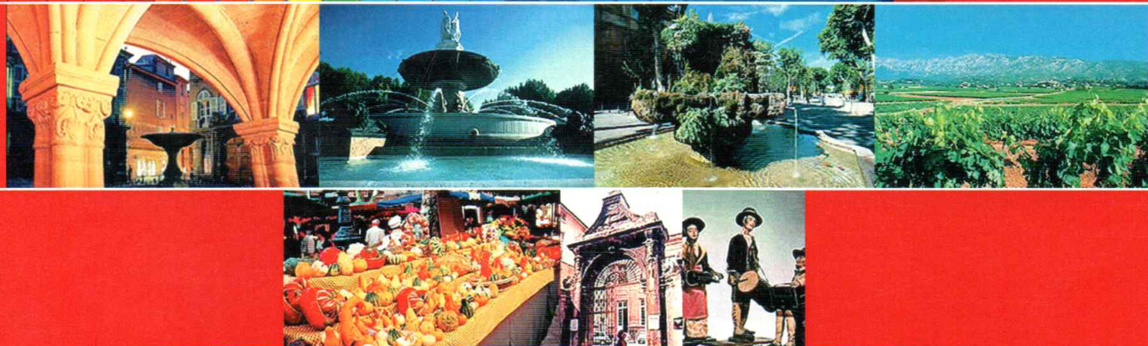
THERMINIC

9th



International Workshop on THERMal INvestigations of ICs and Systems

24-26 September 2003 / Aix-en-Provence, France

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9th International Workshop on
THERMAL INVESTIGATIONS of ICs and Systems
24-26 September 2003,
Aix-en-Provence, France.

Tuesday 23 September	
8:00	**Tutorial: Compact Modelling, Theory and Practice**
Wednesday 24 September	
8:00	**Registration**
9:30	**Welcome address: B. Courtois**, TIMA Laboratory, Grenoble, France
9:40	**Invited talk 1: ON CHIP SOLID STATE COOLING FOR INTEGRATED CIRCUITS** **A. Shakouri**, University of California, Santa Cruz, USA **Chair: V. Székely**, BUTE, Budapest, Hungary
10:20	**Session 1: ADVANCES IN SYSTEM LEVEL APPROACHES** **Chair: J. Parry**, Flomerics Ltd, Hampton Court, UK
10:20	IDENTIFICATION OF CRITICAL SCOPE: COMPREHENSIVE REVIEW OF MICROSCALE CONVECTION S. Mahulikar, Indian Institute of Technology, Bombay, India H. Herwig, O. Hausner, Technical University Hamburg-Harburg, Germany
10:40	OPERATION CONDITION OF A CLOSED ADVANCED TWO-PHASE THERMOSYPHON LOOP FOR COOLING OF RADIO BASE STATIONS R. Khodabandeh, Royal Institute of Technology, Stockholm, Sweden
11:00	ENHANCED BOILING HEAT TRANSFER BY SUBMERGED, VIBRATION INDUCED JETS S. Heffington, S. Tillery, M. Smith, A. Glezer, Georgia Institute of Technology, Atlanta, USA
11:20	**Break**
11:40	**Vendors' session:**
13:00	**Lunch**
14:30	**Session 2: RELIABILITY ISSUES AT PACKAGE AND SYSTEM LEVEL** **Chair: B.M. Guenin**, Sun Microsystems, San Diego, USA
14:30	POWER CYCLING OF BGA ASSEMBLIES: EXPERIMENTS AND SIMULATIONS Y. Abdul Quadir, Z. Radivojevic, J. Rantala, Nokia Research Center, Helinki, Finland
14.50	A STUDY OF FAILURE MECHANISM ON THE ELECTROMIGRATION STRUCTURE FOR THE COPPER-CORAL BACKEND N. Kamat, J. Lim, Chartered Semiconductor Mfg., Singapore
15.10	THERMAL PERFORMANCE, MECHANICAL RELIABILITY AND TECHNOLOGICAL FEATURES OF DIFFERENT COOLING CONCEPTS FOR HIGH POWER CHIP MODULES B. Wunderle, R. Schacht, B. Michel, H. Reichl, Fraunhofer IZM, Berlin, Germany O. Wittler, TU Berlin, Germany
15.30	RELIABILITY ASSESMENT OF RF-POWER AMPLIFIERS AT ELEVATED JUNCTION TEMPERATURES Z. Radivojevic, K. Andersson, J. Rantala, Nokia, Helinki, Finland J. Bielen, P. Van der Wel, Philips Semiconductors, Nijmegen, The Netherlands

15.50	HIGH LEVEL SYNTHESIS WITH ADAPTIVE EVOLUTIONARY ALGORITHM FOR SOLVING RELIABILITY AND THERMAL PROBLEMS IN RECONFIGURABLE MICROELECTRONIC SYSTEMS S. Koziel, W. Szczesniak, Gdansk University of Technology, Poland
16.10	**Break**
16.30	**Session 3: THERMAL MODELLING AND CHARACTERISATION OF COMPONENTS** **Chair: P. Rodgers**, Electronics Thermal Management, Mayo, Ireland
16.30	THREE-DIMENSIONAL TLM THERMAL MODEL FOR HIGH POWER INSULATED GATE BIPOLAR TRANSISTORS R. Hocine, A. Stambouli Boudghene, University of Sciences and Technology of Oran, Algeria S. Pulko, University of Hull, UK
16.50	COUPLED THERMO-MECHANICAL MODELLING AND OPTIMIZATION OF POWER SEMICONDUCTOR DEVICES D. Fedasyuk, V. Makar, Lviv Polytechnic National University, Ukraine
17.10	COMPACT THERMAL MODELS FOR CONVECTIVE MEDIA M-N. Sabry, Université Française, Cairo, Egypt
17.30	COMPUTER ASSISTED THERMAL DESIGN OF AN INTEGRATED STARTER GENERATOR (EXTENDED SUMMARY) K. Oila, ETH, M. Ciappa, W. Fichtner, ETH, Integrated Systems Laboratory, Zurich Switzerland N. Seliger, Siemens Corporate Technology, Munich, Germany
17.50	**Break**
18.10	**Poster introduction and viewing session** **Chair: M. Rencz**, BUTE, Budapest, Hungary CHAOTIC BEHAVIOUR OF SELF-HEATING PARALLED BIPOLAR TRANSISTORS L. Codecasa, D. D'amore, P. Maffezoni, Politecnico di Milano, Italy TEMPERATURE AFFECTS THE UC3842 CURRENT MODE PWM CONTROLLER J. Zarêbski, K. Górecki, Gdynia Maritime University, Gdynia, Poland A MULTI TECHNOLOGIES COMPONENT E. Levy, Computerized Analysis & Simulation Ltd., Haïfa, Israel AN AC MICROCALORIMETER FOR MEASURING SPECIFIC HEAT OF THIN FILM Q. Song, S. Xia, S. Chen, Chinese Academy of Sciences, Beijing, China Z. Cui, Rutherford Appleton Lab., Didcot, UK EXPERIMENTAL AND DETAIL CFD MODELLING OF PERFORATED PLATES INSIDE TELECOMMUNICATION SUBTRACKS R. Anton, H. Jonsson, Royal Institute of Technology, Stockholm, Sweden B. Moshfegh, University of Gävle, Sweden THERMAL MANAGEMENT IN STACKS OF MATCH-X MOEMS F. Schindler-Saefkow, O. Wittler, R. Schacht, V. Großer, B. Michel, Fraunhofer IZM, Berlin, Germany A LINEAR HEAT GENERATION THERMAL MODEL FOR LDMOS BASIC CELL SELF-HEATING ANALYSIS IN TRANSIENT STATE J. Roig, D. Flores, S. Hidalgo, M. Vellvehi, I. Cortés, J. Rebollo, Centre Nacional de Microelectrònica, Bellaterra, Spain GRAPHITE HEAT SINK WITH EMBEDDED HEAT PIPES FOR HIGH THERMAL PERFORMANCE S. Lin, J. Broadbent, R. McGlen, Thermacore Europe, Ashington, UK THERMAL INVESTIGATION OF LOCAL TEMPERATURE INCREASE OF GAAS SUBTRATES UNDER INCIDENT LASER BEAM E. Driessens, B. Vandevelde, G. Borghs, IMEC, Heverlee, Belgium J. Stiens, C. De Tandt, W. Ranson, R. Vounckx, Vrije University, Brussel, Belgium G. Shkerdin, V. Kotov, the Russian Academy of Science, Fryazino, Russia THERMAL SIMULATION OF COLLECTOR-UP HBTS FOR SMALL HIGH-POWER AMPLIFIERS WITH NOVEL THERMAL VIA STRUCTURE UNDERNEATH HBT FINGERS Y. Osone, K. Mochizuki, K. Tanaka, Hitachi, Ibraki, Japan 3D THERMAL-ADI -- AN EFFICIENT CHIP-LEVEL TRANSIENT THERMAL SIMULATOR T-Y. Wang, Y-M. Lee, University of Wisconsin-Madison, Middleton, USA

	C. Chen, National Taiwan University, Taipei, Taiwan STANDARD-CELL BASED TEMPERATURE SENSOR FOR DEEP SUBMICRON CMOS TECHNOLOGIES S.A. Bota, J.L. Rossello, J.A. Segura, University Illes Balears, Palma de Mallorca, Spain AN EXPERIMENTAL-NUMERICAL APPROACH TO THERMAL CONTACT RESISTANCE A. Wymyslowski, K. Friedel, J. Felba, T. Falat, Wroclaw University of Technology, Poland THERMAL ANALYSIS AND REDUCED-ORDER 3D MODELING OF STACKED ELECTRONICS STRUCTURES V. Gatto, V Feuillet, Y. Scudeller, Ecole Polytechnique de l'Université de Nantes, France TEMPERATURE IMPACT ON GLOBAL INTERCONNECTS IN FUTURE TECHNOLOGY NODES M. Casu, M. Graziano, G. Masera, G. Piccinini, M. Zamboni, Politecnico di Torino, Italy NUMERICAL AND EXPERIMENTAL CHARACTERIZATION OF COPPER TRACES G. Lacassin, Flomerics, Orsay, France M. Iliozer, Valeo Electronics & Connective Systems, Montigny le Bretonneux, France REDUCED THERMAL MODEL OF A POWER IC WITH VARIABLE COOLING FLUID FLOW C. Rouaud, Renault, Guyancourt, France P. Lagonotte, A. Alexandre, Laboratoire d'Etudes Thermiques, Futuroscope, France EXPERIMENTS FOR NON-CONTACT THERMOMETRY USING LASER INTERFEROMETER G. Bognár, V. Székely, BUTE, Budapest, Hungary DEVELOPMENTS OF THE SUNRED ALGORITHM G. Pohl, V. Székely, BUTE, Budapest, Hungary
19:00	**Cocktail**
Thursday 25 September	
8:30	**Invited talk 2: CHIP- AND PACKAGE-LEVEL THERMAL MANAGEMENT OF POWER MODULES FOR FIELD RELIABILITY OF POWER SYSTEMS** **K. Shenai**, The University of Illinois at Chicago, USA **Chair: C.J.M. Lasance**, Philips Research Laboratories, Eindhoven, The Netherlands
9:10	**Session 4: DYNAMIC ANALYSIS OF ELECTRONIC PARTS AND SYSTEMS** **Chair: P.E. Raad**, Southern Methodist University, Dallas, USA
9:10	EFFICIENT THERMAL MODELS OF MULTICELLULAR POWER DEVICES V. d'Alessandro, N. Rinaldi, P. Spirito, University of Naples, Italy
9:30	THERMAL INVESTIGATION OF HIGH POWER OPTICAL DEVICES BY TRANSIENT TESTING G. Farkas, MicReD, Budapest, Hungary Q. Van Voorst Vader, Lumileds Lighting B.V., Best, The Netherlands
9:50	EVALUATION ISSUES OF THERMAL MEASUREMENTS BASED ON THE STRUCTURE FUNCTION M. Rencz, MicReD, Budapest, Hungary A. Poppe, MicReD/BUTE, Budapest, Hungary E. Kollár, S. Ress, BUTE, Budapest, Hungary
10:10	BOUNDARY CONDITION INDEPENDENT DYNAMIC THERMAL COMPACT MODELS OF IC-PACKAGES D. Schweitzer, P. Heinz, Infineon Technolgies AG, Munich, Germany
10:30	**Break**
10.50	**Panel**
	NANOTECHNOLOGY AND ITS POTENTIAL IMPACT ON THERMAL ISSUES IN ICS **Moderator: Ali Shakouri**, University of California, Santa Cruz, USA **Panelists:** **Wilfred Claeys**, CPMOH, Université de Bordeaux, France **Peter Raad**, Southern Methodist University, Dallas, USA **Nabil Sabry**, Université Française d'Egypte, Cairo, Egypt

	Nanotechnology is promising to be a disruptive technology that can solve problems in industries as disparate as telecom, biotechnology, microelectronics and energy. After a brief overview of some recent advances in nanoscale science and engineering, the panel will discuss about the short and long term impact of this technology especially on THERMINIC related areas.
12.20	**Lunch**
13.50	**Session 5: ELECTRO-THERMAL SIMULATION** **Chair: M-N. Sabry**, Université Française d'Egypte, Cairo, Egypt
13.50	VERIFICATION OF AN ELECTRO-THERMAL SIMULATION ALGORITHM V. Székely, S. Török, BUTE, Budapest, Hungary
14.10	NANOSCALE ELECTROTHERMAL CO-SIMULATION: COMPACT DYNAMIC MODELS OF HYPERBOLIC HEAT ... N. Pilgrim, W. Batty, R. Kelsall, C. Snowden, University of Leeds, UK
14.30	SELFHEATING EXPERIMENTAL STUDY OF 600V PT-IGBTS UNDER LOW DISSIPATION ENERGIES X. Perpiñà, X. Jordà, M. Vellvehí, P. Godignon, J. Millán, CNM-IMB, Bellaterra, Spain N. Mestres, ICMAB, Bellaterra, Spain
14.50	A NEW SIMULATION MODEL OF ELECTRO-THERMAL DEGRADATION FOR MOSFET DEVICES SUBJECTED TO HOT CARRIER INJECTION STRESS G. Kaytaz, P. Komarov, P. Raad, Southern Methodist University, Dallas, USA
15.10	**Break**
15.30	**Session 6: MEASUREMENT METHODS** **Chair: K. Azar**, Advanced Thermal Solutions, Norwood, USA
15.30	MINIMIZING THE UNCERTAINTIES ASSOCIATED WITH THE MEASUREMENT OF THERMAL PROPERTIES BY THE TRANSIENT THERMO-REFLECTANCE METHOD M.G. Burzo, P.L. Komarov, P.E. Raad, Southern Methodist University, Dallas, USA
15.50	EXTRACTION OF MATERIAL PARAMETERS BASED ON INVERSE MODELING OF THREE DIMENSIONAL INTERCONNECT STRUCTURES S. Holzer, C. Heitzinger, T. Grasser, S. Selberherr, TU Vienna, Austria R. Minixhofer, J. Fellner, austriamicrosystems AG, Uterpremstätten, Austria
16.10	THERMAL MEASUREMENTS OF ACTIVE SEMICONDUCTOR MICRO-STRUCTURES ACQUIRED THROUGH THE SUBSTRATE USING NEAR IR THERMOREFLECTANCE J. Christofferson, A. Shakouri, UC Santa Cruz, USA
16.30	CHARACTERIZATION OF THE THERMAL BEHAVIOR OF PN THERMOELECTRIC COUPLES BY SCANNING THERMAL MICROSCOPE L.D. Patiño-Lopez, M.A. Salhi, S. Dilhaire, S. Grauby, W. Claeys, CPMOH, Université de Bordeaux, France S. Lefèvre, LET-ENSMA, Futuroscope Poitiers, France
19.00	**Social event: Banquet**
Friday 26 September	
9.00	**Embedded tutorial on JEDEC ACTIVITIES** **B.M. Guenin**, Sun Microsystems, San Diego, USA **Chair: M. Rencz**, BUTE, Budapest, Hungary
9.40	**FINAL REPORT ON THE EC-FUNDED THERMAL PROJECT PROFIT** **C.J.M. Lasance**, Philips Research Laboratories, Eindhoven, The Netherlands **Chair: B. Courtois**, TIMA Laboratory, Grenoble, France
10.10	**Break**

10:30	**Session 7: CALCULATION OF TEMPERATURE FIELDS** **Chair: W. Batty**, University of Leeds, UK
10:30	FULLY ANALYTICAL TREATMENT OF INHOMOGENEITY, POSITION VARYING SURFACE HEAT FLUX ... W. Batty, C. Snowden, University of Leeds, UK
10.50	CANONICAL FORMS OF THERMAL IMPEDANCES L. Codecasa, D. D'Amore, P. Maffezzoni, Politecnico di Milano, Italy
11.10	HEAT CONDUCTION WITH NON-LINEAR RADIATIVE AND CONVECTIVE BOUNDARY CONDITIONS TREATED WITH GREEN'S FUNCTION METHOD Y.C. Gerstenmaier, Siemens AG, Corporate Technology, Germany G. Wachutka, Munich University of Technology, Germany
11.30	THERMAL NETWORKS FOR HEAT WAVE EQUATION L. Codecasa, D. D'Amore, P. Maffezzoni, Politecnico di Milano, Italy
12:00	**Lunch**
13:30	**Session 8: MEMS & THERMALLY OPERATED STRUCTURES** **Chair: G. Wachutka**, Munich University of Technology, Germany
13:30	AN SOI CMOS COMPATIBLE THERMAL TRANSDUCER FOR LOW POWER SYSTEMS-ON-A-CHIP DATA ISOLATION T. McNutt, A. Lostetter, A. Mantooth, University of Arkansas, USA M. Mojarradi, Jet Propulsion Laboratory, USA
13.50	NEW OPERATION OF DIODE TEMPERATURE SENSOR AND ITS APPLICATION TO GAS SENSING COMBINED WITH A MICRO-AIR-BRIDGE HEATER M. Kimura, K. Kikuchi, Tohoku-Gakuin University, Japan
14.10	ON-CHIP TEMPERATURE DISTRIBUTION MONITORING VIA CMOS THERMOCOUPLES S. Baglio, S. Castorina, N. Savalli, DIEES - University of Catania, Italy
14.30	MODELLING OF TEMPERATURE PHENOMENA IN ION SENSITIVE TRANSISTORS M. Janicki, M. Daniel, A. Napieralski, Technical University of Lódz, Poland
14:50	**Closing remarks: B. Courtois**, TIMA Laboratory, Grenoble, France

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