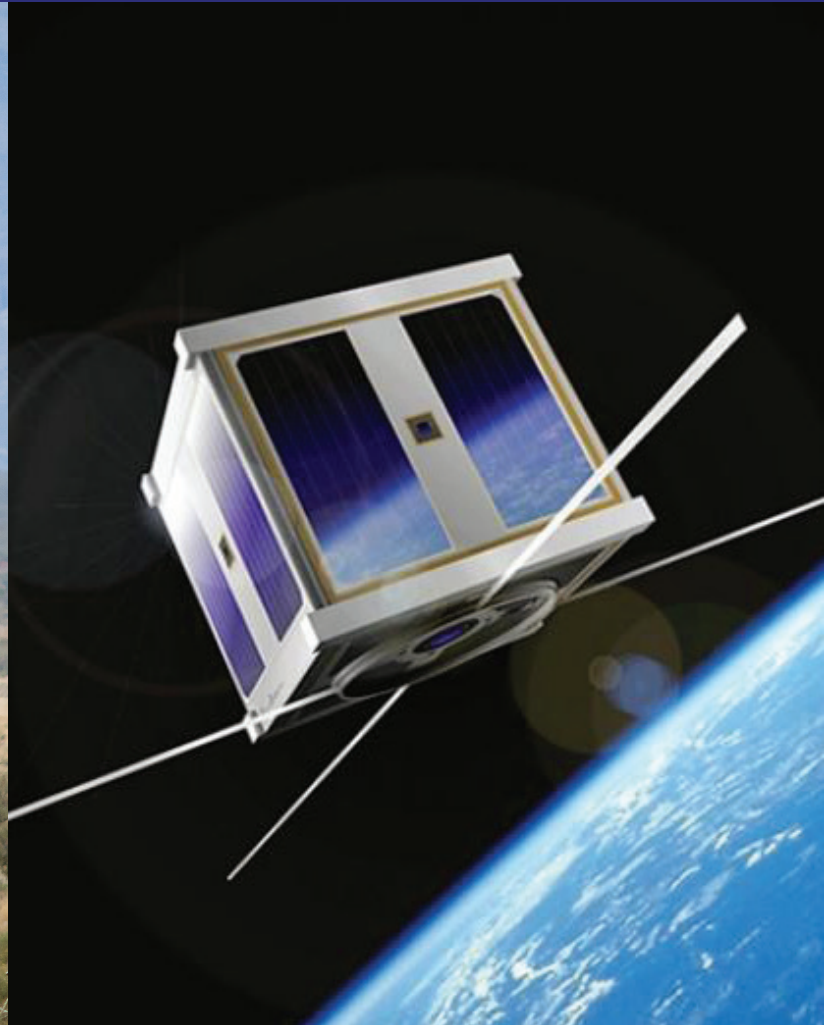


CMSE 2018

PROGRAM BOOK

CLICK PRESENTATION NAMES FOR MORE INFORMATION



22nd Annual Components for Military & Space Electronics Conference & Exhibition

May 7-10th, 2018

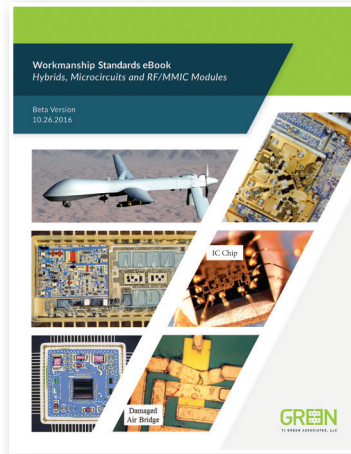
Four Points by Sheraton (LAX)
Los Angeles, California



Organized by: TJ Green Associates LLC

Workmanship Standards eBook: Hybrids, Microcircuits and RF/MMIC Modules

This is an online illustrated guide depicting photos of common workmanship defects as seen during production and each defect slide is tied to a particular page in MIL-STD-883. Its intended as an on-the-floor working document for operators, inspectors and quality engineers to facilitate an understanding of defects generated during the manufacture of hybrids, microcircuits and RF/MMIC modules and how they relate to the contractual requirements of MIL-STD-883.



**Access over
300 color
defect pics**
linked to
Mil-Std-883 source
requirements with
just a click!



GREEN
TJ GREEN ASSOCIATES, LLC

LEARN MORE AT
www.tjgreenllc.com/workmanship-ebook

20% off

Expires 7/1/2018

CMSEWORK20

Dear Military and Space Electronics Professionals,

On behalf of the Program Committee I would like to personally welcome everyone to this year's 22nd annual CMSE Conference and Exhibition. This is an interactive event that requires full participation from the attendees as well as the speakers and exhibitors. The idea is to promote broad discussion about grass root technical issues we all face together in this industry. So please take the time to listen, ask good questions and don't hesitate to respectfully challenge each other's ideas and technical opinions. I'd like to personally thank our sponsors and exhibitors for supporting CMSE. On a programming note an electronic copy of all the presentations will be sent via a secure link to all attendees after completion of CMSE 2018.

I look forward to speaking to each and everyone.
Welcome!

Thomas Green,
Program Chairman

PROGRAM COMMITTEE

Tom Green
TJ Green Associates LLC
Program Chair

Mike Cozzolino
Raytheon

Ron Demcko
AVX Corp.

Aaron DerMarderosian
Raytheon

Leon Hamiter
CTI

Sultan Lilani
Integra Technologies

Bob Lowry
Electronic Materials Consultant

Mike McKeown
Hesse Mechatronics

Mike Sampson
NASA

Jeff Sokol
The Aerospace Corp.

Tom Terlizzi
TJ Green Associates LLC

Andy Moor
Northrop Grumman Mission Systems

Tomáš Zedníček
EPCI European Passive Component
Institute

Tim Flaherty
Golden Altos

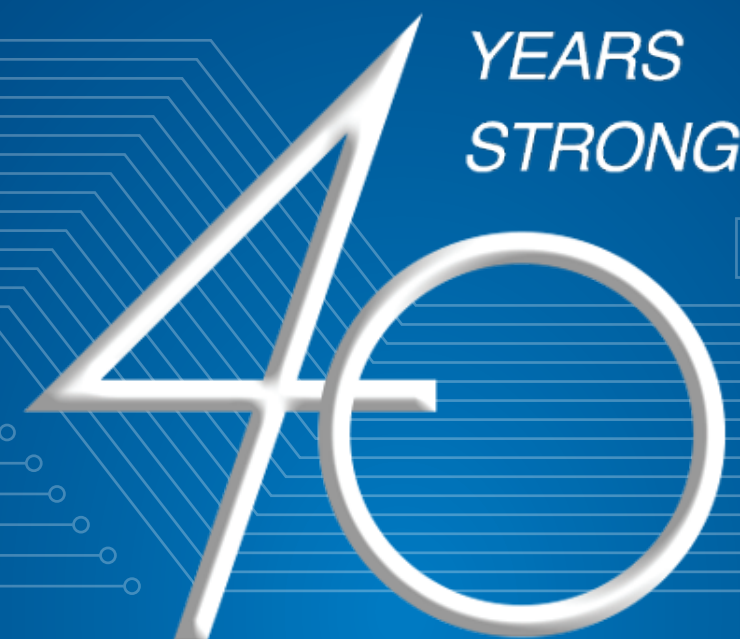
Rick Rodriguez
Raytheon



20 KEYNOTE 18 SPEAKERS

PROFESSOR RAO R. TUMMALA is a Distinguished and Endowed Chair Professor at Georgia Institute of Technology in the USA. He is well known as an industrial technologist, technology pioneer, and educator. Prior to joining Georgia Tech, he was Director of Advanced Packaging at IBM and an IBM Fellow, pioneering such major technologies as the industry's first plasma display and the first and next two generations of 100 chip multi-chip packaging. He is the father of LTCC and System-on-Package (SOP) technologies. As an educator, Prof. Tummala was instrumental in setting up the largest Academic Center funded by NSF as NSF Engineering Research Center in Electronic Systems at Georgia Tech, producing more than 1500 engineers, with an integrated approach to research, education and industry collaborations with companies in US, Europe, Japan, Korea and Taiwan. He has published 800 technical papers and invented many technologies that resulted in over 110 patents, wrote the first modern textbook in packaging, Microelectronics Packaging Handbook (1988); the 1st undergrad textbook, Fundamentals of Microsystem Packaging (2001); and the 1st book introducing the concept of SOP, Introduction to System-on-Package (2006). He received more than 50 Industry, Academic and Professional Society awards. He is a member of NAE and IEEE Fellow.

DR. ANDUIN TOUW, BOEING is a Technical Fellow in Component Engineering and Electronics Reliability at The Boeing Company. She has a MS in Statistics from UCLA and a PhD in Reliability Engineering from University of Maryland. She is chair of the SAE SSTC G12 committee on solid state electronics and SAE G24 committee on Pb-free Risk Mitigation. She led the development of GEIA-STD-0005-2 on tin whisker risk mitigation and has developed standard approaches for managing semiconductor wear out, non-hermetic parts in space applications, use of parametric data for quality evaluation, and other technology insertion activities.



Proudly Celebrating 40 Years of Excellence

Package Gas Analysis

Destructive Physical Analysis

Hermeticity Testing

Environmental Testing

Organic Mass Spectrometry

Materials / Surface Analysis

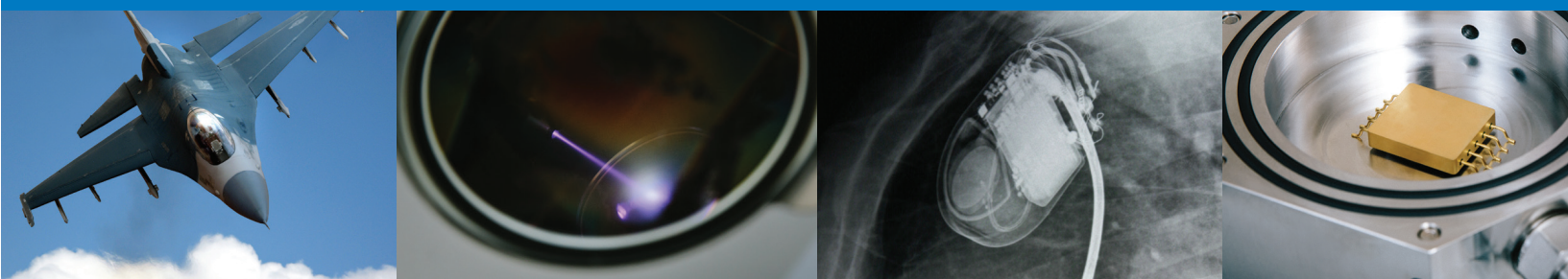
X-Ray Inspection

Consulting Services

Gas Analysis & Leak Test
Instrument Sales

ISO9001, AS9100 and DLA Certified

www.orslabs.com



2018 TUTORIAL SCHEDULE

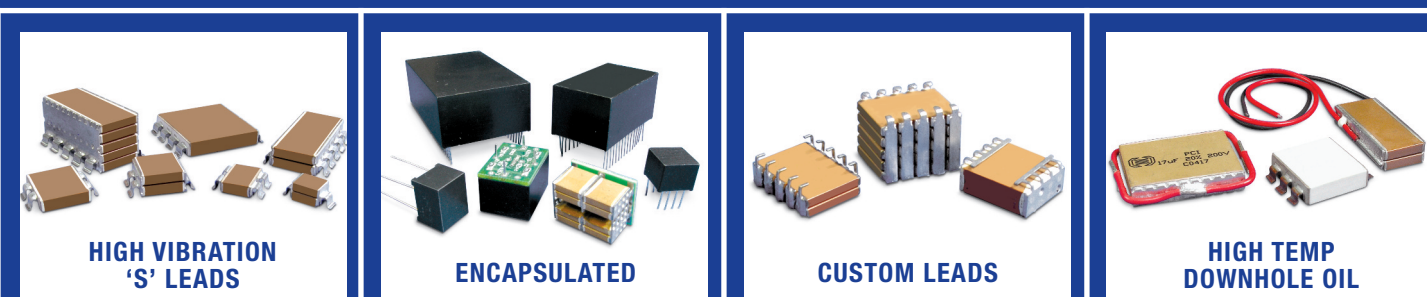
MONDAY, MAY 7

1300 - 1700	Session A Moisture in Microelectronics...Physics and Chemistry of Volatile Species in Hermetic Devices	Thomas J Green <i>TJ Green Associates LLC</i> Robert Lowry <i>Electronic Materials Consultant</i>
	Session B Mission Assurance for Small Satellites – Balancing Cost, Risk and Uncertainty (i.e., More Risk)	Michael Swartwout <i>Saint Louis University</i>

TUESDAY, MAY 8

0700 - 0800	BREAKFAST AND REGISTRATION	
0800 - 1200	Session A Advanced Integrated Circuit Packaging and Reliability Issues	Richard Rao <i>Microsemi Corp.</i>
	Session B Attributes and Challenges of Polymer Electrolytic Capacitors in High Reliability Applications	Mitch Weaver <i>AVX Corporation</i>
1300 - 1700	Session A Passive Components and Integration for Power and RF Modules	P. Markondeya Raj <i>Georgia Tech – Packaging Research Center</i>
	Session B Copper Wirebonding – A Technology Review	Mukul Saran <i>Texas Instruments</i>

HIGH RELIABILITY CERAMIC CAPACITORS



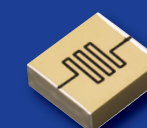
10V to 10kV in Multiple Dielectrics
X7R, BX, N2200, NPO

Capacitors for High Temperature Applications (250°C+)

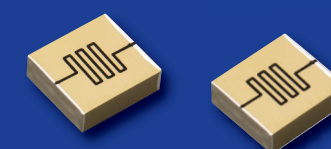
Lead Frames for Board Flex Compliance

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

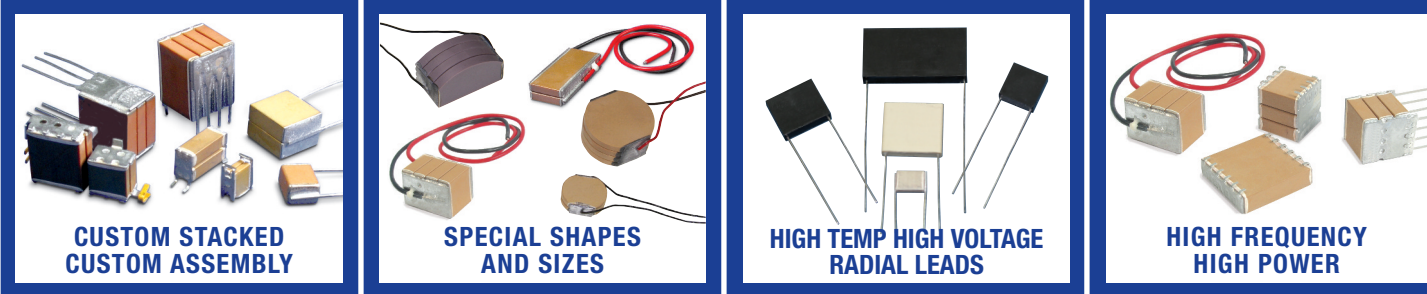


Tin Whisker Mitigation WITH TIN-LEAD CONVERSION

for reliable operation in applications where failure is not an option.

- * Solid Body Fuses
- * Ferrite Chip Beads
- * Terminal Finish Conversion
 - Tin to Tin-Lead
 - Tin to Gold
 - Gold to Tin-Lead

<http://aem-usa.com>



PRESIDIO COMPONENTS, INC.

7169 Construction Court, San Diego, CA 92121 • Tel: 858-578-9390 • Fax: 858-578-6225
www.presidiocomponents.com • info@presidiocomponents.com

2018

PRESENTATION
SCHEDULE

WEDNESDAY, MAY 9
EXHIBITOR HOURS: 1100 - 1900

0800 - 0810	Welcome/Intro	
0810 - 0840	Keynote Packaging and Heterogeneous Integration During and Post Moore’s Law Era	Prof. Rao R. Tummala <i>Georgia Institute of Technology</i>
Session Chair - Paul Enquist, Xperi Inc.		
0840 - 0905	1.0 iPhone X - Steve Jobs’ iPhone	Dr. Bill Cardoso <i>Creative Electron</i>
0905 - 0930	1.1 DPA Techniques for Next Generation Packaged Components	Trevor Devaney <i>Hi-Rel Laboratories</i>
0930 - 0955	1.2 Considerations for 3-D Multi-Chip Modules for High Reliability Applications	Joseph Castaldo <i>Data Device Corporation</i>
0955 - 1010	COFFEE BREAK	
1010 - 1035	1.3 Freebird “Evolution of Rad Hard GaN Power Technologies” Update 2018	Jim Larrauri <i>Freebird Semiconductor Corporation</i>
1035 - 1100	1.4 Highly Integrated RF and Digital Architectures	Lorne Graves <i>Mercury Systems</i>
1100 - 1125	1.5 3D X-ray Analysis for Advanced Package Failures	Cheryl Hartfield <i>Carl Zeiss SMT</i>
1125 - 1150	1.6 Counterfeit Mitigation Testing on FPGAs using Advanced Electrical Testing Algorithms	Sultan Ali Lilani <i>Integra Technologies LLC</i>
1150 - 1345	LUNCH - IN EXHIBITS AREA	
Session Chair - Sultan Ali Lilani, Integra Technologies LLC		
1345 - 1400	1.7 Applications of MIP Decapsulation in Device Quality Control and Failure Analysis	Jiaqi Tang <i>JIACO Instruments B.V., the Netherlands</i>
1400 - 1415	1.8 Introduction of Copper Alloy Bonding Wire for the High Rel Industry	William Crockett <i>Tanaka</i>
1415 - 1540	1.9 Copper Wirebond Panel Discussion Session Moderators: Sultan Ali Lilani, Integra Technologies LLC; Jeff Jarvis, US Army AMRDEC and Robert Varner, Troy 7, Inc.	

1540 - 1555	COFFEE BREAK	
Session Chair - Mike Cozzolino, Raytheon Company		
1555 - 1620	2.0 A Novel RoHS Compliant K~4000 X7R Dielectric Compatible with 80%Ag/20%Pd Internal Electrodes for High Reliability PME MLCC Applications	Anton V. Polotai MRA Laboratories, Inc
1620 - 1645	2.1 Cracking Problems and Mechanical Characteristics of PME and BME Ceramic Capacitors	Alexander Teverovsky NASA
1645 - 1710	2.2 Miniaturization of PME Ceramic Capacitors for Space and Defense Applications	Maud Fabre Exxelia Group
1710 - 1735	2.3 Multi Layer Ceramic Capacitors for Space Level Applications utilizing Base Metal Electrodes	John Marshall AVX Corporation
1735 - 1800	2.4 Evaluation of Automotive Grade Ceramic and Tantalum Chip Capacitors for Space Applications	Michael Sampson & Jay Brusse NASA
1800 - 2000	WELCOME RECEPTION	

ADVERTISING OPPORTUNITY

Contact: Tom Terlizzi Exhibits Chair

terlizzi@tjgreenllc.com | Cell: +1 (516) 807-9488

2018

PRESENTATION
SCHEDULE

THURSDAY, MAY 10
EXHIBITOR HOURS: 1000 - 1400

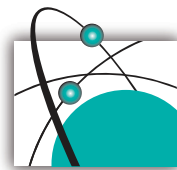
0800 - 0830	Keynote Role of Standardization in 21st Century Mil-Aero Electronics	Dr. Anduin Touw <i>The Boeing Company</i>
Session Chair - Ron Demcko, AVX Corporation		
0830 - 0855	3.0 DLA's Generalized Emulation of Microcircuits (Solution for Microcircuit Obsolescence)	Jennifer Willette <i>SRI International</i>
0855 - 0920	3.1 MIL-STD-981 "Space Level or Not?"	Mike Cozzolino <i>Raytheon Company</i>
0920 - 0945	3.2 COTS Developments in Hi-Rel Applications	Scott Harris <i>Vanguard Electronics</i>
0945 - 1010	3.3 Root Cause Analysis of SMT RF Inductors, Exhibiting Resonance Failures	Aaron Dermarderosian <i>Raytheon Company - Space and Airborne Systems</i>
1010 - 1025	COFFEE BREAK	
1025 - 1050	3.4 Specialized Design and Verification Methods Break Performance Limits of Catalog Magnetics	Victor Quinn <i>Exxelia Group</i>
1050 - 1115	3.5 Attributes and Challenges of Polymer Electrolytic Capacitors in High Reliability Applications	Mitch Weaver <i>AVX Corporation</i>
1115 - 1140	3.6 Advanced Packaging Technology to Attach Electrical Surface Mount Components Directly to Electrical Connectors	Kevin Foreman <i>Quell Connector</i>
Session Chair - Tim Flaherty, Golden Altos		
1140 - 1205	4.0 Tin Whisker Growth from Sn-In-Ag Solder	Lyudmyla Panashchenko <i>NASA</i>
1205 - 1335	LUNCH - IN EXHIBITS AREA	
1335 - 1400	4.1 Trusted Foundry	Jean Pierre Crovetto <i>Defense Microelectronics Activity</i>
1400 - 1425	4.2 Trust in FPGAs: Assurance in your Supply Chain	Steven McNeil <i>Xilinx, Inc.</i>
1425 - 1450	4.3 Long Term Storage of EEE-components for Space Applications	Anastasia Pesce <i>European Space Agency</i>
1450 - 1505	COFFEE BREAK	

1505 - 1530	4.4 Legacy System Sustainment- CCA / Sub-system COTS Counterfeit Inspection & Risk Mitigation	Aaron Dermarderosian <i>Raytheon Company - Space and Airborne Systems</i>
1530 - 1555	4.5 When Will Hydrogen Bring Down Your Components?	Robert Lowry <i>Electronics Materials Consultant</i>
1555 - 1620	4.6 Low Temperature Direct Bond Technology for Reliable High Performance 2.5 and 3D Military and Space Electronics	Paul Enquist <i>Xperi</i>
1620 - 1645	4.7 ES Components Acquisition of Vishay Siliconix Hermetic Product Portfolio, Including All MIL-PRF-19500 and MIL-PRF-38535 Devices; Portfolio Strategy for the Future	Don Larson <i>ES Components</i>
1645 - 1710	4.8 Military & Space Electronics Reliability without Military Component Specifications	Leon Hamiter <i>Components Technology Institute Inc.</i>
END CONFERENCE		

ADVERTISING OPPORTUNITY

Contact: Tom Terlizzi Exhibits Chair

terlizzi@tjgreenllc.com | Cell: +1 (516) 807-9488



MicroCircuit
Laboratories

Hermetic Package Sealing Technology

MicroCircuit Laboratories delivers hermetic encapsulation processes with E-10 atm-cm³/sec air leak rates, slower than the most critical Aerospace per MIL-STD 883 Test Method 1014 Seal. Low internal device temperature is maintained below specifications for all materials with precisely controlled headspace.

Weld seal joints exceed Test Method 2009 External Visual; 80Au20Sn Solder seal joints exceed Test Method 2012 Radiography Lid Seal Voids. All seal joints meet Test Method 1009 Salt Atmosphere.

MCL's capability includes materials design software, class 1 cleanroom processing, pre-seal moisture removal processing, low temperature hermetic package sealing with either parallel seam sealing or one-shot welding; pre-seal moisture removal systems with no polymers; inert environmental processing with 0.1 PPM H₂O and O₂ environments; automatic, single system gross and fine leak detection; Particle Impact Noise Detection.

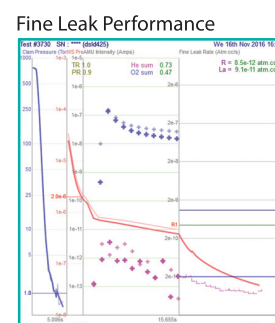
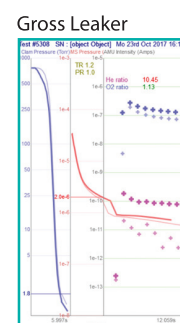
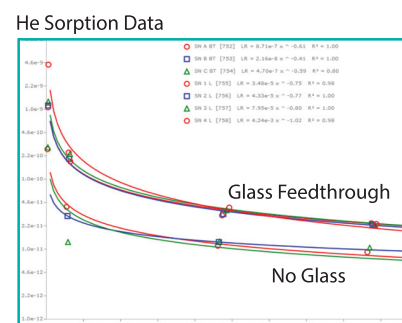
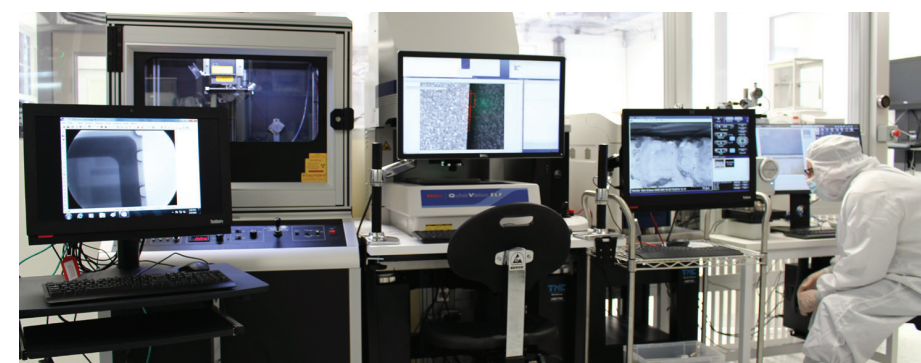
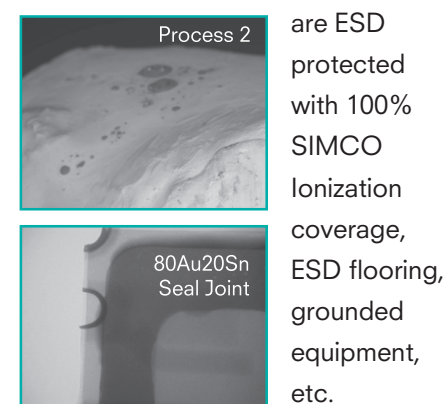


For quick turn process development, on site metrology with Hitachi SEM, GT Real Time X-Ray, Olympus

Opto-Digital Microscopes and Mitutoyo CNC Measuring to assure you are delivered the best process.

All processes are easily transferred to merchant & captive production partners.

Pilot production services are provided which include both pre-seal cleaning and processing in a class 1 cleanroom environment. Your valuable devices



Freebird Semiconductor: (r)evolutionary High-Reliability GaN Technology

Freebird Semiconductor is a fabless design and domestic (USA) manufacturing company offering advanced high-reliability wide-band gap power switching technology.

We are focused on delivering Radiation Hardened Enhancement Mode Gallium Nitride Power Transistors (eGaN HEMT) with game-changing, first-in-class eGaN-based portfolios that facilitate evolutionary advantages over silicon-based solutions.

High-Reliability Power Switching Technology Enhancement Mode Gallium Nitride (eGaN®)

Freebird Semiconductor Series of eGaN® switching power HEMTs have been specifically designed for critical applications in the high-reliability or commercial satellite space environments.

These devices have exceptionally high electron mobility and a low temperature coefficient, resulting in very low RDS(ON) values. The lateral structure of the die provides for very low gate charge (QG) and extremely fast switching times. These features enable faster power supply switching frequencies, resulting in higher power densities, higher efficiencies, and significantly compact circuitry.



High-Reliability Power Switching Technology Enhancement Mode Gallium Nitride (eGaN®) Driver GaN Adaption Module (GAM) Driver Series

Freebird Semiconductor's patented GaN driving GaN HEMT Technology opens the door to revolutionary power supply switching design. A complete portfolio of commercial space epoxy over-molded and emerging ceramic hermetic driver designs expand the limits of future space missions with GaN technology today!

For further product information, including Abstract Radiation Test Reports and Abstract Qualification Test Reports, visit www.freebirdsemi.com or email info@freebirdsemi.com.

Stop at table top T-8!



17 Parkridge Road, Unit E, Haverhill, MA 01835 • 978 208-1334



Optical Leak Test Systems

- Simultaneous Fine & Gross Leak Testing
- MIL-STD 883 & MIL-STD 750 Compliant
- Fast/Reliable Inspection
- Automated Inspection
- Test Board Mounted Devices

Visit us at Table T3 and discuss your Hermetic Testing needs

NorCom offers initial leak testing at no charge

1055 W. Germantown Pike Norristown PA 19403 USA • TEL (610) 592-0167 • FAX (610) 631-0934 www.NorCom-SystemsInc.com



Advanced Capacitors for Demanding Applications

EVANSCAPS, made by Evans Capacitor Company, deliver a key solution for applications where performance is critical. EVANSCAPS provide significant savings of space and weight in addition to improved electrical characteristics when compared to other capacitor technologies.

- Qualified and in service with virtually all Tier 1 Aerospace & Defense contractors
- Screened & qualified to NASA INST-002 and individual mission requirements
- Rugged, hi-rel, hermetically sealed design
- SWaP Technology

Common Applications

Radar • Bridge Power/Power Hold-Up
LIDAR • Filtering • Laser
Electronic Warfare & many more

www.evanscap.com



Hybrid® Capacitor
TDD4080123 398918
1545AB 12000µF 80V
06MN5 Evans Capacitor E. Providence, RI

SPONSORS



European
Passive Components
Institute



RTC MEDIA



EXHIBITORS

AEM, Inc.

AVX Corporation

BSET EQ

Defense Microelectronics
Activity (DMEA)

ES Components

Evans Capacitor Company

Exxelia Group

Freebird Semiconductor

Golden Altos Corp

Hesse Mechatronics Inc.

Hi-Rel Laboratories, Inc.

Honeywell FM&T

JIACO Instruments

Kemet

Knowles Capacitors – Valencia
(Novacap)

Kyocera International, Inc.

Microcircuit Laboratories LLC

Midas Technology, Inc.

NorCom Systems Inc.

Oneida Research Services, Inc.

Presidio Components

Quell Corporation

Solid State Devices, Inc.

Tanaka Kikinzoku International
(America) Inc.

Vanguard Electronics

Vishay Intertechnology, Inc.

Zeiss



Organized by: TJ Green Associates LLC