International Conference and Exhibition on
High Temperature Electronics
(HiTEC 2018)

May 8-10, 2018
Hotel Albuquerque
Albuquerque, New Mexico USA

Conference Events and Technical Program
May 8-10, 2018

General Co-Chairs:
Wayne Johnson, Tennessee Tech University - wjohnson@tntech.edu
Colin Johnston, Oxford University - colin.johnston@materials.ox.ac.uk

Technical Committee:
Holger Kappert, Fraunhofer IMS - Holger.Kappert@ims.fraunhofer.de
F. Patrick McCluskey, University of Maryland - mccluskey@calce.umd.edu
Randy Normann, Perma Works, LLC - randy@permaworks.com
Maithil Pachchigar, Analog Devices - Maithil.Pachchigar@analog.com
Steve Riches, Tribus-D Ltd - striches1@outlook.com
David Sarraf, TE Connectivity - d.sarraf@te.com
Carol Williams, Trendsetter Electronics - carolw@trendsetter.com

Tabletop Exhibition
May 8-9, 2018

PROGRAM OVERVIEW

Tuesday:
- Plenary Speaker
- Exhibits 10:00am – 6:00pm
- Session T1: Packaging
- Session T2: Die Attach
- Networking Reception

Wednesday:
- Plenary Speaker
- Exhibits 10:00am – 4:30pm
- Session W1: SiC
- Session W2: Si / SOI

Thursday:
- Plenary Speaker
- No Exhibits
- Session TH1: Components

Thank you to the Premier Sponsors:

Organized by: International Microelectronics Assembly and Packaging Society (IMAPS)
Bringing Together The Entire Microelectronics Supply Chain!
KEMET offers the latest in high-temperature capacitor technology and provides capacitance solutions for extreme temperature applications up to 260°C. Product applications include harsh environments such as down-hole (oil exploration), automotive (under the hood), defense or aerospace.

Whether you require a surface mount or through-hole solution, KEMET’s vast portfolio of high-temperature capacitors offer significant reliability and performance advantages when operating temperatures are greater than 125°C.

http://www.kemet.com/Hi-Temp
MONDAY, MAY 7 | Pre-Conference Short Course (PDC) -- CANCELLED

Pre-Conference Professional Development Course on:
HIGH TEMPERATURE ELECTRONICS

TUESDAY, MAY 8

7:00am-6:00pm  Registration Open
7:00am-8:00am  Breakfast
10:00am-6:00pm  Exhibits Open (when not in session)

8:00am-8:15am  Opening Remarks: Conference Chair –
Wayne Johnson, Tennessee Tech University

8:15am-9:00am  PLENARY: Monitoring Magma Under Volcanoes: The Future Of Eruption Forecasting And Geothermal Energy
Magma, represents the most extreme environment in Earth's crust. Typical conditions at the top of a magma body are > 50 MPa and > 800°C. The location and conditions of magma storage were entirely speculative until recently when geothermal drilling encountered magma in Iceland, Kenya, and Hawaii. The door is now open, if appropriate sensors can be developed, to monitor conditions at the source of eruptions. This will move eruption forecasting, a concern for 10% of the world's population, from recognizing patterns in proxy surface measurements towards the reliability of weather forecasting. It can also aid in achieving a huge increase in productivity of clean geothermal energy. Associated aqueous fluids are super-heated or super-critical.
John C Eichelberger, Professor of Geology, Emeritus | University of Alaska Fairbanks

SESSION 1  T1: PACKAGING
Session Chair: Harold L. Snyder, Jr., Physical Solutions

9:00am-9:30am  Modelling the Influence of Conformal Coatings on Thermo-Mechanical Fatigue of Solder Interconnects in Electronic Packages
Maxim Serebreni, University of Maryland (Ross Wilcoxon Patrick McCluskey)

9:30am-10:00am  Sixty Earth-days Test of Prototype Pt/HTCC Alumina Package in Simulated Venus Environment
Liangyu Chen, Ohio Aerospace Institute/NASA GRC (Philip Neudeck, Roger Meredith, David Spry, Leah Nakley, Glenn Beheim, Gary Hunter, NASA Glenn Research Center; Dorothy Lukco, Vantage Partners LLC / NASA Glenn Research Center)

10:00am-10:30am  Break in the Exhibit Area
PREMIER SPONSORS:

KEMET Electronics Corp. - 25
NGK / NTK - 26
Presidio Components, Inc. - 24
Trendsetter Electronics - 23

CORPORATE SPONSORS:

Analog Devices, Inc. - 18
CISSOID S.A. - 22
Joule Sales and Marketing - 31
RelChip, Inc. - 30
Tekmos - 27
X-REL Semiconductor - 19

EXHIBITORS:

5N Plus Inc. - 21
AdTech Ceramics - 16
American High Voltage – 13
Arizona State University – 12
AVX Corporation - 29
Criteria Labs - 32
Emerson Automation Solutions - 8
Ferro Corporation - 9
Frequency Management International - 5
Hesse Mechatronics, Inc. - 28
Indium Corporation - 11
Kyocera International, Inc. - 1
Momentive Performance Materials - 3
NASCENTechnology Manufacturing - 14
Ozark Integrated Circuits, Inc. - 10
Palomar Technologies, Inc. - 4
Polyonics, Inc. – 2
Semi Dice, Inc. - 17
Statek Corporation – 20
StratEdge Corporation – 15
TT Semiconductor - 6
Vorago Technologies - 7

HiTEC 2018 Tabletop Exhibition

SPONSORSHIPS & EXHIBITS ARE SOLD OUT
HIGH RELIABILITY CERAMIC CAPACITORS

CAPACITORS FOR HIGH TEMPERATURE APPLICATIONS (350°C+)

10V to 10kV in Multiple Dielectrics
X7R, BX, NPO, N2200...

Lead Frames for Board Flex Compliance

Stacked Capacitors for Increased Energy Density

Pulse Capacitors with Bleed Resistors

Qualified Military & Space Supplier
MIL-PRF-123, -49464, -49467, -49470, -55681
MIL-STD-202 and MIL-STD-790
NASA S311-P-829

PRESIDIO COMPONENTS, INC.
7169 Construction Court, San Diego, CA 92121 • Tel: 858-578-9390 • Fax: 858-578-6225
www.presidiocomponents.com • info@presidiocomponents.com
Organic Hybrids for Circuit Assemblies - Initial Environmental Testing of a Low Cost Alternative to Ceramic Substrate based Assemblies
Martin Wickham, National Physical Laboratory

Identification of Thermo-mechanical Fatigue Fracture Location by Transient Thermal Analysis for High-temperature Operating SiC Power Module Assembled with ZnAl Eutectic Solder
Fumiki Kato, National Institute of Advanced Industrial Science and Technology (Kenichi Kou, Hidekazu Tanisawa, Shinnji Sato, Yoshinori Murakami, Hiroki Takahashi, Hiroshi Yamaguchi, Hiroshi Sato)

Influence of Initial Shear Strength on Time to Failure of Copper (Cu) Wire Bonds in Thermal Aging Condition
Subramani Manoharan, University of Maryland (Stevan Hunter, ON Semiconductor; Chandradip Patel (former student), Patrick McCluskey, University of Maryland)

Increasing High-Temperature Reliability of ICs Assembled in Plastic Packages Using Die Extraction, Gold Ball Removal, ENEPiG Die Bond Pad Plating and Assembly
Charlie Beebout, Global Circuit Innovations

12:30pm-2:00pm | Lunch in the Exhibit Area

SESSION 2  T2: DIE ATTACH
Session Chair: F. Patrick McCluskey, University of Maryland

Highly Reliable Pressure-Less Silver Sintering Joint
Sihai Chen, Indium Corporation of America (William Shambach, Chris LaBarbera, Ning-Cheng Lee)

Development of Conductive Fusion Technology
Maciej Patelka, NAMICS (Nicholas Krasco)

3:00pm-4:00pm | Break in the Exhibit Area

4:00pm-4:30pm **SPEAKER WITHDREW APRIL 27 -- REPLACEMENT TALK TBD**
Effect of Third Elements on Mechanical Properties of Transient Liquid Phase Sintered (TLPS) Alloys
Erick Gutierrez, University of Maryland (Subramani Manoharan, Patrick McCluskey)

Novel Solder-mesh Interconnection Design for Power Module Applications
Adrian Lis, Osaka University (Hiroaki Tatsumi, Tomoki Matsuda, Tomokazu Sano, Yoshihiro Kashiba, Akio Hirose)

5:00pm-6:00pm | Networking Reception in the Exhibit Area

Thank you to the Premier Sponsors:
PLENARY: Sensor Systems for Extreme Harsh Environments

Sensors are key elements for capturing environmental properties and are increasingly important in the industry for the intelligent control of processes. While in many everyday objects highly integrated sensor systems are already state of the art, the situation in an industrial environment is clearly different. Frequently the use of sensor systems is impossible, because the extreme ambient conditions of industrial processes like high operating temperatures, strong mechanical load or a humid or chemically aggressive environment do not allow a reliable operation of sensitive electronic components. The realization of such sensor systems demands a multidisciplinary approach including e.g. the design of reliable sensor elements, high temperature integrated circuits, assembly and housing. Therefore eight Fraunhofer Institutes have concentrated their competencies and have kicked off the Fraunhofer Lighthouse Project ‘eHarsh’. This presentation gives an introduction in the objectives of this comprehensive project.

Dipl.-Ing. Holger Kappert | Fraunhofer Institute for Microelectronic Circuits and Systems IMS

SESSION 3

W1: SiC
Session Chair: Liangyu Chen, Ohio Aerospace Institute/NASA GRC

9:00am- 9:30am  Digital Logic Synthesis for 470 Celsius Silicon Carbide Electronics  
Nick Chiolino, Ozark Integrated Circuits, Inc. (A. Matthew Francis, Jim Holmes, Matthew Barlow)

9:30am-10:00am  Yearlong 500°C Operational Demonstration of Upscaled 4H-SiC JFET Integrated Circuits  
Philip G. Neudeck, NASA Glenn Research Center (David J. Spry, Liangyu Chen, Michael J. Krasowski, Norman F. Prokop, Carl W. Chang, Glenn M. Beheim)

10:00am-10:30am  Break in the Exhibit Area

10:30am-11:00am  Analog and Logic High Temperature Integrated Circuits Based on Enhancement Mode Planar SiC JFETs  
Peter Alexandrov, United Silicon Carbide (Matt O’Grady)

11:00am-11:30am  High Temperature SRAM in SiC CMOS  
Matthew Barlow, Ozark Integrated Circuits, Inc. (A. Matt Francis, Nicholas Chiolino)

11:30am-12:00pm  Co-optimized Reliability and Parasitic Inductance in Small Footprint Vertical Silicon Carbide MOSFET  
Mahsa Montazeri, University of Arkansas

12:00pm-12:30pm  High Heat-density SiC Heater Chip for Thermal Characterization of High Temperature Packaging  
Naoki Wakasugi, Yamato Scientific Co., Ltd. and Osaka University (Shijo Nagao, Dongjin Kim, Katsuaki Suganuma)

12:30pm-2:00pm  Lunch in the Exhibit Area

SESSION 4

W2: Si/ SOI
Session Chair: Holger Kappert, Fraunhofer IMS

2:00pm-2:30pm  Configurable Digital Logic for Extreme Environments  
Richard Rea, RelChip, Inc. (Marshall Soares)

2:30pm-3:00pm  Performance Test Results of a Precision Data Acquisition and Control Platform for 200°C+ High Temperature Environments  
Jeff Watson, Analog Devices (Maithil Pachchigar, Analog Devices; Ross Bannatyne, Clay Merritt, Vorago Technologies; Chris Conrad, Glenn Smollinger, Earle Drack, Petromar Technologies)

3:00pm-3:30pm  Lifetime and Failure Modes of High Temperature SOI Products  
Derek Maxwell, RelChip (Matt Corless)
THURSDAY, MAY 10

7:00am - 11:00am  Registration Open

7:00am - 8:00am  Breakfast
NO EXHIBITS TODAY

8:00am - 8:15am  Opening Remarks: Conference Chair – Wayne Johnson, Tennessee Tech University

8:15am - 9:00am  PLENARY:  US Geothermal Funding Outlook
This paper presents the need for geothermal well monitoring and the general environmental requirements of the geothermal well. HT SOI well monitoring electronics are presented. All well monitoring systems require data recording software on the surface. Surface support systems are also discussed. One of the major costs of any reservoir monitoring system is in the design and testing of the electronics and supporting system software. In fact, it is normal to spend over $100K USD on software development alone. Given the small size of the geothermal market, this cost impedes technology development. This paper outlines the design of the HT SOI well monitoring system using public domain software to aid in holding down development cost. This concept can encourage improved HT SOI well monitoring electronics for future geothermal applications.
Randy A Normann, On Measurement

SESSION 5  TH1: COMPONENTS
Session Chair: Colin Johnston, Oxford University

9:00am - 9:30am  A 300°C High Reliability Halt/Hast Screening/Sorting Procedure for Ceramic Capacitors
Harold L. Snyder, Jr., Physical Solutions

9:30am - 10:00am  Robust Reliability of Ceramic Capacitors for Power Electronics
Abhijit Gurav, KEMET Electronics Corporation (John Buittitude, John McConnell, Reggie Phillips)

10:00am - 10:30am  Coffee/Tea Break

10:30am - 11:00am  New Capacitive Sensor Performance
David Andrew, Rosemount Specialty Products

11:00am - 11:30am  Mitigation of High Temperature Environments on Electrical Disconnects
Kenneth Dowhower, TE Connectivity

**SPEAKER WITHDREW APRIL 27**
Carbon Fiber-based Thermal Interface Materials for High Temperature Applications
MP Divakar, KULR Technology (Michael Mo)

11:30am  Closing Remarks
Forging Innovation and Partnerships

Advanced Technical Ceramics
Packaging for every application

Clara, CA  (408) 727-5180

IGNITE YOUR SPIRIT

scdinfo@ntktech.com
About Trendsetter Electronics

Trendsetter Electronics is a Woman Owned Small Business, ISO Certified, franchised distributor of active, passive, electro-mechanical, and interconnect electronics components. Trendsetter specializes in High Temperature, High Reliability, High Precision components to meet the demanding needs of Military, Space, Avionics, Instrumentation and Extreme Environments.

Certifications

• Woman Owned Small Business • SBA/SAM (CCR) • WBENC Certificate: 236992 • ISO 9001:2015 Certification: 14620 • AS9120 In Process

Market Focus

Mil/Aero

• Full line of Mil QPL/Certified Components
• EOL/DMS Management and Mitigation
• Solutions for: COTS, COTS+, MIL, Custom

Extreme Temperature Applications

• High Temp / High Rel components
• Power Storage Solutions
• Power Conversion
• Green Energy Systems and Solutions

Instrumentation

• High Precision Solutions
• Tolerances and specs to meet your needs

Global Footprint

The need for Reliability, excellent Value and high Precision components knows no language barrier or distance. Trendsetter is uniquely suited to service those needs through a global sales force, with a record of providing cutting edge technologies and superior customer service.

Supported Technologies

AC-DC/DC-DC Converters
Audio
Cable Glands
Capacitors
Connectors
Delay Lines
Die
Diodes
Diode Arrays
Filters
Inductors
Memory
Memory Modules
Networks
Opto/LEDs/LCDs
Power Supplies
Processors
Rectifiers
Resistors
RF Components
Semiconductors
Silicon on Insulator ICs
Terminal Blocks
Thermal Protection
Thermistors
Transformers
Transistors
Voltage Regulators

**High Temperature Product Lines