernhard Wunderle¹

¹Technical University Chemnitz, Germany; ²AMIC Angewandte Messtechnik GmbH, Berlin, Germany; ³IBM Research - Zurich, Switzerland; ⁴Fraunhofer ENAS, Chemnitz, Germany

6.2

Optoelectronic Packaging

Session Chairs: Henning Schröder, Fraunhofer IZM | Ulrich Fischer-Hirchert, Hochschule Harz

Location: Ludwig-Dürr-Hall

Silicon Photonics Assembly Industrialisation 252

Mark Andrew Shaw, Massimo Fere, Luca Maggi, Adamo Bazzotti

STmicroelectronics, Milan, Italy

Multichannel Optical Link Based on Polymer Multimode Waveguides for Board-level Interchip Communication 258

Krzysztof Nieweglowski, Lukas Lorenz, Klaus-Jürgen Wolter, Karlheinz Bock

Technical University Dresden, Germany

Wafer-Level Integration Technology for Multi Emitter High Power Fiber Coupled Lasers 265

Lukas Lorenz, Ralf Rieske, Klaus-Jürgen Wolter, Karlheinz Bock, Krzysztof Nieweglowski

Technical University Dresden, Germany

2:50 –
3:55 pm

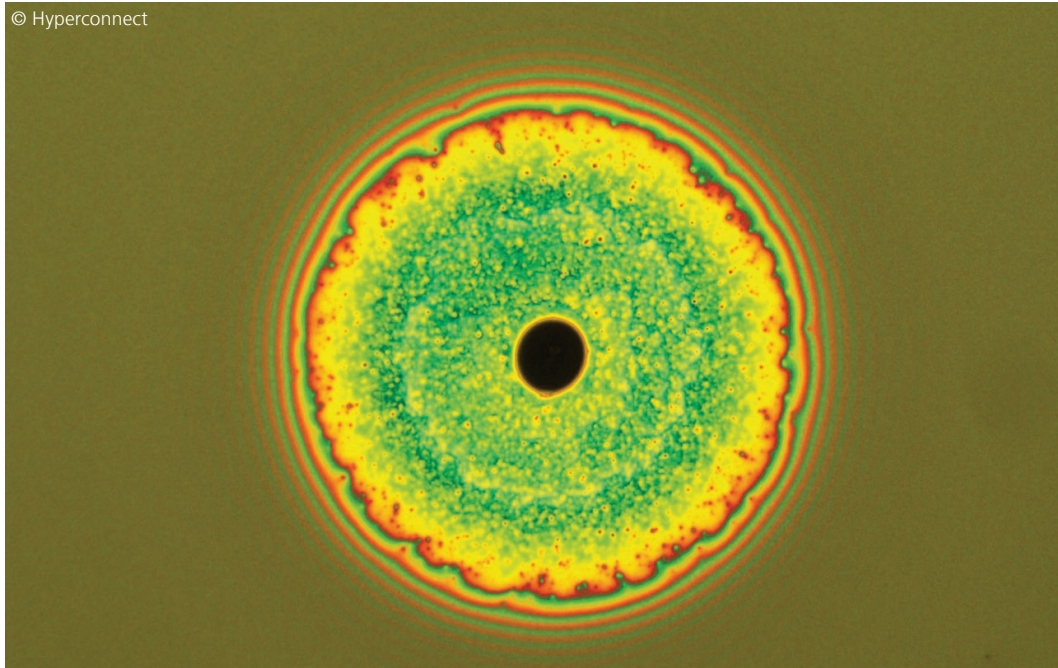
Coffee break & Poster Session B

Location: Poster area

Chair: Nihal Sinnadurai, IMAPS Europe ELC | Thomas Bartnitzek, MicroHybrid

A dust particle trapped in a shallow sea of conductive silver ink

© Hyperconnect



Tuesday 15.9. 3:55 pm – 11:00 pm



7.1

Packaging and Encapsulation

Session Chairs: Grace O'Malley, iNEMI, Klaus-Dieter Lang, Fraunhofer IZM

Location: Hugo-Eckener-Hall

3:55 pm

Development of a Microcamera with Embedded Image Processor Using Panel Level Packaging 271

Andreas Ostmann¹, Christian Boehme², Kai Schrank¹, Klaus-Dieter Lang¹

¹Fraunhofer IZM, Berlin, Germany; ²Technical University Berlin, Germany

4:20 pm

Evaluation of the Dielectric Cure Monitoring of Epoxy Molding Compound in Transfer Molding Process for Electronic Packages 275

Burcu Kaya¹, Jan-Martin Kaiser¹, Karl-Friedrich Becker², Tanja Braun², Klaus-Dieter Lang³

¹Robert Bosch GmbH, Germany; ²Fraunhofer IZM, Berlin, Germany; ³Technische Universität Berlin, Germany

4:45 pm

Functionalized Sensor Packaging Based on Thermoset Injection Molding and Selective Metallization Technology 281

Stefan Beichter, Hagen Müller, Sascha Weser, Thomas Günther, Wolfgang Eberhardt, Heinz Kück, André Zimmermann

Hahn-Schickard, Villingen-Schwenningen, Germany

7.3

Hyperconnect Workshop: Neck-based Electrical Interconnects

Session Chairs: Maaïke M. Visser Taklo, SINTEF

Location: Alfred-Colsman-Hall

3:55 pm

Copper Ink/Paste Considerations for the Formation of Interconnects N/A

Richard John Dixon, Kerry Yu

Intrinsiq Materials, Farnborough, UK

4:20 pm

All-Cu Interconnects for Homogeneous and Heterogeneous Assemblies N/A

Astrid-Sofie Borge Vardøy¹, Jonas Zürcher², Thomas Brunschwiler², Sridhar Ganesh Kumar³, Daniel N. Wright¹, Maaïke M. V. Taklo¹

¹SINTEF, Trondheim, Norway; ²IBM Research - Zurich, Switzerland; ³Technical University Chemnitz, Germany

4:45 pm

Use of Metal Coated Polymer Micro Particles for Electrical Interconnection N/A

Susanne Helland¹, Helge Kristiansen¹, Junlei Tao², David Whalley², Daniel N. Wright³, Maaïke M. V. Taklo³,

¹Conpart AS, Skjetten, Norway; ²Loughborough University, UK; ³SINTEF, Trondheim, Norway

7.2

Advances in Wirebonding

Session Chairs: Thomas Bartnitzek, MicroHybrid | Lars Rebenklau, Fraunhofer IKTS

Location: Ludwig-Dürr-Hall

Biased Humidity Degradation Model for Cu-Al Wire Bonded Contacts Based on Molding Compound Properties 287

Amar Mavinkurve, Rene Rongen, Orla O'Halloran, Leon Goumans, Michiel van Soestbergen, Mark Luke Farrugia

NXP Semiconductors, Eindhoven, Netherlands

Prospects of Wire Bonding as an Approach for Contacting Additive Manufactured Aerosol Jet Printed Structures 297

Christopher Kaestle, Johannes Hoerber, Florian Oechsner, Joerg Franke

Friedrich-Alexander-University Erlangen-Nürnberg, Germany

FEM Analysis of Ball- and Wedge Bond Techniques for the Interconnection Formation on Soft Die Bonds 303

Steffen Wiese, Frank Kraemer

Saarland University, Saarbrücken, Germany

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6:00 pm

Keynote 3: Future 2050 – the Most Important Technologies in the Decades to Come 310

Dr. Ulrich Eberl, Head of Innovation Communication, Siemens AG

Location: Hugo-Eckener-Hall

7:00 –
11:00 pm

Gala Dinner and Three Country Boat Trip

wednesday

AT A GLANCE

8:45 am	Session 8.1: Challenges in 2.5D and 3D Packages Session 8.2: FEM Simulation & Reliability
10:50 am	Coffee break
11:30 am	Session 9.1: Sensor Packaging Session 9.2: Advanced Ceramic Materials & Processes
1:40 pm	Closing session - Awards - Advance information on ESTC 2016 and EMPC 2017

Wednesday 16.9. 8:45 am - 11.30 am



8.1

Challenges in 2.5D and 3D Packages

Session Chairs: Steffen Kroehnert, NANIUM S.A. | Alexander Kaiser, Cicor Advanced Microelectronics & Substrates

Location: Hugo-Eckener-Hall

8:45 am

Si Interposer with 10x100 um Copper TSVs for 2.5D Integration 324

Kai Xue¹, Chongshen Song^{1,2}, Susu Yang¹, Zhenzhong Yong¹, Hengfu Li¹, Xiangmeng Jing^{1,2}, Uihyoung Lee³, Wenqi Zhang^{1,2}

¹NCAP, Wuxi, People's Republic of China; ²Chinese Academy of Sciences, Beijing, People's Republic of China; ³Samsung Electronics Co., Ltd., Seoul, Republic of South Korea

9:10 am

Low-Temperature Refill Process for Through-Silicon-Vias (TSVs) in Stacked Ultra-Thin Chip-on-Wafer by Aerosol Jet Printed Silver 329

Saleh Ferwana¹, Jürgen Keck², Mahadi-UI Hassan¹, Christine Harendt¹, Joachim N. Burghartz¹

¹Institute for Microelectronics Stuttgart (IMS CHIPS), Germany; ²Hahn-Schickard-Institute for Micro Assembly Technology (HSG-IMAT), Stuttgart, Germany

9:35 am

Comparison of Passivation Materials for High Frequency 3D Packaging Application 335

Xiaomin Duan¹, Mathias Böttcher², Stephan Dobritz², David Dahl³, Christian Schuster³, Ivan Ndip¹, Klaus-Dieter Lang¹

¹Fraunhofer IZM, Berlin, Germany; ²Fraunhofer IZM-ASSID, Dresden, Germany; ³Technical University Hamburg-Harburg, Germany

10:00 am

3D RDL with Peripheral Interconnects for Wafer Level Packaging of Electronic Devices N/A

Ayad Ghannam, Alessandro Magnani, David Bourrier, Thierry Parra

³DiS Technologies, Labège, France

10:25 am

eWLB Package for Millimeter Wave Application 339

Ngoc-Hoa Huynh¹, Trotta Saverio¹, Maciej Wojnowski¹, Gerhard Haubner², Sebastian Pahlke², Jean Schmitt², Helmut Mayr¹, Johann Würtele¹, Uwe Rueddenklau¹, Ismail Nasr¹, Jagjit Singh Bal¹

¹Infineon Technologies AG, Munich, Germany; ²Infineon Technologies AG, Regensburg, Germany

10:50 –
11:30 am

Coffee break

Location: Exhibition area

Application of the IForce Piezoresistive Silicon Based Stress Sensor for Prognostic and Health Monitoring Methods 344

Alicja Palczynska¹, Bulong Wu², Dae-Suk Kim², Przemyslaw Gromala¹, Bongtae Han², Tobias Melz³

¹Robert Bosch GmbH, Reutlingen, Germany; ²University of Maryland College Park, USA;

³Fraunhofer LBF, Darmstadt, Germany

Toward Meeting Automotive Reliability Requirements for Flip Chip Packages with Copper Pillar Bump Interconnection N/A

Bradford J Factor, Christophe Zinck, Charles Lee

ASE Group, Waterloo, Belgium

Void Formation in Cu-Sn Solid-Liquid Interdiffusion (SLID) Bonding 350

Knut E Aasmundtveit, Thi-Thuy Luu, Kaiying Wang, Nils Hoivik

HBV - Buskerud and Vestfold University College, Norway

Adequate Mechanical Characterization of PCB Copper Traces for 2nd Level FEM Simulations 356

Steffen Wiese, Frank Kraemer, Daniel Bruch

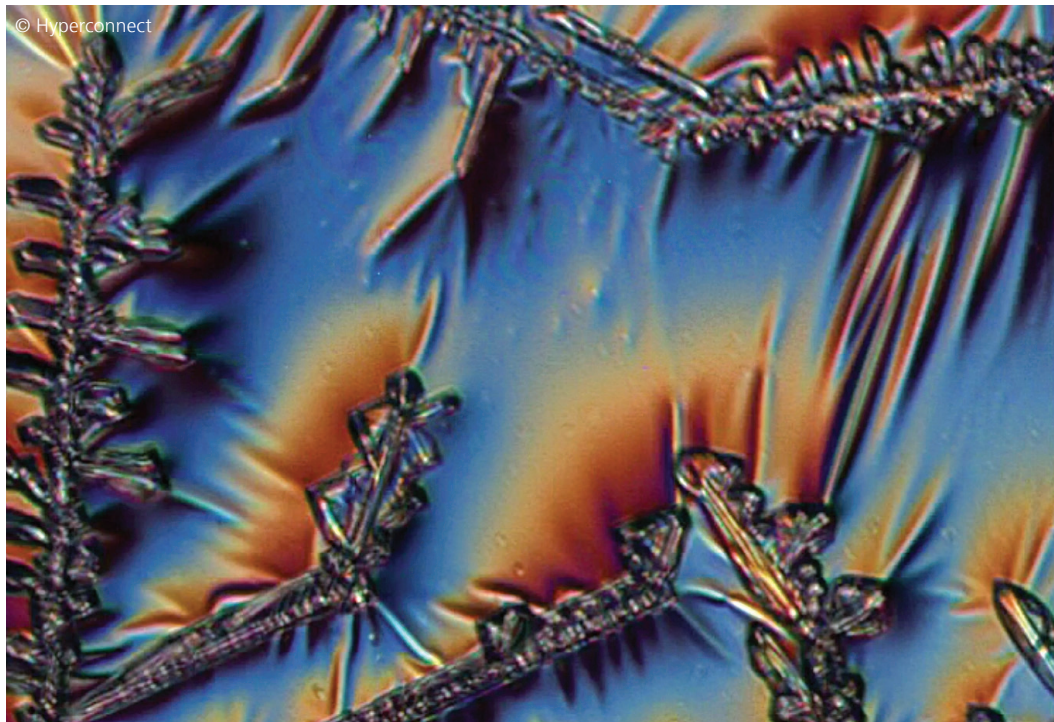
Saarland University, Saarbrücken, Germany

Evaluation of Pattern Scale Stress Effects of 28nm Technology during Wire Bond and Cu-Pillar Flip Chip Assembly 362

Eberhard Kaulfersch¹, Jürgen Auersperg¹, Dirk Breuer², Birgit Brämer¹, Sven Rzepka¹

¹Fraunhofer ENAS, Chemnitz, Germany; ²Globalfoundries Dresden, Germany

Crystal growth



Wednesday 16.9. 11:30 am – 2:00 pm



9.1

Sensor Packaging

Session Chairs: Rolf Aschenbrenner, Fraunhofer IZM | Bernd Römer, Infineon Technologies AG

Location: Hugo-Eckener-Hall

11:30 am

Manufacturing of Flexible (Ultra-)Thin Magnetic Field Sensors 368

Daniel Ernst¹, Michael Melzer², Denys Makarov², Falk Bahr³, Wilfried Hofmann³, Oliver G. Schmidt², Thomas Zerna¹

¹Technical University Dresden, Germany; ²Leibniz Institute for Solid State and Materials Research Dresden, Germany; ³Technical University Dresden, Germany

11:55 am

Integrated High-frequency Sensors in Catheters for Minimally Invasive Plaque Characterization 373

Subhajit Guha¹, Ulrich Schumann³, Farabi Jamal¹, David Wagner², Chafik Meliani¹, Bertram Schmidt², Christian Wenger¹, Jan Wessel¹, Markus Detert²

¹IHP GmbH Innovations for High Performance Microelectronics, Frankfurt (Oder), Germany; ²Chair Otto-von-Guericke-University Magdeburg, Germany; ³Otto-von-Guericke-University Magdeburg, Germany

12:20 pm

Temperature Sensors Based on Thermoelectric Effect 379

Lars Rebenklau¹, Paul Gierth¹, Angelika Paproth¹, Klaus Irrgang², Lutz Lippman², Axel Wodtke³, Klaus Augsburg³, Franz Bechtold⁴, Klaus Augsburg³

¹Fraunhofer IKT, Dresden, Germany; ²Temperaturmeßtechnik Geraberg GmbH, Martinroda, Germany; ³Ilmenau University of Technology, Ilmenau, Germany; ⁴VIA electronic GmbH, Hermsdorf, Germany

12:45 pm

Very Compact, Water-Cooled SiPM Module for PET/MRT Applications 384

Rainer Dohle¹, Ruben Perrone¹, Thomas Rittweg¹, Dr. Vladimir Chernyshev¹, Elke Beyer¹, Jörg Goßler¹, Ilaria Sacco², Peter Fischer²

¹Micro Systems Engineering GmbH, Berg, Germany; ²University of Heidelberg, Germany

1:10 pm

Heat Sensitive Joining Method for Miniaturized Sensor Components in Medical Technology 390

David Wagner, David Ranisch, Bertram Schmidt, Markus Detert
Otto-von-Guericke-University Magdeburg, Germany

1:40 –
2:00 pm

Closing Session – Awards – Advance information on ESTC 2016 and EMPC 2017

Location: Hugo-Eckener-Hall

Chairs: Martin Schneider-Ramelow, Fraunhofer IZM | Markus Detert, IMAPS Deutschland e.V.



Advanced Ceramic Materials & Processes

Session Chairs: Jens Müller, Ilmenau University of Technology | Andrzej Dziedzic, Wrocław University of Technology

Location: Ludwig-Dürr-Hall

Lamination of 3D Structures in LTCC Using Elastomer Bags 394

Artem Ivanov, Andrej Besborodow, Gerhard Sattelberger
University of Applied Sciences, Landshut, Germany

Solder Wettability and Solder Joint Reliability of Rapid Thermal Firing Thick Film Pastes 400

Paul Gierth, Lars Rebenklau
Fraunhofer IKTS, Dresden, Germany

LTCC Technology for Microfluidic Applications Based on the Gap Waveguide Topology 407

Cristina Arenas-Buendia^{1,2}, François Gallée¹, Alejandro Valero-Nogueira², Christian Person¹
¹*LabSticc- Institut-Mine-Télécom- Télécom Bretagne, Brest, France;* ²*Universitat Politècnica de Valencia, Spain*

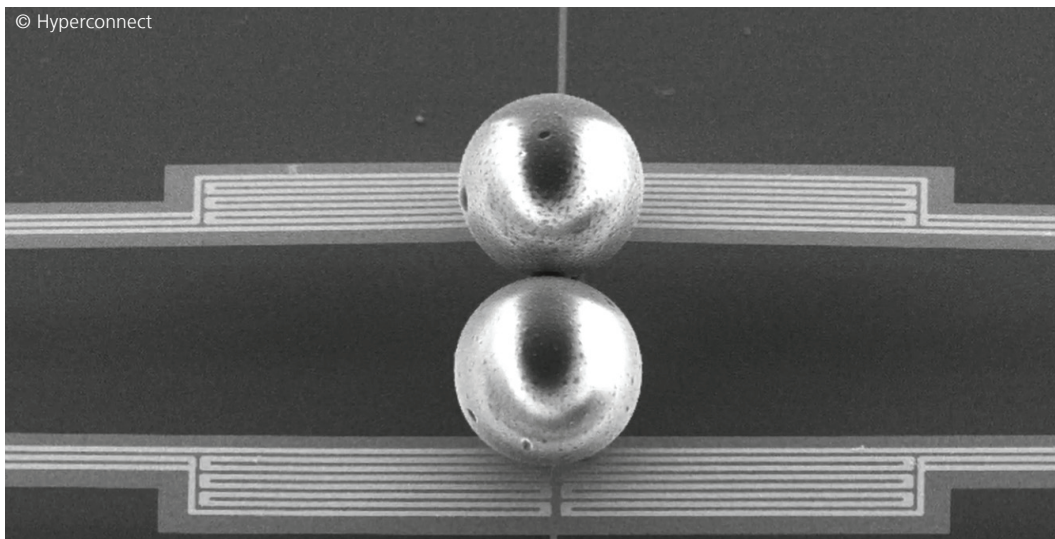
Thickfilm Ceramic Ready for MCM Interposer 412

Sebastian Löffler¹, Günter Reppe¹, Angela Rebs¹, Marcus Herrmann¹, Christopher Mauermann¹, Alexander Kaiser², Karl-Heinz Fritz³
¹*Cicor Advanced Microelectronics & Substrates, RHe Microsystems GmbH, Radeberg, Germany;*
²*Cicor Advanced Microelectronics & Substrates, Reinhard Microtech GmbH, Ulm, Germany;*
³*Cicor Advanced Microelectronics & Substrates, Cicorel AG, Boudry, Switzerland*

Advancing Packaging Solutions Using 3D Capabilities of Ceramic Multilayers 417

Torsten Thelemann, Thomas Bartnitzek, Karl-Heinz Suphan, Stefan Apel
Micro-Hybrid Electronic GmbH, Hermsdorf, Germany

Particle pair experiments are used to quantify the heat flow increase by enhancing the contact area



poster session A

Monday 14.9. 3:40 – 4:50 pm

Session Chairs: Nihal Sinnadurai, IMAPS Europe ELC | Karl-Heinz Drüe, Ilmenau University of Technology

Location: Poster area

- A1 Investigation of Fracture Mechanisms and Bond-Line of Insert Bump Bonding Specimens 423**
Jae Hak Lee, Jun Yeob Song, Tae Ho Ha, Chang Woo Lee, Seung Man Kim, Yong Jin Kim, Young Kang Lee
Korea Institute of Machinery and Materials (KIMM), Republic of South Korea
- A2 Wire Bonding of Au-coated Ag Wire: Wire Properties, Bondability and IMCs Formation 427**
Yi-Wei Tseng, Fei-Yi Hung, Truan-Sheng Lui
National Cheng Kung University, Taiwan, Republic of China
- A3 Bump Scaling and Shear Test Requirements 431**
René P. Zingg
Zinan GmbH, Ismaning, Switzerland
- A4 Isotropic Conductive Paste Based on Epoxy with Ag Coated Cu and SAC305 Solder 434**
Yong Sung Eom, Hak-Son Lee, Hyun-Cheol Bae, Kwang-Seong Choi, Jin-Ho Lee
ETRI, Daejeon, Republic of South Korea
- A5 Reliability Prediction for Textile Packages 439**
Hartmann Hieber
ICR, Germany
- A6 Influence of the PCB Attachment on the Mechanical Properties in Modal Analysis 444**
Boleslav Psota, Ivan Szendiuch, Alexandr Otáhal
University of Technology, Brno, Czech Republic
- A7 A Crack Propagation Analysis of Multilayer Ceramic Capacitors 448**
Joseph Al Ahmar, Steffen Wiese
Saarland University, Saarbrücken, Germany

- A8 Conformal Barrier and Seed Layers Deposition for Voids Free Copper Electroplating in High Aspect Ratio TSV 452**
 Susu Yang, Wan Cheng, Heng Wu, Chongshen Song, Wenqi Zhang
NCAP, Wuxi, People's Republic of China
- A9 Functional Coating of Screens/Stencils for Thick-film Application 456**
 Ralf Weber
KOENEN GmbH, Munich, Germany
- A10 Design, Setup and Test of a Heterogeneous Module and Characterization by Stress Measurement 458**
 Thomas Schreier-Alt¹, Claus Reitlinger², Franz Kaul², Thomas Metzger², Kees Revenberg³
¹*Fraunhofer IZM, Berlin, Germany*; ²*EPCOS AG, Germany*; ³*MASER, Netherlands*
- A11 WiCkeD Tool-Based Design Method for Divide-by-2 Circuits with Multiple Loads 463**
 Raphael Ronald Noal Souza¹, Agord de Matos Pinto Jr.¹, Yuzo Iano², Leandro Manera²
¹*IC-Brazil Program, Brazil*; ²*State University of Campinas - Unicamp, Brazil*
- A12 Optimize Product Cost and Performance with System-level 3D Chip, Package, Board Co-design 468**
 Humair Mandavia¹, Kazunari Koga¹, Ralf Brüning², Nikola Kontic³
¹*Zuken, Inc. Milpitas, CA, USA*; ²*Zuken GmbH, Paderborn, Germany*; ³*Zuken UK Ltd, Bristol, UK*
- A13 Thermal Consideration for Systems with High Speed Memories 472**
 Andy Heinig, Dimitrios Papaioannou, Robert Fischbach
Fraunhofer IIS/EAS, Dresden, Germany

poster session B

Tuesday 15.9. 2:50 – 3:55 pm

Session Chairs: Nihal Sinnadurai, IMAPS Europe ELC | Thomas Bartnitzek, MicroHybrid

Location: Poster area

- B1 Cost-Effective Thermoelectric Cooler Packaging Using Hybrid Cu Paste 478**
Hyun-Cheol BAE, Yong Sung EOM, Aesun Oh, Haksun Lee, Kwang-Sung Choi, Jin-Ho Lee
ETRI, Daejeon, Republic of South Korea
- B2 Temperature Stabilized Chip Expander 482**
Michal Řezníček^{1,3}, Martin Buršík^{1,2,3}, Jaroslav Jankovský^{1,3}, Václav Šimek¹
¹*Brno University of Technology, Brno, Czech Republic*; ²*Central European Institute of Technology, Brno, Czech Republic*; ³*SEANT Technology s.r.o., Brno, Czech Republic*
- B3 Investigation on the Suitability of Electrically Conductive Adhesives for the Die-Attachment of Power Devices 488**
Eike Moeller¹, Lars Middelstaedt², Folkhart Grieger², Andreas Lindemann², Jürgen Wilde¹
¹*University of Freiburg, Germany*; ²*Otto-von-Guericke-University, Magdeburg, Germany*
- B4 Impact Strength of Sn-58mass%Bi/Cu Joints by Laser Process 493**
Hiroshi Nishikawa, Shinya Kubota
Osaka University, Japan
- B5 Application of the System Simulation Methodology for the Package Design and Optimization N/A**
Sergey Yuferev
Infineon Technologies, Austria
- B6 Lapping and Polishing of Different LTCC Substrates for Thin Film Applications 497**
Nam Gutzeit, Michael Fischer, Heike Bartsch, Jens Müller
Ilmenau University of Technology, Ilmenau, Germany

- B7 Fabrication of Elastic Bumps and Narrow Metal Patterning for Si Based Flexible Electronics 501**
Joon Yub Song, Yongjin Kim, Chang Woo Lee, Tae Ho Ha, Jae Hak Lee, Seung Man Kim, Ju Yong Lee
Korea Institute of Machinery and Materials (KIMM), Republic of South Korea
- B8 CFD Simulations of Wave Soldering on Through-Hole Printed Circuit Assemblies 505**
Adam Yuile¹, Steffen Wiese¹, Heinz Wohlrabe²
¹*Saarland University, Saarbrücken, Germany*; ²*Dresden University of Technology, Dresden, Germany*
- B9 Electrical Tensile Test 511**
Hao-Wen Hsueh, Fei-Yi Hung, Truan-Sheng Lui, Li-Hui Chen
National Cheng Kung University, Taiwan, Republic of China
- B10 Development of a New Piezoelectric Sensor to Measure Loads 515**
Sophie Engelsberger¹, Anton Harasim¹, Tobias Schmidt²
¹*University of Applied Sciences Landshut, Germany*; ²*CeramTec, Germany*
- B11 Large Area, Transparent Heaters Based on Carbon Nanotubes and Graphene Platelets for Heated Glass Application 520**
Grzegorz Wroblewski¹, Marcin Sloma^{1,2}, Daniel Janczak¹, Lucja Sarapuk-Dybowska^{1,2}, Malgorzata Jakubowska^{1,2}
¹*Warsaw University of Technology, Warsaw, Poland*; ²*Institute of Electronic Materials Technology, Warsaw, Poland*
- B12 Plasma Dicing 4 Thin Wafers 524**
Reinhard Windemuth
Panasonic Automotive & Industrial Systems Europe GmbH