The Multinational Power Electronics Association

PSMA

Packaging/Manufacturing Committee

March 19, 2024

John Bultitude, Brian Narveson, Jason Rouse

Co-chairman

Meeting Agenda

- Ernie Parker has retired from Crane & although he will continue to serve on the Committee Jason Rouse will replace him as our co-chair
- Thank You Ernie for your many years of support and welcome Jason
- APEC 2024 Industry Session Summary
- 3D-PEIM 2025 Update
  - 3D-PEIM Organizing Committee – Update
  - 3D-PEIM Technical Committee Update
- IWIPP 2025 Update
- Pwr Soc 2025 Update
- Power Technology Report on Embedded and Integrated Magnetics- Update
- APEC 2025
  - Focus Topic Brainstorm for Packaging and Manufacturing

APEC 2024 Industry Session - Wednesday February 28

IS10 Advances in 3D-Packaging Technology for Power Electronics

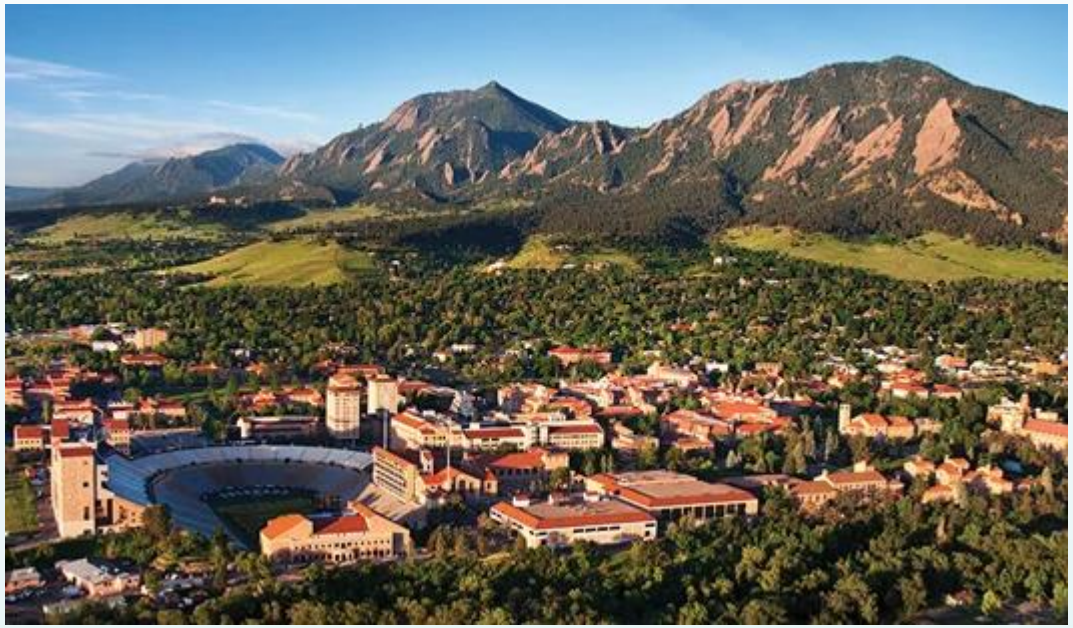
Focus:

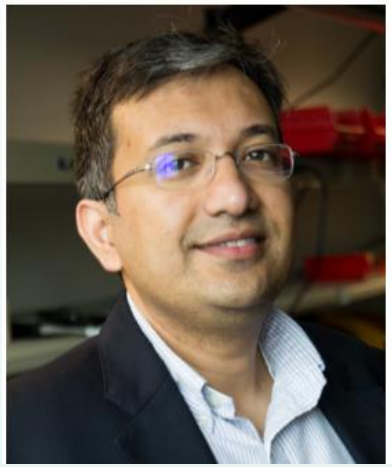
The PSMA Packaging Committee is organizing and proposing an Industry Session for APEC 2024 that is focused on advances in 3D-Packaging Technology for power e…eve high packaging densities, such as embedding, wh… packaging needs for a broad range of different applic…er power systems. Application of AI higher power syste… demands for higher density, more efficient power electronics will be described. The latest developments in onshoring of packaging will also be presented. This session will bring together leading academic and industrial researchers in this area. Attendance in RED

- **APEC 2024 was well attended**
- **Presentation attendees in range 30-80**

Start	Finish	ID	Presentation Title	Presenter	Title/Affiliation
8:30 AM	8:55 AM	IS 10.1	Common Mode Noise and Minimizing Emissions through Packaging Technology 32	Douglas C. Hopkins	Professor in Electrical and Computer Engineering, Director of the Laboratory for Packaging Research in Electronic Energy Systems (PREES), NC State, USA
8:55 AM	9:20 AM	IS 10.2	Packaging for IoT Device Energy Harvesting Solutions – Roadmap and Considerations 31	Mike Hayes / Brian Zahnstecher	Head of Group ICT for Energy Efficiency, Tyndall National Institute, County Cork, Ireland / Founder & Principal, PowerRox, Niantic, CT, USA
9:20 AM	9:45 AM	IS 10.3	Efficiency improvements for power conversion units by means of PCB embedding technology for fast switching devices like SiC and GaN 80	Thomas Gottwald	Vice President Technology Schweizer Electronic AG, Germany
9:45 AM	10:10 AM	IS 10.4	Innovation and Collaboration in Power Module Packaging and HVM in the fast-changing world 48	Thomas Wang	Director of ASE Corporate R&D, ASE, Taiwan
10:10 AM	10:40AM	**BREAK**			
10:40 AM	11:05 AM	IS 10.5	On-Shoring Power Packaging 32	Charles Woychik	EHanced Semiconductor, Inc. formerly Sr. Director Advanced Packaging Platforms at Skywater Technology Foundry, Kissimmee, Florida, USA
11:05 AM	11:30 AM	IS 10.6	Chiplets and Integration in Power Distribution Networks 18	Siddarth Ravichandran	Chipletz, Austin, TX, USA
11:30 AM	11:55 AM	IS 10.7	AI-Driven Reliability of Solar Power Inverters 25?	Patrick McCluskey	Professor and Director of Undergraduate Studies Dept. of Mechanical Engineering University of Maryland, College Park, MD USA

3D-PEIM 2025





3D-PEIM is held every 2 years to bring together technologists interested in merging of power packaging, circuits, components and manufacturing to create high performance power solutions using 3D packaging technology and manufacturing techniques.

3D-PEIM

- **Dr. Faisal Khan Chief Researcher/Scientist NREL – General Chairman**
- **June 2025**
- In-person Conference
- University of Colorado, Boulder Campus?
- Connect with world's top Power Packaging and Manufacturing experts
- PSMA sole Financial Sponsor, IEEE EPS Technical Sponsor

3D-PEIM 2025 Technical Co-chairs Chairs

Sreekant Narumanchi, Ph.D.,
ASME Fellow
Group Manager, Advanced Power Electronics and Electric Machines Group
Center for Integrated Mobility Sciences
National Renewable Energy Laboratory, MS 1633

Email: sreekant.narumanchi@nrel.gov

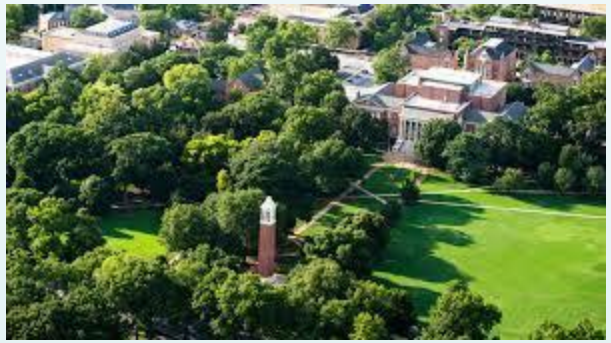
Jason Rouse Ph.D.,
Manager Strategic Growth & Ventures
Taiyo America Inc.

Email: jhrouse@taiyo-america.com

- **Currently we are Recruiting for the Technical Committee to help Organize the Program**

IWIPP 2025

- IWIPP International Workshop on Integrated Power Packaging is a biennial IEEE event dedicated to advancing the state of the art in power semiconductor packaging, which is widely recognized as one of the critical factors influencing the performance and reliability of today's power electronics



- **IWIPP April 8-10, 2025**
- **Dr. Andy Lemon – General Chairman**
- In-person Conference
- University of Alabama, **Tuscaloosa, Alabama**
- Connect with world's top power, device, integrations and system researchers
- PSMA Board Approved Sponsorship at January 2024 Meeting

IWIPP is Sponsored By:

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IEEE ELECTRONICS PACKAGING SOCIETY

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PwrSoC 2025

- The Packaging Committee supports PwrSoC
- The PwrSoC steering committee has been searching for a host for the next workshop.
- Steering Committee Meeting heard a proposal from Prof. Jaeha Kim, Seoul National University and will be evaluating at our next meeting.

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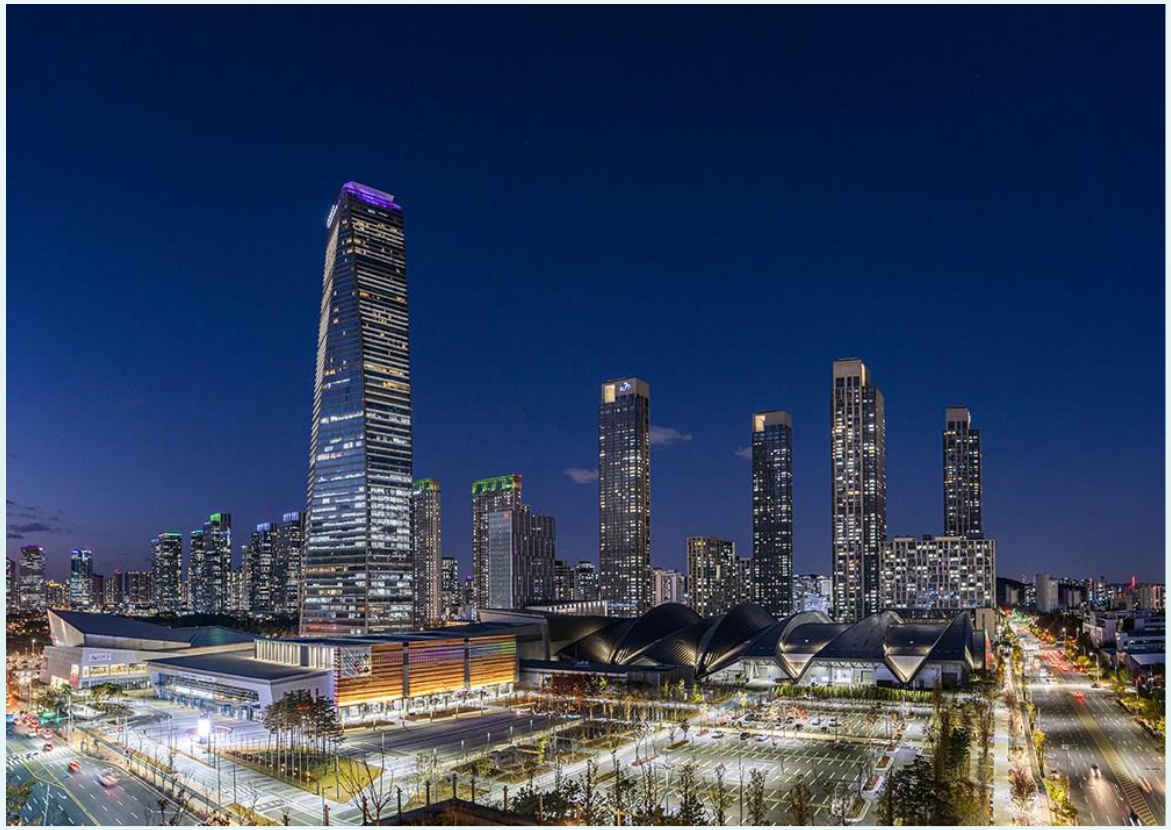

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Power Technology Report on Embedded and Integrated Magnetics

- Purpose
  - To provide and up to date reference for member companies on the present state of integrated and embedded magnetics.
  - The report will follow the format of the previous 3 Technology Reports
  - The report will deep dive into the explosion of integrated and embedded PCB magnetics
  - The report would look at
    - What's available today and the applications they are used in.
    - What is in the pipeline for the next 2-3 years.
    - Potential roadmap for the future.
    - What the main roadblocks are.
- Supported by the Packaging and Magnetics Committee
  - Brian Narveson – Subcommittee Chair – Pkg Committee Co-Chair
  - John Bultitude – Yageo – Pkg Committee Co-chair
  - Cian O Manthuna –Tyndall – Pkg Committee
  - Matt Wilkowski – ENA Chip – Pkg and Magnetics Committee
  - George Salma – Wurth – Magnetics Committee
  - Justin Henspeter – IBM – Packaging Committee
  - Dr. PM Raj – Florida International University – Packaging Committee
- Meeting to review first draft of RFP on March 21st
- Target Publication APEC 2025
- Estimated Cost $125K-$150K

Power Technology Report on Embedded and Integrated Magnetics

- Organizations Researching and/or Manufacturing Embedded Magnetics
  - AT&S Austria
  - Shengyi Electronics, Dongguan, China (Patent)
  - Virginia Tech
  - NEC-Tokin
  - Shennan Circuits (SCC Americas) (9 Patents)
  - Tyndall National Institute
  - Intel
  - University of Denmark
  - Florida International University
  - Mitsubishi Electric
  - University de Lyon, France
  - University of Tennessee
  - 30 papers In Explore in the last 10 years on “embedded inductors”

- Organizations Researching and/or Manufacturing Integrated Magnetics
  - EnaChip
  - Ferric
  - Georgia Tech
  - Wright University
  - Stanford University
  - Texas Instruments
  - TSMC
  - Intel
  - University of Wisconsin
  - University of Missouri
  - 207 papers In Explore in the last 10 years on “integrated inductors”

APEC 2025 Focus Topic Brainstorm

- Comparison of Packages
- Efficiency at High Frequency
- Cost Effectiveness
- Electromagnetic Simulations
- Multiphysics Modeling, Design & Packaging
- Advanced Design for Assembly
  Digital Twin Tools
- Electronic Design Automation
- Design Validation Techniques
- Physical Changes, Temperature 3D –Failure Mechanisms and how to avoid them
- Lower Cost materials & Manufacturing processes
- Higher temperatures 175 to 200^{o}C
- Process Time and Cost Down
- Thermal compounds

APEC 2025 Focus Topic Brainstorm

- Double sided cooling
- HALT testing – Auto Reliability
- Cost Effective Modeling
- System Architecture – higher end phase redundancy
- Multi-chip processors – multi voltages
- Power converters onto processors
  - Control each chip
  - Lower system cost
  - Improved Reliability
  - Magnetics buck regulation
- Integration high current high frequency GPUs
- Power Supply on chip
- Larger Scale Vehicle electrification
- Address problems at many levels chips/module/system – how does this differ?

APEC 2025 Focus Topic Brainstorm

- Panel level packaging of GaN
  - Large Area & volume assembly
  - Optical System Inspection
  - Organic Vs. Glass substrates
- AI models
  - Train the model
  - Reduce time-to-market
- Immersion Cooling
  - Realize higher power and currents
  - AI datacenters
- Convergence trends in Power Packaging – Acadamia—Industry
- Power passives as part of tools/database – integrated power problem the packaging community needs to own this
- Review ECTC agenda for presenters – TSMC, Samsung, Intel, Vicor….

APEC 2025 Focus Topic Brainstorm

- Integration on chip – innovations pushing the technology forward
- How to verify manufacturing process after each stage
- Implement AI for inspection
- Integrated Components
  - Figures of Merit (FOM)
  - Component Level or System Level
  - What is the true FOM for the system
  - What is being optimized
- Validated database of Multiphysics Models
- Multi chip Packaging (Including Power ?)
- Use of AI to anticipate power demand?
- How to get power sources to include in EDA tools?
- How to get power packaging innovations to market faster?
- What is the right power architecture for AI boards?

Thank You

Next Committee Meeting

Tuesday April 23, 9am Central Time