Opening

Peter Fuchs, Graz 2023 Local Organiser **Monday April 17 2023 08:45**

Welcome speech

Last update 14-04-2023 10:25

Industry Keynotes

09:00 Monday April 17 2023 *Chaired by Bart Vandevelde, Chris Bailey*

09:00	Polymeric materials for reliable microelectronics: application-specific characterization and simulation approaches; Peter Fuchs, Polymer Competence Center Leoben GmbH
09:30	System engineering of optical sensors – managing complexity by simulation; Markus Sonnemann, ams-Osram
10:00	Advanced substrates for advanced packaging - The need for virtual toolset in electronic system development; Hannes Voraberger, VP Corporate R&D, AT&S

10:30 Coffee break

11:00 Award Ceremony - Sven Rzepka, Kouchi Zhang

Technical Keynotes — Session 1

Chaired by Kouchi Zhang, Willem van Driel

Monday April 17 2023 **11:15**

11:15
30mn

A 15-year journey of research on electromigration

Xuejun Fan, *Lamar University, Beaumont, Texas, USA*

11:45
30mn

AI and Feature-Vector Based Damage Monitoring and Remaining Useful-Life Assessment for Electronics Assemblies in Mechanical Shock and Vibration

Pradeep Lall, Tony Thomas, *Auburn University, Auburn, AL, USA*

12:30 **Lunch**

Session 2 — AI and Machine Learning in Multi-Physics

13:30 Monday April 17 2023 Chaired by Bernhard Wunderle, Adwait Inamdar

13:30
20mn

Using Grid Search Methods and Parallel Computing to Reduce AI Training Time for Reliability Lifetime Prediction of Wafer-Level Packaging

Chih-Yi, Chang, Kuo-Ning, Chiang, Chih-Hsuan, Lee, *Department of Power Mechanical Engineering, National Tsing Hua University, Hsinchu, Taiwan*

13:50
20mn

AI surrogate models for error analysis in optical systems

Peter Meszmer, Neha Mundada, Majid Tavakolibasti, Bernhard Wunderle, *Chemnitz University of Technology, Faculty for electrical engineering and information technologies, Chair materials and reliability of microsystems, 09107 Chemnitz, Germany*

14:10
20mn

A Reliability Assessment Approach for A LIF Neurons Based Spiking Neural Network Circuit

Bo Sun, Jingying Li, Xiaoyan Xie, *Guangdong University of Technology*

14:30
20mn

Probabilistic and physics-informed machine learning for predictive maintenance

Phan-Anh Vu [1], Emanuel Aldea [2], Mounira Bouarroudj [3], Sylvie Le Hégarat-Mascle [2]
[1] *GIPSA-Lab, Grenoble Alpes University*
[2] *SATIE Laboratory, Paris-Saclay University*
[3] *SATIE Laboratory, Paris EST Créteil University*

Material modelling techniques — Session 3

Chaired by Dag Anderson, Dong Hu

Monday April 17 2023 **13:30**

13:30
20mn

Impact of Viscoelastic Properties on Package Warpage Prediction

Daniela Spini, Marco Rovitto, *STMicroelectronics, Agrate Brianza, Italy*

13:50
20mn

Prediction of thermo-mechanical properties of PCB conductive layers using convolutional neural networks

Mariia Shevchuk [1], Christian Schipfer [1], Matthias Haselmann [1], Qi Tao [2], Peter Fuchs [1]
[1] Polymer Competence Center Leoben (PCCL), Leoben, Austria
[2] Austria Technologie & Systemtechnik, Leoben, Austria

14:10
20mn

Modelling Creep Behaviour in Sintered Silver using User-Programmable Features in ANSYS

Freerik Forndran [1], Jens Heilmann [2], Martin Metzler [1], Markus Leicht [1], Bernhard Wunderle [2]
[1] Vitesco Technologies Germany Gmbh
[2] Chemnitz University of Technology

14:30
20mn

Fatigue behavior of Au, Cu and PCC fine wire bond connections for power LED applications

Bernhard Czerny, Sebastian Schuh, *University of applied sciences Burgenland*

Session 4 — Thermal Characterization

15:00 Monday April 17 2023

Chaired by Marcin Janicki, Elke Kraker

15:00
20mn

Microstructure Analysis Based on 3D reconstruction Model and Transient Thermal Impedance Measurement of Resin-added Hybrid Ag Sintering Material for High power RF device

Xiao Hu [1], Henry Martin [2], René Poelma [3], JianLin Huang [4], Hans van Rijckevorsel [4], Huib Scholten [4], Edsger Smits [5], Willem van Driel [3], GuoQi Zhang [3]
[1] Delft University of Technology, Department of Microelectronics, Delft, The Netherlands; Ampleon B.V., Nijmegen, The Netherlands.
[2] Delft University of Technology, Department of Microelectronics, Delft, The Netherlands; Chip Integration Technology Center (CITC), Nijmegen, The Netherlands.
[3] Delft University of Technology, Department of Microelectronics, Delft, The Netherlands.
[4] Ampleon B.V., Nijmegen, The Netherlands.
[5] Chip Integration Technology Center (CITC), Nijmegen, The Netherlands.

15:20
20mn

Failure Analysis of Sintered Layers in Power Modules Using Laser Lock-in Thermography

Sara Panahandeh [1], Daniel May [1], Daniel May [2], Corinna Grosse-Kockert [1], Bernhard Wunderle [2], Mohamad Abo Ras [1]
[1] Berliner Nanotest und Design GmbH, Berlin, Germany
[2] Technische Universität Chemnitz, Chemnitz, Germany

15:40
20mn

Validation of the thermal path with one phase liquid cooling for HPC in harsh environment

Tobias Grün [1], Daniel May [1], Hubert Straub [2], Gromala Przemyslaw Jakub [2], Willem Verleysen [3], Bernhard Wunderle [1]
[1] Technische Universität Chemnitz, Germany
[2] Robert Bosch GmbH, Reutlingen, Germany
[3] Materialise, Leuven, Belgium

16:00
20mn

Thermal management of vertical GaN transistors

Lisa Mitterhuber [1], Verena Leitgeb [1], Markus Krainz [1], Robert Strauss [1], Thomas Kaden [2], Eldad Bahat Treidel [3], Frank Brunner [3], Christian Huber [2], Elke Kraker [1]
[1] Materials Center Leoben Forschung GmbH, Roseggerstr. 12, 8700 Leoben, Austria
[2] Robert Bosch GmbH, Robert-Bosch-Campus 1, 717272 Renningen, Germany
[3] Ferdinand-Braun-Institut gGmbH, Gustav-Kirchhoff-Strasse 4,12489 Berlin, Germany

Life time simulations — Session 5

Chaired by XueJun Fan, Ilko Schmadlak

Monday April 17 2023 **15:00**

15:00 20mn

Characterization and simulation of delamination on package-level considering sub-critical interfacial fracture-parameters under cyclic loading.

Rudolf Kniely, *ams OSRAM Group, Chemnitz University of Technology*
Jens Heilmann, *Chemnitz University of Technology*
Fabian Huber, *ams OSRAM Group*
Bernhard Wunderle, *Chemnitz University of Technology, Fraunhofer ENAS*

15:20 20mn

Impact of mechanical material modeling on the solder joint fatigue analysis of a leadless package mounted at different positions inside a generic cast aluminum ECU

Martin Niessner [1], Attila Gyarmati [2], Herbert Guettler [2]
[1] *Infineon Technologies AG, Neubiberg, Germany*
[2] *MicroConsult Engineering GmbH, Bernstadt, Germany*

15:40 20mn

FEA-based Layout Optimization of E1.S Solid-State Drive to Improve Thermal Cycling Reliability

Eunho Oh, Junghoon Kim, Yusuf Cinar, Woosung Kim, Byungil Lee, Myungryul Jang, Namho Song, Sungki Lee, Jonggyu Park, *Solution Development Team, Memory Business, Samsung Electronics*

16:00 20mn

Influence of the Bond Foot Angle on Active Power Cycling Lifetime of Wire Bonds

Marcel Sippel [1], Yi Fong Tan [1], Ralf Schmidt [2], Pietro Botazzoli [2], Mario Sprenger [1], Jörg Franke [1]
[1] *Institute for Factory Automation and Production Systems (FAPS), Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany*
[2] *Siemens AG, Erlangen, Germany*

16:20 **Coffee break**

Session 6 — AI and Machine learning techniques for thermo-mechanical reliability

16:45 Monday April 17 2023 Chaired by Jeroen Zaal, Karsten Meier

16:45
20mn

Enrichment of the reliability regression models by the transfer AI modeling technology

Cadmus Yuan [1], Jing Yu Wang [2], Cheng En Lee [2], Kuo-Ning Chiang [2]
[1] *Feng Chia University*
[2] *National Tsing Hua University*

17:05
20mn

Application of AI-enabled Simulation in Power Package Development

Haibo Fan, *Nexperia Hong Kong*
Peilun Yao, *Hong Kong University of Science and Technology, Hong Kong,*
Haibin Chen, *The Hong Kong University of Science and Technology (Guangzhou), Guangzhou, Guangdong Province, P.R. China*

17:25
20mn

Thermo-Mechanical Super-Element of a Packaged-Chip Model for the Reintegration of Reduced State-Space Models into Finite Element Analysis Tools

Chisom Bernard Umunnakwe [1], I. Zawra [1], E. B. Rudnyi [2], M. Niessner [3], T. Bechtold [1]
[1] *Jade University of Applied Sciences, Wilhelmshaven, Germany*
[2] *Cadfem GmbH, Munich Germany*
[3] *Infineon Technologies AG, Neubiberg, Germany*

17:45
20mn

Influence of Finite Element Supported Data Augmentation on Deep Learning Algorithm for Defect Detection using Infrared Thermography

Kaushal Arun Pareek, *Chemnitz University of Technology, Germany*

Computational Efficient Techniques for Multi-Physics — Session 7

Chaired by Martin Niessner, Tamara Bechtold

Monday April 17 2023 **16:45**

16:45
20mn

Model order reduction for nonlinear modal analysis of MEMS devices: theory and recent advancements

Andrea Opreni, *Engineering MEMS Design, Robert Bosch GmbH, Tübinger Straße 123, 72703 Reutlingen, Germany*
Peter Degenfeld-Schonburg, *Corporate Research, Robert Bosch GmbH, Robert Bosch Campus 1, 71272 Renningen, Germany*

17:05
20mn

PCBA reliability simulation in the cloud

Harald Ziegelwanger, *Elastic-Simulations GmbH*

17:25
20mn

Matrix Interpolation-Based Parametric Model Order Reduction of Electromagnetic Systems with Translational Movement

Arwed Schütz, Tamara Bechtold, *Jade University of Applied Sciences, Wilhelmshaven, Germany*

17:45
20mn

Analytical Solution for Moisture Diffusion with Initial Non-Uniform Moisture Concentration used in Bake Time Study in Electronics Packaging

Mukunda Khanal, Jiang Zhou, Xuejun Fan, *Department of Mechanical Engineering, Lamar University Beaumont, TX USA*

19:00 **Dinner downtown Am Schlossberg**

Session 8 — Posters Interactive Session

08:30 Tuesday April 18 2023 Chaired by Sven Rzepka, Véronique Rochus

PID 1

Studying Asymmetric Warpage Behavior of Panel-Level Packages Using Process Modeling Techniques and Viscoelasticity Theory

Z. Shu, K. N. Chiang, *Advanced Microsystem Packaging and Nano-Mechanics Research Lab +Dept. of Power Mechanical Engineering, National Tsing Hua University, Hsinchu, Taiwan, R.O.C*

PID 3

Improved nanoindentation methods for polymer based multilayer film cross-section

Petra Christöfl [1], Joseph E. Jakes [2], Jutta Geier [1], Gerald Pinter [3], Gernot Oreski [1], Don Stone [4], Christian Teichert [5]
[1] *Polymer Competence Center Leoben GmbH, Leoben, Austria*
[2] *USDA Forest Service, Forest Product Laboratory, Madison, Unites States*
[3] *Montanuniversitaet Leoben- Materials Science and Testing of Polymers, Leoben, Austria*
[4] *University of Wisconsin-Madison, Madison, United States*
[5] *Montanuniversitaet Leoben-Chair of Physics, Dept. Physics, Mechanics, and Electrical Engineering, Leoben, Austria*

PID 4

Power Semiconductor Die Passivation Layer Stress Mechanism Investigation and Optimization by Numerical Analysis

Zhou Zhou [1], Haibo Fan [1], Adam Brown [2]
[1] *Nexperia Hong Kong*
[2] *Nexperia UK*

PID 5

The Effect of Geometric and Material Uncertainty on Debonding Warpage in Fan-Out Panel Level Packaging

H. L. Chen, K. N. Chiang, *Advanced Microsystem Packaging and Nano-Mechanics Research Lab +Dept. of Power Mechanical Engineering, National Tsing Hua University, Hsinchu, Taiwan, R.O.C*

PID 6

FEM simulation of influence of different polymeric module materials and layouts on thermomechanical deformations in strings of shingled solar cells

Margit Lang [1], Gernot Oreski [1], Eric Helfer [1], Peter Fuchs [1], Andreas Halm [2], Markus Klenk [3]
[1] *Polymer Competence Center Leoben GmbH, Leoben, Austria*
[2] *International Solar Energy Research Center Konstanz, Konstanz, Germany*
[3] *Zurich University of Applied Science, Zurich, Switzerland*

PID 7

Finite Element-Based Monitoring of Solder Degradation in Discrete SiC MOSFETs

Borja Kilian [1], Jonas Gleichauf [1], Youssef Maniar [1], Olaf Wittler [2], Martin Schneider-Ramelow [3]
[1] Robert Bosch GmbH, Corporate Sector Research and Advance Engineering, Renningen, Germany
[2] Fraunhofer IZM, Department Environmental and Reliability Engineering, Berlin, Germany
[3] Technical University Berlin, Faculty IV - Electrical Engineering and Computer Science, Berlin, Germany

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PID 10

Investigating the Occurrence of Bifurcation in Large Metalized Wafers using ANSYS Layered Shell Elements

Vincenzo Vinciguerra [1], Mohamed Boutaleb [2], Giuseppe Luigi Malgioglio [1], Antonio Landi [1], Fabrice Roqueta [2], Marco Renna [1]
[1] STMicroelectronics, ADG R
[2] ADG-DFD, STMicroelectronics Tours, 10 rue Thalès de Milet 37071 Tours Cedex 2, France

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PID 11

Influence of the quality of material models on warpage and lifetime prediction by finite element simulation

Julia Zündel, Markus Weninger, Thomas Krivec, Markus Frewein, Sebastian Waschnig, *AT*

PID 12

Simulating and optimizing the induction heating temperature field of horizontal 6 inches 4H-SiC epitaxial CVD reactor

Zhuorui Tang [1], Jing Tian [1], Chaobin Mao [2], Nan Zhang [2], Jiyu Huang [2], Jiajie Fan [1], Guoqi Zhang [3]
[1] Fudan University
[2] Jihua Laboratory
[3] Delft University of Technology

PID 15

Hydrolysis mechanism analysis of (Ca, Sr)AlSiN3:Eu2+ red phosphor aged under both pressure cooker test and 85°C&85%RH test: kinetics modelling and first-principle calculation

Minzhen Wen [1], Baotong Guo [1], Shanghuan Chen [2], Xiao Hu [3], Xuejun Fan [4], Guoqi Zhang [3], Jiajie Fan [1]
[1] Fudan University
[2] Hohai University
[3] Delft University of Technology
[4] Lamar University

PID 24

Deformation analysis of QFN packages for validation of thermo-mechanical finite element simulations

Chinmay Nawghane [1], Thomas Moncond'huy [2], Bart Vandevelde [1], Pierre Vernhes [2], Rodolfo Cruz [2]
[1] *Imec, Leuven, Belgium*
[2] *Insidix, Seyssins, France*

PID 29

Thermomechanical and electrical material characterization for a DLP printing process simulation of electrically conductive parts

Andreas Thalhamer [1], Elisabeth Rossegger [1], Siegfried Hasil [1], Katja Hrbinič [1], Viktoria Feigl [1], Martin Pfost [2], Peter Fuchs [1]
[1] *Polymer Competence Center Leoben GmbH (PCCL), Leoben, Austria*
[2] *TU Dortmund University, Chair of Energy Conversion, Dortmund, Germany*

PID 32

Determination of the Equivalent Thickness of a Taiko Wafer using ANSYS Finite Elements Analysis

Correspondant: Vincenzo Vinciguerra, STMicroelectronics

PID 36

A 3-axis capacitive nonlinear MEMS energy harvester simulation: unidirectivity no more?

Bogdan Vysotskyi, Veronique Rochus, *IMEC, Kapeldreef 75, 3001 Leuven, Belgium*

PID 39

Frame detachment simulation of PV modules under mechanical load

Daniel Christopher Joseph, Anna Saperas López, Pascal Romer, Andreas J. Beinert,
Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

PID 41

Predictive thermo-mechanical models for the quantification of electro-mechanical interactions during production and field-life

J.J.M. Zaal [1], C. He [1], J.A.M. Claes [1], J. van Herk [1], A.O. Adojutelegan [1], X. Cheng [2]
[1] *NXP Semiconductors, Nijmegen, the Netherlands*
[2] *NXP Semiconductors, Chandler, USA*

PID 42

Evaluation of thermomechanical behavior of electronic devices through the use of a reduced order modelling approach

Markus Weninger [1], Julia Zündel [1], Markus Frewein [1], Thomas Krivec [1], Sebastian Waschnig [1], Peter Fuchs [2], Christian Obst [3]
[1] *AT&S Austria Technologie & Systemtechnik Aktiengesellschaft, Austria*
[2] *Polymer Competence Center Leoben, Austria*
[3] *Prime Aerostructures , Austria*

PID 46

Investigation of copper corrosion mechanisms in thin layers using small-scale test structures and simulation

Correspondant: Hasan Sadat Nabi, TU Wien

PID 49

A simulation-based design approach for optimized performance of Cu-Mo-Cu clips in high-power semiconductor modules

Matt Packwood, Xiang Li, Muhammad Morshed, Harley Neal, Yangang Wang, *Dynex Semiconductor Ltd., Lincoln, United Kingdom*

PID 50

Determination of Lemaitre Damage Parameters for Al H11 Wire Material

Simon Kuttler, *Technical University of Berlin, Berlin, Germany*
Bilen Emek Abali, *Uppsala University, Uppsala, Sweden*
Olaf Wittler, *Fraunhofer IZM, Berlin, Germany*

PID 56

Characterization of polysilicon strength at stoppers through on-chip testing

Tiago Vicentini Ferreira do Valle [1], Aldo Ghisi [1], Biagio De Masi [1], Stefano Mariani [1], Francesco Rizzini [2], Gabriele Gattere [2], Carlo Valzasina [2]
[1] *Department of Civil and Environmental Engineering, Politecnico di Milano, Italy*
[2] *STMicroelectronics, Cornaredo (MI), Italy*

PID 57

Models of Bifurcation and Gravity Induced Deflection in Wide Band Gap 4H-SiC Semiconductor Wafers

Vincenzo Vinciguerra, Giuseppe Luigi Malgioglio , Antonio Landi , Marco Renna, *STMicroelectronics, ADG R*

PID 61

TC Reliability Enhancement Technology for SSD with Low Temperature Solder Paste Material

Junghoon Kim, Yong Jung, Eunho Oh, Yusuf Cinar, Jongwook Jeong, Sungki Lee , Jonggyu Park, *Solution Development Team, Samsung Electronics*

PID 65

Characterization and simulation of four bending test to estimate resin-copper adhesion

Alessandro Sitta [1], Giuseppe Mauromicale [1], Marco Alfio Torrisi [1], Gaetano Sequenzia [2], Giuseppe D'Arrigo [3], Michele Calabretta [1]
[1] *STMicroelectronics*
[2] *Università di Catania*
[3] *Consiglio Nazionale delle Ricerche*

PID 66

Fully-Coupled Transient Modeling of Highly Miniaturized Electrostatic Pull-In Driven Micropumps

Wolfgang Hölzl, Martin Seidl, Gabriele Schrag, *Technical University of Munich, Munich, Germany*

PID 67

Simulation methods for LED multi-domain models parameter extraction

Reem Al-zubaidi, *Department of Electron Devices, Faculty of Electrical Engineering and Informatics, Budapest University of Technology and Economics, Budapest, Hungary*

PID 80

Analyzing the Impact of Die Positions inside the Power Module on the Reliability of Solder Layers for different power cycling scenarios

Bhanu Pratap Singh [1], Shirong Li [1], Khaled Redwan Choudhury [2], Staffan Norrga [1], Hans-Peter Nee [1]
[1] *KTH Royal Institute of Technology, Stockholm, Sweden*
[2] *University of Warwick, Coventry, UK*

PID 84

Manufacturing of an In-Package Relative Humidity Sensor for Epoxy Molding Compound Packages

Romina Sattari, Henk van Zeijl, Guoqi Zhang, *Delft University of Technology*

PID 86

Computational Simulation on Micro-cantilever Bending test of Sintered Cu for Power Electronic Devices

Leiming Du [1], Dong Hu [1], René Poelma [2], Willem Van Driel [3], Kouchi Zhang [1]
[1] *EEMCS Faculty, Delft University of Technology, Delft, the Netherlands*
[2] *Nexperia, Nijmegen, the Netherlands*
[3] *Signify, Eindhoven, the Netherlands*

PID 91

Application of Finite Element Simulation for Training an AI Algorithm to Detect Wire Bond Lift-Off in Power Modules

H. Huai, N. Chidanandappa, J. Wilde, *Albert-Ludwigs-University Freiburg, Department for Microsystems Technology, Freiburg, Germany*

PID 92

Simulation of Roll-to-Roll UV Nano Imprint Lithography

Correspondant: Johannes Götz, JOANNEUM RESEARCH Forschungsgesellschaft mbH

PID 96

Stress Recovery in the Reduced Space for Parametric Reduced Models in Microelectronics

Ibrahim Zawra [1], C. B. Umunnakwe [1], M. van Soestbergen [2], E. B. Rudnyi [3], T. Bechtold [1]
[1] *Jade University of Applied Sciences, Wilhelmshaven, Germany*
[2] *NXP Semiconductors, Nijmegen, Netherlands*
[3] *Cadfem GmbH, Munich, Germany*

PID 110

Effect of Thermomigration on Electromigration in SWEAT Structures

Zhen Cui [1], Xuejun Fan [2], Guoqi Zhang [1]
[1] *Department of Microelectronics, Delft University of Technology, Delft, Netherlands*
[2] *Department of Mechanical Engineering, Lamar University, Beaumont, TX USA*

PID 111

FE-Analysis of deformation state during a four-point bending experiment on soldered MLCCs

Shiva Goud Anthati, Vlad Serea, Erik Wiss, Steffen Wiese, *Saarland University, Chair of Microintegration and Reliability*

PID 123

Thermal Stresses in a Bi-Layer Assembly in Electronics Packaging

Mathews T Vellukunnel, Mukunda Khanal, Xuejun Fan, *Department of Mechanical Engineering, Lamar University Beaumont TX, USA*

PID 125

Anand model calibration for SAC305 solder joints based on the evolution of the shear stress and strain hysteresis loops for different thermal cycling conditions

Jean-Baptiste Libot [1], Zoé Bussière [1], Lara Mahfouz [1], Joël Alexis [2], Olivier Dalverny [2]
[1] *Safran, France*
[2] *INP Toulouse - ENIT, France*

PID 127

Comparison of finite elements approaches for Si wafer buckling calculation

Camille Sautot [1], Jean-Charles Craveur [2], Mohamed Boutaleb [3], Fabrice Roqueta [3]
[1] *ISMANS-CESI, Le Mans, France; CNRS LAUM - UMR 6613, Le Mans, France*
[2] *ISMANS-CESI, Le Mans, France*
[3] *ADG-DFD, STMicroelectronics Tours, Tours, France*

10:00 **Coffee time**

Session 9 — Thermal Modelling

11:00 Tuesday April 18 2023 Chaired by Cadmus Yuan, Lisa Stencel

11:00
20mn

Ab-initio derived force field potential for the accurate simulation of thermal transport in AlN

Simon Fernbach, Elke Kraker, Natalia Bedoya-Martínez, *Microelectronics Materials Center Leoben Leoben, Austria*

11:20
20mn

Frequency Analysis of Dual-Phase-Lag Heat Transfer Model

Artur Sobczak, Grzegorz Jabłoński, Marcin Janicki, *Łódź University of Technology, Poland*

11:40
20mn

Efficient Simulation of the Effect of Solder Voids and Tilting on the Cooling of Power Semiconductors

Nils Jahn, Martin Pfost, *TU Dortmund University, Dortmund, Germany*

12:00
20mn

Trigger specific failure in LED system by power and duty cycle patterns life time testing

Julien Magnien, Lisa Mitterhuber, Katrin Fladischer, Jördis Rosc, Elke Kraker, *Materials Center Leoben Forschung GmbH, Roseggerstraße 12, 8700 Leoben, Austria*

Advanced Material Characterisation — Session 10

Chaired by Peter Fuchs, Xiao Hu

Tuesday April 18 2023 **11:00**

11:00
20mn

Leadframe-Epoxy Moulding Compound Adhesion: A Micromechanics-driven Investigation

Alessandro Della Porta [1], Stefano Mariani [2], Marco Rovitto [1], Luca Andena [2], Samuele Zalaffi [1]
[1] *STMicroelectronics, Agrate Brianza, Italy*
[2] *Politecnico di Milano, Milano, Italy*

11:20
20mn

MEMS Cantilever for High-Cycle Fatigue Testing of thin Metal Films

N. Jöhrmann [1], C. Stöckel [2], B. Wunderle [1]
[1] *TU Chemnitz, Germany*
[2] *Fraunhofer ENAS, Chemnitz, Germany*

11:40
20mn

Degradation of silicone-based sealing materials used in microelectronics

Maryam Yazdan Mehr [1], Pejman Hajipour [2], H.van Zeijl [1], W.D. van Driel [3], Thierry Cooremans [4], Francois De Buyl [4], G.Q. Zhang [1]
[1] *Faculty EEMCS, Delft University of Technology, Delft, The Netherlands*
[2] *Chemical and Materials Engineering, University of Alberta, Edmonton, Canada*
[3] *Faculty EEMCS, Delft University of Technology, Delft, The Netherlands; Signify, Eindhoven, The Netherlands*
[4] *Dow Silicones Belgium sprl, Seneffe, Belgium*

12:00
20mn

Simulation of Cu bulge-out by cyclic Cu surface diffusion FEM in Cu/SiCN hybrid bonding

Yan Wen Tsau [1], Joke De Messemaeker [2], Mario Gonzalez [2], Marc Seefeldt [3], Eric Beyne [2], Ingrid De Wolf [1]
[1] *imec/KU Leuven*
[2] *imec*
[3] *KU Leuven*

12:30 **Lunch**

Session 11 — Simulation of advanced packaging technologies

13:30 Tuesday April 18 2023 Chaired by Alberto Corigliano, Rudolf Kniely

13:30
20mn

Numerical simulation of Crosstalk Effects in PMUT Arrays

Omer Mohamed Osman Abdalla [1], Gianluca Massimino [1], Cristina D'Argenzio [1], Matteo Colosio [1], Marco Soldo [2], Fabio Quaglia [2], Alberto Corigliano [1]
[1] *Department of Civil and Environmental Engineering, Politecnico di Milano, Milan, Italy*
[2] *STMicroelectronics, Cornaredo, Italy*

13:50
20mn

A simple modeling of ferroelectric actuator based on phenomenological model

B.H. Nguyen, M. Zunic, G.B. Torri, V. Rochus, *imec, Leuven, Belgium*

14:10
20mn

Towards System-level Simulation of an Electromagnetic Energy Harvester Model via Equivalent Circuit Extraction from ANSYS Maxwell 3D

Chengdong Yuan [1], Dennis Hohlfeld [2], Tamara Bechtold [1]
[1] *Department of Engineering, Jade University of Applied Sciences, Wilhelmshaven Germany*
[2] *Institute for Electronic Appliances and Circuits, University of Rostock, Rostock, Germany*

14:30
20mn

Optimal design of piezoelectric MEMS for vibration monitoring system with nanoionics zero-energy memory elements

Alexey Shaporin [1], Chris Stöckel [2], Marcel Melzer [3], Falk Schaller [3], Roman Forke [4], Sven Zimmermann [2], Harald Kuhn [2]
[1] *Fraunhofer Institute for Electronic Nano Systems, Chemnitz, Germany*
[2] *Fraunhofer Institute for Electronic Nano Systems, Chemnitz, Germany and Center for Microtechnology, Chemnitz University of Technology, Chemnitz, Germany*
[3] *Center for Microtechnology, Chemnitz University of Technology, Chemnitz, Germany*
[4] *Fraunhofer Institute for Electronic Nano Systems, Chemnitz, Germany*

MEMS Simulations — Session 12

Chaired by Jiajie Fan, Julia Zündel

Tuesday April 18 2023 **13:30**

13:30
20mn

An advanced finite element model of the Cu pillar solder reflow assembly

Cao, Zhibo [1], Pekkolay, Baran [2], Okur, Aslihan [2], Heusdens, Bruno [3], Carta, Corrado [4], Kaynak, Mehmet [1]
[1] IHP – Leibniz-Institut für innovative Mikroelektronik, Frankfurt (Oder), Germany
[2] Sabancı University, Istanbul, Turkey
[3] TAIPRO Engineering, Lambermont, Belgium
[4] IHP – Leibniz-Institut für innovative Mikroelektronik, Frankfurt (Oder), Germany; Technische Universität Berlin, Berlin, Germany

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13:50
20mn

FEM Modelling of Ag-Sinter Joints with Respect of Porosity and Sinter Pressure

Mike Roellig [1], Robert Schwerz [1], Joerg Meyer [2], Karsten Meier [2]
[1] Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Dresden, Germany
[2] Electronics Packaging Laboratory, Technische Universitaet Dresden Dresden, Germany

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14:10
20mn

Modification of Prony Series Coefficients to Account for Thermo-Oxidative Ageing Effects within Numerical Simulations

Marius van Dijk [1], Olaf Wittler [1], Stefan Wagner [1], Martin Schneider-Ramelow [2]
[1] Fraunhofer IZM, Berlin, Germany
[2] TU Berlin, Berlin, Germany

14:30
20mn

Reactive Die Bonding on LTCC Substrates – Analysis by CFD Simulation

Erik Wiss [1], Adam Yuile [1], Alexander Schulz [2], Jens Müller [2], Steffen Wiese [1]
[1] Saarland University, Chair of Microintegration and Reliability
[2] TU Ilmenau, Electronics Technology Group

Session 13 — Wafer level technology simulations

15:00 Tuesday April 18 2023 Chaired by Lynn Davis, Olaf Wittler

15:00
20mn

Finite Element Model for Prediction of Back-End-of-Line Process Induced Wafer Bow for Patterned Wafer.

Prashant Kumar Singh [1], Kashi Vishwanath Machani [1], Dirk Breuer [1], Michael Hecker [1], Karsten Meier [2], Frank Kuechenmeister [1], Marcel Wieland [1], Karlheinz Bock [2]
[1] *GlobalFoundries Dresden Module One LLC*
[2] *Technische Universität Dresden, Institute of Electronic Packaging Technology, 01062 Dresden, Germany*

15:20
20mn

Packaging Induced Stresses in Embedded and Molded GaN Power Electronics Components

Saeed Akbari, Jonas Holmberg, Dag Andersson, Madhav Mishra, Klas Brinkfeldt,
RISE Research Institutes of Sweden

15:40
20mn

Warpage of Fan-Out Panel Level Packaging – Experimental and Numerical Study of Geometry and Process Influence

Andreas Stegmaier [1], Ole Hölck [1], Marius van Dijk [1], Hans Walter [1], Olaf Wittler [1], Martin Schneider-Ramelow [2]
[1] *Fraunhofer Institute for Reliability and Microintegration IZM*
[2] *Research Center of Microperipheric Technologies, Technische Universität Berlin*

16:00
20mn

A Continuously Updated Package-Degradation Model reflecting Thermomechanical Changes at Different Thermo-Oxidative Stages of Moulding Compound

Adwait Inamdar [1], Michiel van Soestbergen [2], Amar Mavinkurve [2], Willem van Driel [3], GuoQi Zhang [1]
[1] *Delft University of Technology, Delft, The Netherlands*
[2] *NXP Semiconductors, Nijmegen, The Netherlands*
[3] *Signify, Eindhoven, The Netherlands*

Design and Modelling for Heterogeneous Integration — Session 14

Chaired by Rainer Dudek, Michiel van Soestbergen

Tuesday April 18 2023 **15:00**

15:00
20mn

Transient Thermal 2D FEM Analysis of SiC Mosfet in Short-Circuit Operation Including Solidus – Liquidus Phase Transition of the Aluminum Source Electrode

E. Sarraute, Th. Cazimajou, F. Richardeau, *LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France*

15:20
20mn

Multi-scale electro-thermo-mechanical simulation of a SiC MOSFET transistor during short-circuit

Florent Loche-Moinet, Loic Theolier, Eric Woirgard, *Laboratoire de l'Intégration du Matériau au Système, Bordeaux*

15:40
20mn

Two-Phase Flow Simulation of Capillary Underfilling as a Design Tool for Heterogenous Integration

Lisa Christin Stencel, Jörg Strogies, Rüdiger Knofe, Bernd Müller, Carsten Borwieck, Matthias Heimann, *Siemens AG, T ICE ELM-DE, 13629 Berlin, Germany*

16:00
20mn

Warpage of transfer-molded automotive power modules – experimental characterization, numerical simulation and optimization

Sprenger, Mario [1], Krämer, Martin [2], Tolyschew, Eduard [2], Steinau, Martin [2], Renner, Dietrich [2], Ottinger, Bettina [1], Goth, Christian [2], Franke, Jörg [3]
[1] *Vitesco Technologies, Nuremberg, Germany; Institute for Factory Automation and Production Systems (FAPS), Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany*
[2] *Vitesco Technologies, Nuremberg, Germany*
[3] *Institute for Factory Automation and Production Systems (FAPS), Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen, Germany*

16:20 **Coffee break**

Session 15 — Mixed modelling and simulation

16:45 Tuesday April 18 2023 Chaired by Peter Meszmer, Youssef Maniar

16:45
20mn

Improving the Vibration Reliability of SAC Flip-Chip Interconnects Using Underfill

Robert Höhne, Karsten Meier, Michael Reim, Marco Lehmann, Karl-Heinz Bock, *Institute of Electronic Packaging Technology Technische Universität Dresden, Germany*

17:05
20mn

Size Scaling of Brittle Strength using Multi-Mode Weibull Distribution

S. Ananiev, G.M. Reuther, N. Del Vecchio, P. Altieri-Weimar, *Infineon Technologies AG, Germany*

17:25
20mn

Undoped and Doped Solder Performance under High Strain Rates and Wide Operating Temperatures after Prolonged Storage

Pradeep Lall, Vishal Mehta, Vikas Yadav, Mrinmoy Saha, Jeff Suhling, *Auburn University, Auburn, AL, USA*

Manufacturing Process Models — Session 16

Chaired by Karsten Meier, Julien Magnien

Tuesday April 18 2023 **16:45**

16:45
20mn

Supportless 5-Axis 3D-Printing and Conformal Slicing: A Simulation-based Approach

Lakshmi Srinivas G, Michalec Pawel, Laux Marius, Lisa Marie Faller, *ADMiRE Research Center, School of Engineering and IT, Carinthia University of Applied Sciences, Villach, Austria.*

17:05
20mn

Effect of Undercut due to Isotropic Etch while Releasing on the Performance of TPoS Resonators

Bijay J, Bhadri Narayanan K N, Abhijit Sarkar, Amitava DasGupta, Deleep R Nair, *Department of Electrical Engineering, Indian Institute of Technology Madras, Chennai 600036, India*

17:25
20mn

Modeling of in-plane distortions and overlay errors encountered during 3-D NAND flash device fabrication

Oguzhan Orkut Okudur, Mario Gonzalez, Geert Van den bosch, Maarten Rosmeulen, *imec, Leuven, Belgium*

17:45
20mn

Simulation of Temperature Driven Microflows Using a Lattice Boltzmann Method in Slip and Moderate Transition Regimes

Anas Selmi [1], Sahil Bhapkar [1], Cristian Nagel [1], Adrian Kummerländer [2], Mathias J. Krause [2]
[1] *Robert Bosch Gmbh, Reutlingen, Germany*
[2] *Karlsruhe Institute of Technology, Karlsruhe, Germany*

Exhibitors and sponsors session

18:10 **Tuesday April 18 2023** *Chaired by Przemyslaw Gromala, Martin Niessner*

18:10 CADFEM - Steffen Peters / René Fuger

18:18 Dantec Dynamics - Roland Wahler

18:26 Infineon - Martin Niessner (Sponsor)

18:34 Nanotest - Marcus Schulz / Andrea Heuser

18:42 PCCL - Peter Fuchs / Margit Lang

18:50 Prime - Andreas Szadeczkys / Alexander Buchner

18:58 Quanscient - Alexandre Halbach / Juha Riippi

19:06 Siemens - Matthias Heimann (Sponsor)

19:14 Silicon Alps - Gernot Eder (Sponsor)

19:30 **Cocktail dinner party at venue**

Mixed Session — Session 17

Chaired by Pradeep Lall, Abhijit Dasgupta

Wednesday April 19 2023 **09:00**

09:00 20mn

Molecular dynamics simulation on tensile mechanical properties of sintered nanocopper particles used in power electronics die-attachment

Cheng Qian [1], Dong Hu [2], Xu Liu [1], Xuejun Fan [3], Guoqi Zhang [2], Jiajie Fan [1]
[1] *Fudan University, Shangai, China*
[2] *Delft University of Technology, the Netherlands*
[3] *Lamar University, USA*

09:20 20mn

Metamaterials and MEMS (MetaMEMS): a promising trend in Microsystems technology

Raffaele Ardito, Claudia Comi, Valentina Zega, Alberto Corigliano, *Department of Civil and Environmental Engineering, Politecnico di Milano, Italy*

09:40 20mn

Metal-based Direct Multi-jet Impingement Cooling Solution for Autonomous Driving High-Performance Vehicle Computer (HPVC)

Reza Moloudi [1], Tobias Grün [2], Willem Verleysen [3], Bart Vandevelde [1], Silke G.C. Cleuren [3], Daniel May [2], Bernhard Wunderle [2]
[1] *IMEC, Leuven, Belgium*
[2] *TU Chemnitz, Germany*
[3] *Materialise, Leuven, Belgium*

Awards ceremony

10:00 Wednesday April 19 2023 *Chaired by Sven Rzepka*

10:00 Best and outstanding papers and posters

10:15 Coffee break

Thermal Behavior — Session 18

Harald Ziegelwanger, Florent Loche-Moinet

Wednesday April 19 2023 **10:45**

10:45
20mn

Design of power modules using containers filled with phase change materials as device top interconnection for power peak management

Rabih Khazaka [1], Yvan Avenas [2], Rachelle Hanna [2], Stephane Azzopardi [1]
[1] *Safran Tech, Electrical-Electronic Systems Research Group, Châteaufort, France*
[2] *Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France*

11:05
20mn

Multiphysics System Simulation of Electronic Components Including Reduced Order Modelling - Demonstrated on a Laser Diode Package

Rene Fuger, *CADFEM (Austria) GmbH, Vienna*

11:25
20mn

Over-current Capability of SiC Devices for Short Power and Heat Pulses

Shubhangi Bhadoria, Hans-Peter Nee, *KTH Royal Institute of Technology, Stockholm, Sweden*

Session 19 — Solder joint strain characterisation

10:45 Wednesday April 19 2023 Chaired by Lisa Mitterhuber, Binh Nguyen

10:45
20mn

Analytical and experimental studies on the damage evolution of SAC solder alloys

S. Glane [1], A. Morozov [1], W.H. Müller [1], T. Hauck [2], G.R. Mazumder [3], M.A. Haq [3], J. Suhling [3]
[1] Berlin Institute of Technology, Berlin, Germany
[2] NXP Semiconductors, München, Germany
[3] Auburn University, Auburn, USA

11:05
20mn

Strain Measurements and Thermo-Mechanical Simulation of SnAgCu vs. low melting point alloy (LMPA-Q) solder joints

Bart Vandevelde [1], Riet Labie [1], Ralph Lauwaert [2], Rainer Dudek [3], Przemyslaw Gromala [4], Michael Eichorst [5]
[1] imec
[2] Interflux Electronics
[3] Fraunhofer ENAS
[4] Robert Bosch
[5] CWM

11:25
20mn

Microstructure dependent modelling of SAC305 Solder Joints under Cyclic Viscoplastic Creep

Aniket Bharamgonda [1], Abhijit Dasgupta [2], Abhishek Deshpande [2], Torsten Hauck [3], Yaxiong Chen [3]
[1] University of Maryland, College Park, MD, USA-20740
[2] University of Maryland, College Park, MD, USA-20740
[3] NXP Semiconductors

12:00 **Lunch**

MEMS and Heterogeneous Integration — Session 20

Chaired by Mike Röllig, Tatyana Kashko

Wednesday April 19 2023 **13:00**

13:00
20mn

A Probability Soft-Error Model for a 28-nm SRAM-based FPGA under Neutron Radiation Exposure

Gia Bao Thieu [1], Johannes Schmechel [1], Kirsten Weide-Zaage [2], Katharina Schmidt [3], Dorian Hagenah [3], Guillermo Payá-Vayá [1]
[1] Chair for Chip Design for Embedded Computing, Technische Universität Braunschweig, Braunschweig, Germany
[2] RESRI Group, Institute of Microelectronic Systems (IMS), Leibniz Universität Hannover, Hannover, Germany
[3] Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS), Munster, Germany

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13:20
20mn

Neuron-Electrode Interface with Hodgkin-Huxley Model in Ansys

Ulrike Fitzer [1], Dennis Hohlfeld [2], Tamara Bechtold [1]
[1] Jade University of Applied Sciences, Wilhelmshaven, Germany and University of Rostock, Rostock, Germany
[2] University of Rostock, Rostock, Germany

13:40
20mn

Presentation is canceled. Paper available in proceedings and Xplore

Humidity Sensing for free—advanced thermoacoustic signal models in miniaturized photoacoustic gas sensors

Simon Essing [1], Mauriz Trautmann [2], David Tumpold [2], Gabriele Schrag [1]
[1] Chair of Physics of Electrotechnology, Technical University of Munich, Germany
[2] Infineon Technologies AG, Neubiberg, Germany

Session 21 — Power electronics

13:00 Wednesday April 19 2023 Chaired by Marcus Schulz, Vincenzo Vinciguerra

13:00
20mn

Non-intrusive electro-thermo-mechanical reduced model for diagnosis and prognostic on IGBT power modules

Louis Schuler [1], Ludovic Chamoin [2], Zoubir Khatir [3], Mounira Bouarroudj [4], Merouane Ouhab [1]
[1] *Mitsubishi Electric R&D Centre Europe*
[2] *Université Paris-Saclay, CentraleSupélec, ENS Paris-Saclay, CNRS, LMPS - Laboratoire de Mécanique Paris-Saclay, France*
[3] *Université Gustave Eiffel, SATIE, France*
[4] *Université Paris EST Créteil, SATIE, CNRS, ENS Paris-Saclay, France*

13:20
20mn

Lifetime modeling of copper metallization for SiC power electronics

Daniel Losbichler [1], Markus Klingler [1], Steffen Orso [1], Bernhard Wunderle [2]
[1] *Robert Bosch GmbH*
[2] *Chemnitz University of Technology*

13:40
20mn

Reduction of empiricism in the solder joint reliability assessment of QFN packages by using thermo-mechanical simulations

M. van Soestbergen [1], R. Roucou [1], M. Rebosolan [2], J.J.M Zaal [1]
[1] *NXP Semiconductors, Nijmegen, Netherlands*
[2] *Delft University of Technology, Delft, Netherlands*

14:00
20mn

Failure Prediction and Analysis of an IGBT Module for Industrial Applications Subjected to Passive and Power Cycling

Rainer Dudek [1], Alexander Otto [1], Ralf Döring [1], Anu Mathew [1], Xing Liu [2], Sven Rzepka [1]
[1] *Fraunhofer ENAS, Dept. Micro Materials Center*
[2] *Chemnitz University of Technology, Professorship of Power Electronics*

14:20 **Coffee break**

Heterogeneous Integration Roadmap

Wednesday April 19 2023 14:35

14:35	Heterogeneous Integration Paving the way for Microelectronics Resurgence; XueJun Fan, Abhijit Dasgupta
14:50	Intelligent Reliability along the Value Chain; Klaus Pressel, Willem van Driel
15:05	State of the Art and Future Trends for Reliability Assessment of Silicon Carbide Power Modules - results from the IPCEI ME; Alessandro Sitta (STMicroelectronics)
15:25	Discussion, Next Steps and Closure

Session 22 — Simulation of emerging technologies

14:35 Wednesday April 19 2023 Chaired by Jonas Gleichauf, Aldo Ghisi

14:35 20mn

Thermomechanical Modelling of Photovoltaic Modules

Andreas J. Beinert, Pascal Romer, *Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany*

14:55 20mn

Multi-Physical Numerical Modelling of Hybrid Flexible Sensor

Correspondant: ZhuangJian Liu, INSTITUTE OF HIGH PERFORMANCE COMPUTING, Astar

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15:15 20mn

UV LEDs: Performance and Reliability for Commercial InGaN and AlGaN LED Products

Lynn Davis, Kelley Rountree, Roger Pope, Karmann Riter, Clint Clayton, Andrew Dart, Michelle McCombs, Abdal Wallace, *RTI International*

15:35 **Closure**

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