

SEMI-THERM[®]

SEMI-THERM 34

The 34th Annual Thermal Measurement,
Modeling and Management Symposium
March 19th - 23rd 2018

34

Thermal Innovations that Make the World's Technology Cool

San Jose, California at the Doubletree by Hilton

For program details, registration, exhibition and hotel information
visit **WWW.SEMI-THERM.ORG** today!

Pre-conference short-courses from world-class thermal experts

Networking opportunities with industry leaders & innovators

Over 50 expert-reviewed papers presented by the brightest thermal professionals and educators

Technical Sessions

2.5D and 3D Electronics

Additive Manufacturing

Air Mover Technologies with Low Acoustics

Automotive / Aerospace / Outdoor

Computational Fluid Dynamics (CFD)

Concurrent Design / LED

Consumer Electronics

Data Center Cooling

Liquid Cooling

Measurement Technologies

Thermal Interface Materials

Two Phase Cooling

NEW TO SEMI-THERM 34

Panel Discussion: "Challenges in Consumer Electronics Cooling"
Thursday Afternoon, March 22

Dialog Session

App Development Challenge

Free How-To Courses developed to introduce practical knowledge of thermal issues to
technical and marketing personnel

Program includes evening events and luncheon speakers

THERMI, Harvey Rosten and Thermal Hall of Fame Award presentations

**Two-day SEMI-THERM exhibition with over 40 vendors and vendor workshops
presenting the most recent technical information**

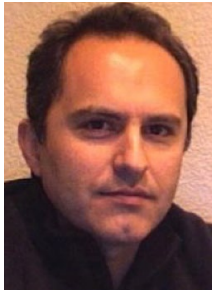
Complimentary receptions Monday and Wednesday evenings

Take advantage of these opportunities to network with thermal experts

KEYNOTE Tuesday March 20, 2018

Thermal Challenges and Industry Trends of Consumer Electronic Devices.

There are many thermal design challenges in consumer electronic devices including wearables, portable computing platforms and IOT communication devices. This talk covers industry trends in the consumer electronics hardware business and the role that thermal management and design plays, as well as how to cope with the trends to overcome power and thermal challenges.



Dr. Andre Ali currently heads thermal engineering for Google HW. He is a former chief thermal architect at Apple where he is credited for leading and innovating thermal technologies and design architectures for Apple's MacBook, MacBook Pro, MacBook Air, iPhone and iPad. He is a former thermal technologist at Intel's mobile product group. His interests and research focus are in electronics thermal management and control, energy efficiency, renewable energy. Dr. Ali invented and published numerous patents and papers in the field of thermal management, CFD and two-phase heat transfer. He also served as keynote speaker, panelist and chair at various conferences and forums worldwide. He has a PhD in Mechanical Engineering from University of Maryland.

CALL FOR EXHIBITORS

SEMI-THERM is the premier symposium on thermal design, management and characterization of electronic components and systems. The exhibition is a central part of our events schedule and with over 30 years of successful symposiums and exhibitions, SEMI-THERM continues to be the choice for providers of products and services related to thermal management of all scales, from semiconductors, RF, LED, solar / PV, PCB and box systems to network equipment and facilities.

Our exhibitors are highlighted throughout the year in email marketing and onsite events which help to generate and keep traffic through the exhibit hall. The exhibits are free to the public which draws many local engineers, managers and decision makers who are looking for thermal solutions for their products and processes.



To become an exhibitor see our website : www.semi-therm.org
Contact Bob Schuch : rschuch@semi-therm.org

Panel Discussion
“Challenges in Consumer Electronics Cooling”
Thursday, March 22 2:00p.m. - 4:00p.m.

“Challenges in Consumer Electronics Cooling” will address how current challenges are being met and will emphasize future challenges, how they are framed, and what approaches and technologies might be applied to overcome them. Each panelist will give a 10 minute presentation from their perspective, with 30 minutes for audience questions.

Moderator: Mark Carbone, Intel

Co-Topic Champions: Consumer Electronics

William Maltz, President, Electronic Cooling Solutions, wmaltz@ecooling.com
and Mark Carbone, Senior Thermal Engineer, Intel, mark.carbone@intel.com

PANELISTS:

Andy Delano, Microsoft, andel@microsoft.com

Jie Yang, Huawei, yangjie67@huawei.com

Emil Rahim, Google, emilrahim@google.com

Guy Wagner, ECS, gwagner@ecooling.com

Gabriel Khouri, Intel, gabriel.g.khouri@intel.com

Sponsors Include:



Mechanical Analysis



SEMI-THERM 34



SEMI-THERM 34 General Chair: Jesse Galloway, Amkor Technology

Program Chair: Adriana Rangel, Cisco

Program Vice-Chair: Pablo Hidalgo, Aavid Thermacore

SESSION TITLES and TOPIC CHAMPIONS

2.5D and 3D Electronics • Jesse Galloway, Amkor Technology

Additive Manufacturing • Tom Tarter, Package Science Services

Air Mover Technologies with Low Acoustics • David Nelson, Nelson Acoustics

Automotive / Aerospace / Outdoor • Eric Dede, Toyota Research Institute

Computational Fluid Dynamics (CFD) • Robin Bornoff and John Parry,
Mentor Graphics, a Siemens Business

Concurrent Design/LED • Jim Petroski

Consumer Electronics • William Maltz, Electronic Cooling Solutions
and Mark Carbone, Intel

Data Center Cooling • Marcelo del Valle, Intel

Liquid Cooling • Dave Saums, DS&A LLC

Measurement Techniques • Kazuaki Yazawa, Purdue University

Thermal Interface Materials • Jason Strader, Laird Technologies

Two Phase Cooling • Pablo Hidalgo, Aavid Thermacore

Thank you to our SEMI-THERM 34 Scholarship Donors:

K. Mulay Memorial Scholarship (\$1,500); Celsia Inc. Scholarship (\$1,000);

Thermal Engineering Associates, Inc. Scholarship (\$1,000);

Center for Energy-Smart Electronic Systems Scholarship (\$1,000)

SEMI-THERM 33 Scholarship Winners

K. Mulay Memorial Scholarship (\$1,500)

Award for Best Student Paper at ST33:

Experimental Study on Flow Boiling in a Hierarchical Manifold Microchannel Heat Sink Array
Kevin P Drummond, Purdue University

Celsia Inc. Scholarship (\$1,000)

Best Student Paper in the area of Two-Phase Thermal Management at ST33:

Experimental Study on Flow Boiling in a Hierarchical Manifold Microchannel Heat Sink Array
Kevin P Drummond, Purdue University

Thermal Engineering Associates, Inc. Scholarship (\$1,000)

Best Student Paper in the area of Thermal Measurement Technology at ST33:

Experiments on the Thermal Resistance of Deformable Thermal Interface Materials under Mechanical Loading
Richard Kenney, Villanova University

Center for Energy-Smart Electronic Systems Scholarship (\$1,000)

Best Student Paper in the area of Energy-Smart Electronic Systems Technology at ST33

Impact of Elevated Temperature on Data center Operation based on Internal and External Instrumentation
Mohammad I. Tradat, Binghamton University

SHORT COURSES Monday, March 19, 2018

Short courses are offered on Monday prior to the formal opening of the symposium. Concurrent short courses at SEMI-THERM 34 will be held in the morning and afternoon of March 19, 2018. These sessions are free to regular paid attendees. Short courses for SEMI-THERM 34 are under development.

A partial listing includes:

Power Electronics & Energy Harvesting: Unleashing the Potential of IoT

Brian Zahnstecher, PowerRox

Managing Cooling Fan Noise

David Nelson, Nelson Acoustics

Experimental Methods in Thermal Sciences

Al Ortega, Santa Clara University

LED Thermal Design

Genevieve Martin, Philips Lighting

Shock and Vibe

Nick Clinkinbeard, Rockwell Collins

Additional Short Courses will be given by:

Suhkvinder Kang, Aavid Thermalloy

Peter Raad, SMU

Short courses at SEMI-THERM 33 included:

A History of Commercial CFD from Bernoulli to Spalding and Beyond, with a Focus on Electronics Cooling Simulation

Robin Bornoff, Mentor Graphics John Parry, Mentor Graphics

Fundamentals of Liquid Cooling: From Fluid Selection to Phase Change

Timothy Shedd, Ebullient Inc

Transient Thermal Analysis using Linear Superposition

Roger Stout, ON Semiconductor

Spreadsheet Based Thermal Analysis Method

Ross Wilcoxon, Rockwell Collins

Design of Experiments for Thermal Engineering

James Petroski

Fundamentals of Power in the Data Center

Brian Zahnstecher, Power Rox

For program details, registration, exhibition and hotel information
visit WWW.SEMI-THERM.ORG today!

The logo for SEMI-THERM features the word "SEMI" in white and "THERM" in black, both in a bold, sans-serif font. Below the text is a red graphic element consisting of a series of vertical bars of varying heights, resembling a stylized city skyline or a thermal profile. A registered trademark symbol (®) is located at the top right of the word "THERM".

How-To Courses

SEMI-THERM is known as an application-oriented symposium. The How-To Courses are designed for those new to thermal technology and also as a review for more experienced thermal professionals. SEMI-THERM's How-To Courses are meant to allow an expert overview of various engineering disciplines that relate not only to thermal phenomena, but also include topics on electrical, mechanical, design, materials, processes, manufacturing, and more. The focus is on real world practices and techniques from the chip and package to the board, backplane and system level. The tutorials are presented by experienced and well-known specialists from industry and academia.

SEMI-THERM 33's How-To Courses Included:

Thermocouple Theory and Practice

Robert J. Moffatt, Stanford Emeritus

Design of Liquid Cooled Systems

Pablo Hidalgo, Aavid Thermacore

Design Consideration for Heat Sink Mounting Solution

Dr. Milena Vujosevic, Intel, Juan L. Cruz, Light

Practical Guidelines for Using Heat Pipes and Vapor Chambers in Heat Sinks

George Meyer, Celsia

SEMI-THERM's Technical Committee is currently developing the How-To Courses for SEMI-THERM 34. The courses will be held concurrently from 6:30p.m. - 8:30p.m on Wednesday March 21, 2018.

Please check the website for updates: www.semi-therm.org

THERMI Award

Each year, SEMI-THERM honors a person as a Significant Contributor to the field of semiconductor thermal management. The THERMI award is intended to recognize a recipient's history of contributions to crucial thermal issues affecting the performance of semiconductor devices and systems.



From left to right: Dereje Agonafer, SEMI-THERM 33 Thermi Winner Chandrakant Patel, Devin Patel, and SEMI-THERM 33 General Chair Veerendra Mulay.



Mechanical & Aerospace Engineering
The University of Texas at Arlington

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ES2

Center for Energy-Smart
Electronic Systems

We are proud to sponsor:

The SEMI-THERM Educational Foundation
Thermal Hall of Fame

Lifetime Achievement Award

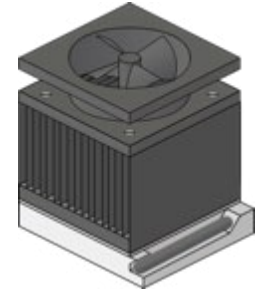
Presented To



Bernie Siegal

**In Recognition of Significant Contributions
to the Field of Electronics Thermal Management**

Bernie Siegal's first involvement in semiconductor thermal matters came in 1966 while working at the microwave semiconductor group within Hewlett-Packard Associates (HPA). Bernie and an associate developed an automated system for making thermal resistance measurements on microwave diodes and authored a feature article describing the method, which appeared in the October 1967 issue of the HP Journal. From that beginning to today, Bernie has been an active participant in the semiconductor measurement, modeling and management field. In 1974, Bernie founded SAGE Enterprises, Inc. and began offering test equipment for measurement of thermal resistance for many different types of semiconductor devices. The thermal testing techniques Bernie developed eventually became incorporated into many of the industry (SEMI and EIA/JEDEC) and US military measurement (Mil Std 750) standards. Besides being actively involved in many of the various standards-creating committees, Bernie is co-founder and primary force behind the start of SEMI-THERM, the premier technical symposium in the field. He has authored over 40 technical papers, presented seminars to world-wide audiences, and conducted several short courses for the UC Berkeley Extension program. His current company, THERMAL ENGINEERING ASSOCIATES, INC. (TEA), maintains his involvement in the field. Bernie holds M.B.A. (Santa Clara University), M.S.E.E. (San Jose State University), and B.S.E.E. (Cornell University) degrees. He was elected a Fellow of the IEEE and received the IEEE Significant Contributor Award for his work in the semiconductor thermal field. He currently serves as the Chairman of the IEEE CPMT Silicon Valley Chapter.



SEMI-THERM Electronics Cooling App Development Challenge Call for Apps

The goal of the Development Challenge (ADC) is to encourage SEMI-THERM attendees to develop mobile apps that would be useful to those in the electronics cooling industry. The ADC is open to all individuals and companies within the electronics cooling community. Students are particularly encouraged to develop apps, either individually, as part of a class project, or in collaboration with industry partners.

Submitted apps will be reviewed and scored by members of the SEMI-THERM program committee. The developer of the highest scoring app will receive a FLIR One IR imaging attachment for smartphones. Developers of the three highest scoring apps will be invited to SEMI-THERM, with a reduced registration fee, so that they can present their app to the rest of the community.

Apps submitted for the ADC will be made available to SEMI-THERM attendees at no cost. Developers only need to provide the executable code for their apps and have no obligation to provide any support for its use. Please contact AppDevChal@semi-therm.org for more information or to submit your app.

Schedule:

- October 27, 2017 - Individuals who are planning to submit an app for the ADC are requested (not required) to inform SEMI-THERM of their 'intent to submit' by this date
- January 12, 2018 - Apps are to be submitted to SEMI-THERM by this date
- February 5, 2018 - The SEMI-THERM committee will announce which six apps received the highest scores from the reviewers and invite the top three winners to present at SEMI-THERM (if the developer of any of these three selected apps cannot travel to SEMI-THERM, the next highest scoring developer will be invited)
- March 2018 (at SEMI-THERM) - Three apps will be demonstrated by their developers at the SEMI-THERM symposium as part of a special session

SEMI-THERM 34 Location: DoubleTree by Hilton San Jose 2050 Gateway Place, San Jose, CA 95110 Phone: 1 (408) 453-4000

