THERMINTIC 2013

19th INTERNATIONAL WORKSHOP
Thermal Investigations of ICs and Systems

SEPTEMBER 25 - 27, 2013 @ FRAUNHOFER FORUM BERLIN

PROGRAMME
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Welcome to Therminic 2013!


This program has been designed as a navigator for your conference participation. It includes not just all the sessions, presentations and evening events, but also the venue floor plan, timetable and crucial information to help make the most of your stay in Berlin. Note that the days have been color-coded for easier handling.

Each day kicks off with a keynote by a global player from industry. Thomas Brunswiler (IBM Research), Berthold Hellenthal (AUDI AG) and Theo Treurniet (Philips Lighting) will share their insights on thermal challenges for microprocessors and high performance computing, for automotive electronics, and for solid state lighting, respectively.

Wednesday morning through to Friday afternoon are dedicated to technological sessions, which have been organized into 12 main thermal topics. The Friday, for the first time, offers a parallel session on the Smartpower and Nanotherm projects.

Don’t forget the conference’s evening program. The cocktail reception on Wednesday evening in the Fraunhofer Forum’s exhibition area will be a first opportunity to mingle with old and new contacts and the concurrent poster session should be a great chance to discover new potential and exciting young projects. Then rev up your conference spirit at Therminic’s Thursday night guided boat tour on the river Spree.

Apart from the opportunity to participate in what we believe will be some truly inspiring research presentations, on a personal level we also hope Therminic 2013 will be a chance for us to meet new colleagues and reconnect with trusted partners. Please bring your ideas, comments and suggestions – anything at all that you feel will help us provide a better service to you.

We look forward to spending a perfect late summer conference with you at Therminic 2013 in Berlin.
**General Chair:** Peter Raad, Southern Methodist University, Dallas, USA  
**Vice General Chair:** Marta Rencz, Budapest University of Technology & Economics, Hungary  
**Programme Chair:** Bernhard Wunderle, Chemnitz University of Technology, Germany  
**Vice Programme Chair:** Andreas Poppe, Budapest University of Technology & Economics, Hungary

**Steering Committee:**  
M. Rencz, Budapest University of Technology & Economics, Hungary [chair]  
B. Courtois, CMP, France  
J. Janssen, NXP Semiconductors, Nijmegen, The Netherlands  
A. Napieralski, TU Lodz, Poland  
P. Raad, Southern Methodist University, Atlanta, USA  
A. Rubio, U. Politècnica de Catalunya, Spain  
B. Wunderle, Chemnitz University of Technology, Germany

**Programme Committee:**

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<th>Name</th>
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<td>A. Allet</td>
<td>U. Politècnica de Catalunya, Spain</td>
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<td>M. Abo Ras</td>
<td>Berliner Nanotext und Design GmbH, Germany</td>
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<td>T. Baba</td>
<td>National Metrology Institute Tsukuba, Japan</td>
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<td>I. Barany</td>
<td>Institute for Technical Physics and Materials Science IMFM</td>
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<td>S. Boueixtra</td>
<td>MEMS Technical Consultancy, Amsterdam, The Netherlands</td>
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<td>K. Chakraborty</td>
<td>Duke University, Durham, USA</td>
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<td>O. Chapuis</td>
<td>CN2-CCSC, Barcelona, Spain</td>
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<td>L. Codecasa</td>
<td>Politecnico di Milano, Italy</td>
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<td>A. Daniel</td>
<td>Intel, USA</td>
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<td>R. Egashe</td>
<td>Tohoku University, Japan</td>
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<td>V. Ewley</td>
<td>The Petroleum Inst., UAE</td>
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<td>S. Garmilla</td>
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<td>Y. C. Garstenmaier</td>
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<td>A. Glezer</td>
<td>The Georgia Institute of Technology, USA</td>
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<td>A. Gupta</td>
<td>Freescale Semiconductor Inc., Austin, USA</td>
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<td>J. Janssen</td>
<td>NXP Semiconductors, Nijmegen, The Netherlands</td>
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<td>X. Jordan</td>
<td>Centro Nacional de Microelectronic, Spain</td>
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<td>J. Keller</td>
<td>AMC Angewandte Mikro-Messtechnik GmbH, Germany</td>
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<td>W. Lutten</td>
<td>Philips Applied Technologies, Eindhoven, The Netherlands</td>
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<td>W. C. Maas</td>
<td>THALES-EPM, Meudon-la-Forêt, France</td>
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<td>B. Michel</td>
<td>Fraunhofer Institute for Electronic Nanosystems ENAS, Germany</td>
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<td>IBM Zurich, Romansh, Switzerland</td>
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<td>A. Napieralski</td>
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<td>H. Opfermann</td>
<td>Fraunhofer Institute for Reliability and Microintegration ZIM, Germany</td>
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<td>S. Sapatnekar</td>
<td>University of Minnesota, USA</td>
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<td>R. Schacht</td>
<td>Brandenburg University of Technology, Cottbus-Senftenberg, Germany</td>
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<td>D. Schweitzer</td>
<td>Infineon Technologies AG, Germany</td>
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<td>E-Polytech U. Nantes, France</td>
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<td>UC Santa Cruz, USA</td>
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<td>A. Tay</td>
<td>NUS, Singapore</td>
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<td>V. Turi</td>
<td>Huawei Technologies, Sweden</td>
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<td>B. Vandewalle</td>
<td>IMEC, Belgium</td>
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<td>Ecole Centrale Paris, France</td>
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<td>G. Wachtelke</td>
<td>TU München, Germany</td>
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<td>J. Yu</td>
<td>Philips Research, The Netherlands</td>
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<td>T. Zahnner</td>
<td>OSRAM, Germany</td>
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CONFERENCE VENUE
The Conference will be held at the Fraunhofer-Forum Berlin, right in the center of the city.

FRAUNHOFER-FORUM BERLIN
Anna-Louisa-Karsch-Straße 2, 10178 Berlin, Germany
www.forum.fraunhofer.de

HOW TO FIND YOUR WAY AROUND
We have booked the Fraunhofer-Forum’s entire ground floor for the Therminic 2013 Workshop. The floor plan on page 10 and the session overviews are designed to help you find your way around. Coffee break and lunchtime catering will be offered on the ground floor in the exhibition and poster area.

WARDROBE AND BAGGAGE CHECK
Wardrobe and baggage check are available on the ground floor, next to the registration desk.

CONFERENCE REGISTRATION
The conference registration fee includes admission to all conference sessions and the poster session. The conference package includes a printed copy of the proceedings, a list of registered conference participants and authors, lunch and refreshments during breaks. Regular participants have free admission to the gala dinner. For accompanying persons extra tickets can be purchased for this event.

THE REGISTRATION DESK IS OPEN
Wednesday, September 25, 2013 08:00 am – 06:30 pm
Thursday, September 26, 2013 08:30 am – 06:30 pm
Friday, September 27, 2013 08:30 am – 03:00 pm

DOOR REGISTRATION FEES
Regular Workshop Participation: 750 EUR
IEEE or Committee Member Workshop Participation: 690 EUR
One-day Participation Special Sessions September 27, 2013: 290 EUR
Gala Dinner // Spree River Cruise: 70 EUR

PAYMENT
The registration fee must be credited towards the conference account no later than September 20, 2013. All transfer charges must be covered by the participant’s bank. If we have not received your payment September 20, 2013 you will have to pay at the conference.

CONTACT INFORMATION AND ASSISTANCE DURING THE CONFERENCE
Don’t hesitate to approach us at the registration desk if you have any questions or requests. Our aim is to help you make the most of your conference participation.

DIETARY REQUIREMENTS
The rich buffet lunch is designed to cater for all dietary requirements and all tastes. When in doubt, please consult one of the chefs serving the food, they will be able to give you detailed information.

INTERNET ACCESS
The Fraunhofer-Forum kindly provides all conference delegates with wireless Internet access throughout the conference. Login-information is available at the registration counter.

Please remember to log out when not using the Internet in order to avoid jammed lines.

CONFERENCE LANGUAGE AND PROCEEDINGS
The official language of all presentations is English. The conference proceedings will be handed out at the registration desk upon check-in.
FRAUNHOFER-FORUM BERLIN
@ SPREEPALAIS
Anna-Louisa-Karsch-Straße 2, 10178
Berlin, Germany
www.forum.fraunhofer.de

PUBLIC TRANSPORT
S-Bahn lines S 5, S 7, S 75, S 9 all stop at Hackescher Markt, a 2-minute walk from the Fraunhofer Forum.

CONFERECE VENUE
MENTOR GRAPHICS

The Mechanical Analysis Division has led the market in electronics thermal design with software solutions for more than two decades and has the largest installed base of any tool provider. Mentor Graphics’ FloTHERM®, and FloEFD™ suites of thermal simulation tools predict airflow, temperature and heat transfer in components, boards and complete systems, across all industries. These software solutions are complemented by a range of thermal characterization hardware that can measure the thermal resistances and capacitances in the heat flow path from the die junction to the ambient, identifying material properties and interfacial resistances to allow full thermal model verification.

CONTACT:
Mentor Graphics MicReD Division | Dr. Gabor Farkas
Gabor Denes u. tca 2. fzt 1 | Infopark D | Budapest, Hungary H-1117
Phone: +36 30 280 3752 | Gabor_Farkas@mentor.com

INFRATEC GMBH

The Dresden-based company InfraTec GmbH Infrarotsensorik und Messtechnik is a specialist for products and services in the field of infrared technology. The business sector of infrared measuring technology operates in all areas of thermographic applications, with its scope of performance ranging from sales of thermographic cameras to the self-developed and manufactured high-end thermal camera series ImageIR®. Extensive detailed images of electrical assemblies and components with a pixel size of up to 2 μm can be generated with the aid of the 8-times microscope.

CONTACT:
InfraTec GmbH | Infrarotsensorik und Messtechnik
Gostritzer Str. 61 – 63 | 01217 Dresden, Germany
Phone: +49 351 871-8620 | thermo@InfraTec.de | www.InfraTec.de

NANOTEST

The Berlin-based Nanotest und Design GmbH serves as a full-scale provider of engineering and testing services for reliability evaluation in microsystem technologies and nanotechnology. One main area of expertise is thermal characterization of materials, interfaces and components in microelectronics.

At THERMINIC 2013 Nanotest presents the TIMA Tester, a universal platform providing various modules for precise and reproducible thermal characterization (based on steady-state technique). All types of TIMs, substrates, isolation or high conductive die attach materials etc. can be investigated. Properties from thermal conductivity, thermal interface resistance etc. up to aging behavior can be analyzed.

CONTACT:
Berliner Nanotest und Design GmbH | Mohammad Abo Ras
Volmerstr. 9 B | 12489 Berlin, Germany
Phone: +49 30 6392 3880 | aboras@nanotest.org | www.nanotest.org
Wednesday, September 25, 2013

Registration
● 8.00am – 9.00am

Welcome
● 9.00am – 9.10am

Keynote I:
Thermal Challenges for Microprocessors and High Performance Computing
Thomas Brunschwiler, IBM Research
Chair: Peter E. Raad, SMU
● 9.10am – 9.50am

Session 1:
Thermal Phenomena on the Nano Scale
● 9.50am – 11.10am

Coffee Break
● 11.10am – 11.40am

Session 2:
Design and Simulation I
● 11.40am – 12.40pm

Lunch
● 12.40 pm – 2.10 pm

Session 3:
Characterization
● 2.10pm – 3.10 pm

Coffee Break
● 3.10 pm – 3.40 pm

Session 4:
Thermal (Interface) Materials
● 3.40 pm – 4.40 pm

Coffee Break
● 4.40 pm – 5.10 pm

Poster Introduction Session
● 5.10 pm – 6.30 pm

Poster Session & Cocktails
● 6.30 pm – 8.00 pm
Session 1: Thermal Phenomena on the Nano Scale

9.50 am - 11.10 am

Chairs: P-Olivier Chapuis, Lorenzo Codecasa

9.50 am Nanoscale Thermal Transport And Phonon Dynamics In Ultra-Thin Si Based Nanostructures
Markus R. Wagner1, Emergildo Chávez-Ángel1,2, Jordi Gomis-Bresco1, Juan Sebastian Reparaz1, Andrey Shchepetov3, Mika Prunnila3, Jouni Ahopelto3, Francesc Alzina1, Clivia M. Sotomayor-Torres1,2
1Institute of Nanotechnology (ICN), Campus UAB, Barcelona, Spain; 2Dept. of Physics, Campus UAB, Barcelona, Spain; 3VTT Technical Research Centre of Finland, Espoo, Finland; 4Catalan Institution for Research and Advanced Studies (ICREA), Barcelona, Spain

10.10 am Investigation of High Gigahertz Acoustic Phonon Lifetimes in Thin Silicon Membranes
Martin Schubert, Martin Grossmann, Matthias Klingele, Oliver Ristow, Mike Hetlich, Thomas Dekornoy
Department of Physics, University of Konstanz, Germany

10.30 am Investigation of the Thermal Behavior of Thin Crystalline Silicon Solar Cells
Balázs Plesz, Sándor Ress
Budapest University of Technology and Economics, Hungary

10.50 am The Nondestructive Thermoacoustic Method of Determination of the Air-Tightness of Metal Packagings of Transistors
Maciej Kubicki, Mirosław Mańkowski
Koszalin University of Technology, Poland

Session 2: Design and Simulation I

11.40 am - 12.40 pm

Chairs: Gerhard Wachutka, John David Parry

11.40 am Multiphysics Modelling for Power Electronics Modules – Current Status and Future Challenges
Chris John Bailey
University of Greenwich, United Kingdom

12.00 pm Stochastic Thermal Modeling by Polynomial Chaos Expansion
Lorenzo Codecasa, Luca Di Rienzo
Politecnico di Milano, Italy

12.20 pm Electro-Thermal Co-Design of Chip-Package-Board-Systems
Christoph Sohrmann, Andy Haining, Michael Dittrich, Roland Jancze, Peter Schneider
Fraunhofer IIS/EAS, Dresden, Germany
Session 3:
Characterization
2.10 pm – 3.10 pm

Chairs: Peter Gabor Szabo, Carl Zandén

2.10 pm Toolset for Measuring Thermal Behavior of FPGA Devices
Paweł Weber1, Maciej Zagrabski1, Bartosz Wojciechowski1, Krzysztof S.
Berezowski1, Maciej Nikodem1, Krzysztof Kępa2
1Wroclaw University of Technology, Poland; 2Virginia Tech, Blacksburg,
Virginia, USA

2.30 pm Thermal Conductivity Measurements with the 3omega Method
and Scanning Thermal Microscopy
Wassim Jaber, Ali Assy, Stéphane Lefèvre, Séverine Gomès, P-Olivier Chapuis
Centre for Thermal Sciences (CETHIL), CNRS - INSA Lyon, France

2.50 pm Thermal Conductivity of Isotopically Enriched Silicon Carbide
Björn Lundqvist1, Peter E. Raad3,4, Milan Yazdanfar1, Pontus Stenberg1, Rickard
Ljusdahl1, Pavel L. Komarov4, Joel Ager (IF, Gila Kordina1, Ivan Ivanov1, Erik Janzén1
1Linköping University, Sweden; 2Chairman University of Technology, Gothenburg,
Sweden; 3Southern Methodist University, Dallas, Texas, USA; 4TMX Scientific, Dallas,
Texas, USA; 5Lawrence Berkeley National Labs, Berkeley, California, USA

Session 4:
Thermal (Interface) Materials
3.40 pm – 4.40 pm

Chairs: Anna Ellett, Daniel May

3.40 pm Polymers in Power Electronics – Performance of Thermal Interface Materials
André Zimmermann, Klaus-Wolker Schuett
Robert Bosch GmbH, Germany

4.00 pm Development and Fabrication of Thin Film Thermo Test Chips and its
Integration into a Test System for Thermal Interface Characterization
Mohamed Abs Rah1,2, Günter Engelmann3, Daniel May4, Mario Rothermund4, Ralph
Schaich1,2, Bernhard Wanderle1,2, Thomas Winkler1, Bernd Mischke1, Hermann Oppermann2
1Berlin NanoTest and Design GmbH, Berlin, Germany; 2Fraunhofer ENAS,
Chemnitz, Germany; 3Fraunhofer IZM, Berlin, Germany; 4Brandenburg University
of Technology, Cottbus-Senftenberg, Germany; 5Chemnitz University of Technology,
Germany

4.20 pm Effect of Nanostructuration on the Thermal Conductivity of
Thermoelectric Materials
Stéphane Grauby1, Etienne Puyoo2, Miguel Munoz Rojo3, Marissal Martin
Gonzalez5, Wilfried Claey5, Stefan Dilsma5
1Université Bordeaux 1, France; 2INSA, Lyon, France; 3IMM-CSIC, Madrid, Spain

Wednesday, September 25, 2013

18 | Thermix 2013

Thermix 2013 | 19
01 The Effect of Heat Treatment on Spin-On Oxide Glasses in Solar Cell Application
Enikő Bándy, Árpád Földváry, Márta Dr. Rencz
Budapest University of Technology and Economics, Hungary

02 Thermal Model Generalization of Infrared Radiation Sensors
György Bogár, Péter Gábor Szabó
Budapest University of Technology and Economics, Hungary

03 Self-Heating Effects in Nano-Scale SOI MOSFETs: TCAD and Molecular Dynamics Simulations
Alex Burenkov1, Viktor Balke2, Juergen Lorenz1
1Fraunhofer IISB, Erlangen, Germany; 2Belarussian State University, Minsk, Belarus

04 Compact Electro-Thermal Models of Interconnects
Lorenzo Codecasa
Politecnico di Milano, Italy

05 Investigation of DELPHI Compact Thermal Model Style for Modeling Surface-Mounted Soft Magnetic Composite Inductor
Cheikh Tidiane Dia1, Eric Monier-Viard1, Naji Le Laraq1, Valentin Bissuel1
1Pholos Global Services, Meudon-La-Forêt, France; 2Université Paris Ouest, Laboratoire Thermique Interfaces Environnement, France

06 Thermal Characterization of Multichip Structures
Ferenc Endre1, Gáspár Hantosi1, Dirk Schweitzer2, Péter Gábor Szabó1
1Budapest University of Technology and Economics, Hungary; 2Infineon Technologies AG, Neuburg, Germany

07 The Compact Thermal Model of the Pulse Transformer
Krzysztof Górecki, Małgorzata Rogalska
Gdynia Maritime University, Poland

08 Heat Flux Sensor for Power Loss Measurements of Switching Devices
Demetrio Iera1, Francesco D. Dalla Corte1, Giuseppe Fiorentino2, Pasiqualina M. Sarro2, Bruno Morana2
1Università Mediterranea Reggio Calabria, Italy; 2Delft University of Technology, The Netherlands

09 Empirical Feasibility Assessment of Energy Scavenging Opportunity in Compact Mobile Computers
Muhammad Azhar Ali Khan, Ali Muhtaroğlu
Middle East Technical University - Northern Cyprus Campus, Turkey

10 Non-linear Thermal Simulations of Semiconductor Devices on System Level
Vladimír Košel1, Monica Schipani2, Ehrenfried Seebacher1
1ams AG, Unterpremstaetten, Austria; 2ams Italy Srl, Navacchio, Italy
11 Proposal of New Thermal Resistance for Light-Emitting Diodes
Byungjin Ma1, Kwanhoon Lee2
1Korea Electronics Technology Institute, Suwon, Korea, Republic of (South Korea); 2Hanyang University, Seoul, Republic of (South Korea)

12 Combined Method for Thermal Characterization of High Power Semiconductors
Enrico Merten1, Mohamad Abo Ras1, Tobias von Essen1, Ralph Schacht2, Daniel May2, Thomas Wöhrle1, Bernd Michel4
1Berliner Nanotest & Design GmbH, Berlin, Germany; 2Brandenburg University of Technology, Cottbus-Senftenberg, Germany; 3Chemnitz University of Technology, Germany; 4Fraunhofer ENAS, Chemnitz, Germany

13 Thermal-Electronic Integrated Logic
János Mizsei1, Jyrki Lappalainen2, Márton C. Bein1
1Budapest University of Technology and Economics, Hungary; 2University of Oulu, Finland

14 Approach For Reliability of Thermal Interface Materials In Battery Cell Sensors
Torsten Nowak, Matthias Müller1, Felix Wüst1, Michael Weisinger, Ola Höök, Hans Walter1, Olaf Wittler1, Klaus-Dieter Lang1
1Fraunhofer IZM, Berlin, Germany; Technical University Berlin, Germany

15 Low Voltage Fully Integrated DC-DC Converter for Self-Powered Temperature Sensors
Manuela Randhika Pathirana, Ali Muhtaroğlu
Middle East Technical University Northern Cyprus Campus, Turkey

16 Single Kernel Electro-Thermal IC Simulator
Philippe Raymond
Mentor Graphics, Montmorency Saint Martin, France

17 SrTiO3 Thin Films as Highly Efficient Thermoelectric Materials
Juan Sebastian Reparaz1, Seeta Bhransal1, Wibounut Khunsin1, Markus R. Wagner2,5, Jairo Roquetas1, Jose Santiso1, Begona Abad Mayor1, Pablo Diaz-Chae3, Markus Martin-Gonzalez1, Ciavia M. Salomayer Torres1
1Catalan Institute of Nanotechnology, Barcelona, Spain; 2Centre d’Investigació en Nanociència i nanotecnologia (CIN2), Barcelona, Spain; 3Instituto de Microelectronicas de Madrid, Spain; 4Catalan Institute for Research and Advanced Studies (ICREA), Spain

18 Electronics Cooling By Extended Surface: Refractive Index Change Flow Visualization of the Natural Convection Heat Transfer
Carmine Sapia, Gi. Scalino
University Roma TRE, Italy

19 Parametric Transient Thermo-Electrical PSPICE-Model for a Power Cable
Ralph Schacht1,2, Sven Riepek1, Bernd Michel1,2
1Brandenburg University of Technology, Cottbus-Senftenberg, Germany; 2Fraunhofer ENAS, Chemnitz, Germany; Joint Lab Berlin - Technical Safety, Germany

20 Characterization and Kinetic Monitoring of the Reactions between ToxAl4 Phases in Ti:Al based Ohmic Contacts on n-type GaN by Differential Scanning Calorimetry
Nicolas Thomy-Jadot1, Rodica Chirca1, Christian Bilykiewicz1
1Université de Lyon, Laboratoire des Matériaux et Interfaces, Villeurbanne, France; 2INSA de Lyon, Laboratoire Ampère, Villeurbanne, France
21 Lego-Thermal Simulation Using High-Resolution Temperature Dependent Delay Models
Andras Timar, Marta Rencz
Budapest University of Technology and Economics, Hungary

22 In-Situ Measurements of Material Thermal Parameters for Accurate LED Lamp Thermal Modelling
Miquel Vellvehi1, Xavier Perpinyà1, Xavier Jordà1, Robert J Verkhoven2, Jos M. G. Komen1, Jiri Jakovenko3, Peter Bancken4, Pieter J. Bolt2
1Institut de Microelectrònica de Barcelona (IMB-CNM,CSIC), Spain; 2TNO, Eindhoven, the Netherlands; 3Czech Technical University in Prague, Czech Republic; 4Philips Lighting, Eindhoven, The Netherlands

23 Analysis of Effectiveness of Core Swapping in Modern Multicore Processors
Piotr Zajac, Michal Szemer, Marcin Janicki, Cezary Maj, Piotr Pietrzak, Andrzej Napieralski
Lodz University of Technology, Poland

Poster Session & Cocktails
6.30 pm – 8.00 pm

→ Chairs: Marta Rencz, András Poppe
Thursday, September 26, 2013

Keynote II: Thermal Challenges for Automotive Electronics
Berthold Hellenthal, AUDI AG
Chair: Bernhard Wunderle, TU Chemnitz
9.00 am – 9.40 am

Session 6: Thermal Metrology
9.40 am – 11.00 am

Coffee Break
11.00 am – 11.30 am

Session 7: Reliability
11.30 am – 1.10 pm

Lunch
1.10 pm – 2.40 pm

Session 8: Thermal Management Concepts
2.40 pm – 4.00 pm

Coffee Break
4.00 pm – 4.30 pm

Session 9: Design and Simulation II
4.30 pm – 5.30 pm

Vendors’ Session
5.30 pm – 6.00 pm

Social Event: Boat Tour
8.00 pm – 11.00 pm
Session 6: Thermal Metrology

09.40 am Transient Thermal Techniques as Failure Analytical Tool
Daniel May1, Bernhard Wunderle1, Ralph Schacht2
1 Chemnitz University of Technology, Germany; 2 Brandenburg University of Technology, Cottbus–Senftenberg, Germany

10.00 am Practical Aspects of Thermal Transient Testing in Live Digital Circuits
Gergely Nagy, Pékér Horváth, András Poppe
Budapest University of Technology and Economics, Hungary

10.20 am Improving the Accuracy of Junction Temperature Measurement with the Square-Root-t Method
Christian Herold1, Menia Beier1, Josef Lutz1, Alexander Hommel2
1 Chemnitz University of Technology, Germany; 2 SIEMENS AG, Erlangen, Germany

10.40 am Thermal Conductivity Reduction in Si Free-Standing Membranes Investigated Using Raman Thermometry
Markus R. Wagner1, Juan Sebastian Reparaz1, Emigdio Chávez-Ángel1, Jordi Gomis-Bresco1, Andrey Shchepetov3, Mika Prunnila3, Jouni Ahopelto3, Francesc Alzina1, Clivia M. Sotomayor Torres1,4
1 Catalan Institute of Nanotechnology, Barcelona, Spain; 2 Dept. of Physics, UAB, Barcelona, Spain; 3 VTT Technical Research Centre of Finland, Finland; 4 Institució Catalana de Recerca i Estudis Avançats (ICREA), Barcelona, Spain

Session 7: Reliability

11.30 am Solder Joint Lifetime of Rapid Cycled LED Components
Wendy Luiten
Philips Research, Eindhoven, The Netherlands

11.50 am Mean-Time-to-Crack Model of Microbump Interconnect in FCGBA Package under Thermal Cyclic Test
Chen-Chang Chen1, Wei-Chen Wu1, Ching Yu Chen1, Hung-Ming Chen1, Wai Lm1, Eason Chen1
1 National Chiao Tung University, Taiwan, R.O.C.; 2 NLS Design Automation Laboratory, National Chiao Tung University, HsinChu City, Taiwan, R.O.C.; 3 Siliconware Precision Industries Co., Taiwan, R.O.C.

12.10 pm Stress Impact of Thermal-Mechanical Loads Measured with the Stress Chip
Florian Schindler-Sawrow1, Florian Roel1, Alexander Otto1, Jürgen Keller2, Thomas Winkler2
1 Fraunhofer ENAS, Chemnitz, Germany; 2 AMIC Angewandte Micro-Messtechnik GmbH, Berlin, Germany; 3 Chemnitz University of Technology, Germany; 4 Berliner Nanotest and Design GmbH, Berlin, Germany

12.30 pm Optimisation of Low Dissipation Micro-Hotplates – Thermo-Mechanical Design and Characterisation
Ferenc Bíró1,2, Andrea Edit Pap1, Csaba Dúcsas3, István Bársony4
1 Electrical School of Molecular & Nanotechnologies, University of Pannonia, Veszprém, Hungary; 2 Research Centre of Natural Science, Research Institute for Technical Physics and Materials Science, Budapest, Hungary

12.50 pm Lifetime of CMOS Circuits Evaluation by Means of Electro-Thermal Simulations
Manos Gari, Jean-Baptiste Kamerener, Luc Hébrard
ICube, Strasbourg, France
Session 8: Thermal Management Concepts

2.40 pm – 4.00 pm

Chairs: Bernhard Wunderle, Ralph Schacht

- Double-Sided Cooling and Thermo-Electrical Management of Power Transients for Silicon Chips on DCB-Substrates for Converter Applications: Design, Technology and Test
  Bernhard Wunderle¹, Charles-Alix Manier², Mohamad Abo Ras³, Martin Springborn⁴, Daniel May⁵, Hermann Oppermann⁶, Michael Tappe⁷, Raul Mrossko⁸, T. Xhonneux⁹, Tristan Cantat¹⁰, Wilhelm Maurer¹¹, Radouan Mitova¹²
  ¹Chemnitz University of Technology, Germany; ²Fraunhofer IZM, Berlin, Germany; ³Berliner Nanotest und Design GmbH, Berlin, Germany; ⁴AMIC Angewandte Micro-Messtechnik GmbH, Berlin, Germany; ⁵STAPRO Engineering, Sarang, Belgium; ⁶CEA Grenoble, France; ⁷Infineon, Munich, Germany; ⁸Schneider Electric, Grenoble, France

- Thermal Management Challenges in the Passive Cooling of Handheld Devices
  Guy Robert Wagner, William Maltz
  Electronic Cooling Solutions, Santa Clara, California, USA

- Power and Thermal Constraints of Modern System-on-a-Chip Computer
  Efraim Rotem¹, Ran Grosser², Uzi Weiss³, Avi Mendelson²
  ¹Intel Corporation, Haifa, Israel; ²Technion, Israel Institute of Technology, Israel

- Experimental Investigation of Uninterrupted and Interrupted Microchannel Heat Sinks
  Ayse Gozde Ulu Soysal¹, Cuneyt Sert², Almıla Guvenc Yazicioglu²
  ¹Aselsan A.S., Turkey; ²Middle East Technical University, Ankara, Turkey

Session 9: Design and Simulation II

4.30 pm – 5.30 pm

Chairs: Chris John Bailey, Marcin Janicki

- Convolution Based Compact Thermal Model for 3D-ICs: Methodology and Accuracy Analysis
  Federica Lidia Teresa Maggioni¹, Herman Opros⁴, Eric Beyne⁵, Ingrid De Wolf⁶
  ¹IMEC, Leuven, Belgium; ²KULeuven, Leuven, Belgium; ³KULeuven, Leuven, Belgium

- Dynamic Sub-Compact Model and Global Compact Model Reduction for Multichip Components
  Cheikh Tidiane Diao¹, Eric Mones-Vinard², Naqib Laraqi³, Valentin Bissuel⁴, Olivier Daniel⁵
  ¹Thales Global Services, Meudon La Fornel, France; ²Laboratoire Thermique Interfaces Environnement (LTIE), Paris, France

- Novel Approach to Compact Modeling for Nonlinear Thermal Conduction Problems
  Lorenzo Codeccia
  Politecnico di Milano, Italy
Vendors’ Session

5.30 pm – 6.00 pm

Chair: Peter E. Raad

The three exhibiting companies Mentor Graphics, Infratec and Nanotest will each give a ten-minute presentation on their services and equipment.

Social Event: Boat Tour on the MS BELVEDERE

8.00 pm – 11.00 pm

The planned 3-hour-tour links historical and modern Berlin and offers another perspective of the city! On board the ships, a guide explain the well-known and less-known sights of Berlin and make them more familiar with a wealth of intriguing information and anecdotes.

Departure from FFB 7.00 pm
Ship boarding time 7.30 pm
Ship departure time 8.00 pm

Address Märkisches Ufer, 10179 Berlin
Mobile number +49 163 97 28 653

From FFB, the ship jetty can be reached on foot. We will start our short walk (1.5 km, about 20 min) leaving FFB at 7.00 pm sharp. If you want to make your own way to the jetty, we will be happy to provide you with a map at the registration counter.

The Spree trip will take us through the city passing Mühlenbergsschleuse, Nikolai Quarter, Berlin Cathedral, Museum Island, Friedrichstrasse, Reichstag, Jakob-Kaiser-Haus, Marie-Elisabeth-Lüders-Haus, Paul-Löbe-Haus, Chancellor’s Office, House of Cultures of the World, Mabibl Wder, Bellevue Castle, the German Federal Ministry of the Interior, Castle Bridge with view of the Charlottenburg Castle and back again.
Friday, September 27, 2013

Keynote III:
Thermal Challenges for Solid State Lighting
Theo Treurniet, Philips Lighting
Chair: Bernard Courtois, CMP
9.00 am – 9.40 am

Session 10:
Solid State Lighting / LED
9.40 am – 11.20 am

Coffee Break
11.20 am – 11.50 am

Session 11:
Power Electronics
11.50 am – 1.10 pm

Lunch
1.10 pm – 2.40 pm

Session 12:
Fluidics
2.40 pm – 3.40 pm

Closing Remarks
3.40 pm – 3.50 pm

Special Session 1:
Smart Power
9.40 am – 11.20 am

Special Session 2:
Nanotherm
11.50 am – 1.10 pm
Session 10: Solid State Lighting / LED

- 9.40 am - 11.20 am

**Chairs:** Thomas Zahner, Joan H. Yu

**9.40 am**
**Inline Rth Control: Fast Thermal Transient Evaluation for High Power LEDs**
Thomas Dannerbauer, Thomas Zahner
Osram Opto Semiconductors GmbH, Regensburg, Germany

**10.00 am**
**Improving Thermal Conductivity of Polymer Composites in Embedded LEDs**
Joan H. Yu, Giovanni Cennini
Philips Research, Eindhoven, The Netherlands

**10.20 am**
**Study on Thermal Performance of High Power LED Employing Aluminium Filled Epoxy Composite as Thermal Interface Material**
Anithambigai Permal1, Shanmugan Subramaniam1, Mulharasw Devarajan1, Thomas Zahner2, David Lacey3
1 Universiti Sains Malaysia, Malasia; 2 OSRAM Opto Semiconductors GmbH, Germany; 3 OSRAM Opto Semiconductors (Malaysia) Sdn. Bhd., Malaysia

**10.40 am**
**The Influence of Mutual Thermal Interactions between Power LEDs on their Characteristics**
Krzysztof Górecki
Gdynia Maritime University, Poland

**Special Session 1: Smart Power**

- 9.40 am - 11.20 am

**Chairs:** Jens Heilmann, Yifeng Fu

**9.40 am**
**Free Standing Thermal Interface Material based on Vertical Array Composites**
Elodie Laveugle, Laurent Dixay, Hung Le Khanh, Jeffrey Deyn, Evelyne Chastang, Pierre Le Barny, Alkis Zaias
Thales Research and Technology, Palaiseau, France

**10.00 am**
**Controlling the Density of CNTs by Different Underlayer Materials in PECVD Growth**
Li Xu1,2, Di Jiang1, Yifeng Fu3, Shantung Tu4, Johan Liu5
1 Chalmers University of Technology, Gothenburg, Sweden; 2 East China University of Science and Technology, China; 3 STT Smart High Tech AB, Gothenburg, Sweden; 4 Shanghai University, China

**10.20 am**
**Transient Cooling of Power Electronic Devices Using Thermoelectric Coolers Coupled withPhase Change Materials**
Tristan Caroff1, Radoslava Mitova2, Julia Simon1, Bernhard Wunderle1
1 CEA, Grenoble, France; 2 Schneider Electric, Grenoble, France; 3 Chemnitz University of Technology, Germany

**10.40 am**
**Novel High Sensitivity Sensor Structures for Temperature Monitoring of GaN based MMICS**
Alexandra Müller1, George Konstantinidis2, Adrian Dixescu2, Valentin Buisculescu2, Alexandra Stefanescu, Alina Cismaru1, Ioana Giangu1
1 IMT Bucharest, Romania; 2 FORTH-IESL-MRS Heraclion, Greece; 3 Thales Research & Technology, France

**11.00 am**
**Failure Prediction of IGBT Modules Based on Power Cycling Tests**
Zoltan Sarkany, Andras Vass-Virmay, Gusztiak Hantos, Marta Renicz
Budapest University of Technology and Economics, Hungary
**Session 11: Power Electronics**

**11.50 am – 1.10 pm**

**Chairs: John Janssen, Enrico Merten**

- **11.50 am** Impact of Nonlinearities in Boundary Conditions on Device Compact Thermal Models
  Marcin Janicki1, Tomasz Terzewsic1, Andrzej Vass-Verm11, Andrzej Napieralski1

- **12.10 am** Thermal Design of a High Current Circuit Board for Automotive Applications
  Radz Mrzlik1, Thomas Hofmann2, Christoph Nebe1, Alexander Neumann1

- **12.30 pm** Fully-Coupled 3D Electro-Thermal Field Simulator for Chip-Level Analysis of Power Devices
  Wim Schoenmaker1, Olivier Dupuis1, Bart De Smedt1, Peter Meuris1, Jörg Kellner1

- **12.50 pm** Generation of Electro-Thermal Models of Integrated Power Electronics Modules Using a Novel Synthesis Technique
  Giuseppe Granato1, Giovanni Vona1, Angelo Raciti2, Davide Cristaldi1
  [1] STMicroelectronics, Catania, Italy; [2] Department of Electric Electronic and Systems Engineering, University of Catania, Italy

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**Special Session 2: Nanotherm**

**11.50 am – 1.10 pm**

**Chairs: Elodie Leveugle, Johan Liu**

- **11.50 am** Integrating Advanced Interconnect Technologies in a High Power Lighting Application: First Steps
  Sander Noijen1, Sebastian Fritsche1, Andreas Steffen Kran1, András Poppe1,
  Gerard Huijms1, Ola van der Sloot1

- **12.10 pm** Reliability of Advanced Thermal Interface Technologies based on Sintered Die-Attach Materials
  Jens Heilmann1, Ivan Nikitin2, Daniel May1, Klaus Pressel1, Bernhard Wunderle1,2
  [1] Chemnitz University of Technology, Germany; [2] Infineon Technologies, Regensburg, Germany

- **12.30 pm** Modelling of Graphene and Few-Layer Graphene Heat Spreaders for Hot-Spot Cooling
  Yuxiang Ni, Jose Ordonez-Miranda, Yann Chalopin, Sebastian Velz
  École Centrale Paris, France

- **12.50 pm** Fabrication and Characterization of a Metal Matrix Polymer Fibre Composite for Thermal Interface Material Applications
  Carl Zandén1, Xin Luo1, Lilei Ye2, Johan Liu1,3
Session 12: Fluidics
📅  2.40 pm – 3.40 pm

 Chairs: Yogendra Joshi, Ralph Schacht

2.40 pm Hybrid Porous Media and Fluid Domain Modeling Strategy to Optimize a Novel Staggered Fin Heat Sink Design
Ningkang Li1, Bernd Schlottig1, Marco De-Fazio1, Sharma Chander Shekhar1, Marosh Tiwan1, Roberto Brioschi3, Thomas Brunschwiler1
1IBM Research, Zurich, Switzerland; 2Swiss Federal Institute of Technology in Zurich (ETHZ), Switzerland; 3STMicroelectronics, Agrate, Italy

3.00 pm Numerical Basis and Validation of CAD-Centric CFD: Honeycomb Heatsink Study
Travis Majesteve, John Pierp, Paul Blais
Mentor Graphics Corporation, Wilsonville, OR, USA

3.20 pm Co-Design of Multicore Architectures and Microfluidic Cooling for 3D Stacked ICs
Zhimin Wan, He Xiao, Yogendra Joshi, Sudhakar Yalamanchili
Georgia Institute of Technology, Atlanta, USA

Closing Remarks
📅  3.40 pm – 3.50 pm
Berlin... a center of (re)invention

November 9th, 1989 marked the beginning of a new chapter in Berlin’s history. The eyes of the world watched its residents level the wall that had outraged so many. Shortly afterwards, for the first time in over 28 years, East and West mingled via the Brandenburg Gate, setting the foundation for a new self-understanding. Over the last 20 years, much has changed. Germany’s government moved to Berlin in 2001; its institutions, embassies, media, leading corporations, lobby groups and artists, drawn by Berlin’s long cultural tradition and its newly emerging hopes and tensions, followed.

A previous no-man’s zone that had, along with the wall, epitomized the breach between the two German republics, Potsdamer Platz has been completely rebuilt and rehabilitated to its former position as the city’s governmental and commercial center. Many iconic buildings pepper the area, including the »Bundeskanzleramt«, presently home to Chancellor Angela Merkel, and a new central railway station, Europe’s largest crossing station. Germany’s parliament, the Reichstag, was restored and the inclusion of its famous glass dome, designed by Sir Norman Foster, was considered by some as intended to signal a new era of social and governmental transparency. While the number of new buildings to house political and diplomatic institutions has grown massively, construction is by no means complete. The city remains sprinkled with building sites, and indeed, in this city that has more bridges than Venice, some might argue, always will be.

Germany’s »salad bowl«

Over 3.4 million people live in Berlin; the majority in single-person households. Berlin is Germany’s, if not melting pot, then salad bowl of cultures, religions and life styles. Berlin counts as its own residents from more than 150 nations, and is home to the largest Turkish community outside Turkey, which has led to the Kreuzberg district’s nickname »Little Istanbul«. Every spring, new and old Berliners from around the world celebrate their cultural backgrounds at »Carnival of Cultures«, which is attended by more than half a million merry-makers. Take a walk around the 12 districts to get the size of this multicultural city, or do like the locals and hop on a bicycle – Berlin is arguably second only to Amsterdam as Europe’s cycling capital.

All things cultural

Berlin is one of the world’s most exciting cities. Opera or performance art, antique sculpture or random street art, traditional or contemporary – the city caters to all tastes. With three opera houses, its Museumsinsel (literally, island of museums; a UNESCO World Heritage Site), tourists are kept on the go. Visit the Jewish Museum for an interesting overview of more than 2000 years of Jewish life or the Museum of Technology for a fascinating look at the history of airplanes, ships and computers. For fans of obscuria, Kreuzberg’s Museum der Dinge (Museum of Objects) offers a lively, eclectic history of everyday items.

Berlin’s inner-city districts of Mitte, Prenzlauer Berg, Friedrichshain, Kreuzberg and north Neukölln are home to the city’s young and innovative arts scene. Temporary galleries, start-up boutiques, and all variety of musicians abound. These are also among the city’s main party zones, with a large variety of clubs, bars, restaurants open around the clock.

Despite the cutting-edge urban experience Berlin offers, nature is never far away, as forests and lakes surround the city. Take a boat down the Spree river, go canoeing in the Spreewald, hiking in Grünewald, cycle part of the new bike path Mauerweg (wall trail), or take in some history at the beautiful Sanssouci palace and park in Potsdam.

City of science

Berlin has four universities with more than 140,000 students. The city is also home to many other applied and basic research institutes, including the Fraunhofer-Gesellschaft, the Max-Planck-Gesellschaft and two technology parks, making it the perfect location for the Therminic 2013 Workshop! The Fraunhofer Forum is situated right in the historic center of town, next to the Brandenburg Gate, the boulevard »Unter den Linden«, and the Museumsinsel. Berlin’s widely praised public transport system and bike-friendliness ensures longer excursions are easily undertaken.
CONFERENCE CHAIR
Peter E. Raad, Southern Methodist University, Dallas, USA

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PCO / CONFERENCE OFFICE
mcc Agentur für Kommunikation GmbH
+49 (0) 30. 61 288 611
info@mcc-pr.de
www.mcc-pr.de

CONFERENCE WEBSITE
www.therminic2013.de

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