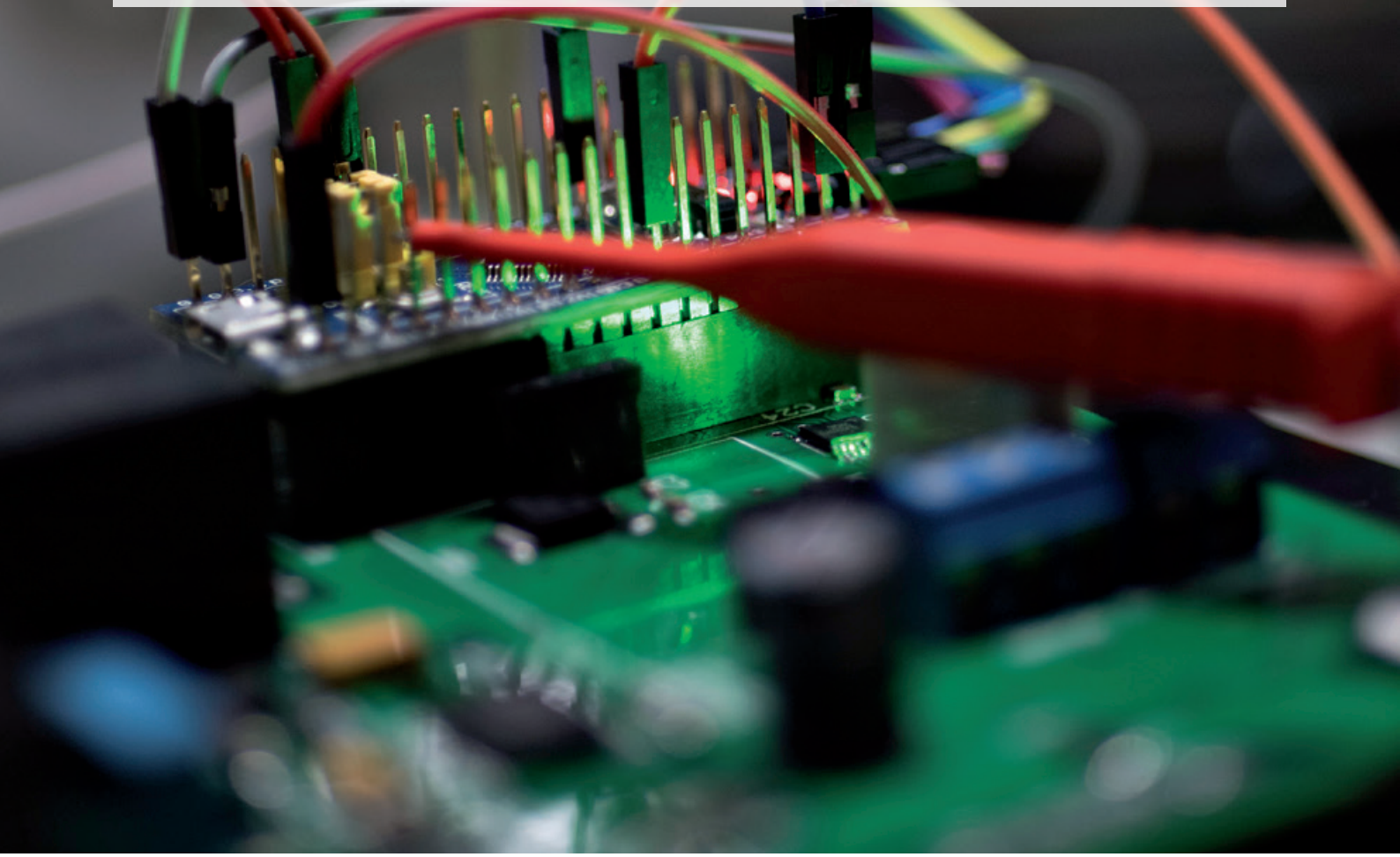
PROGRAMME

29th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis

OCTOBER 1–5 2018

AALBORG – DENMARK

WWW.ESREF2018CONF.ORG



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WELCOME
TO ESREF 2018

I am pleased and honoured to welcome you to ESREF 2018, the 29th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis, from October 1st to 5th, 2018, at Aalborg Congress and Culture Centre, in Aalborg, Denmark.

ESREF allows electronic reliability professionals and failure analysis professionals to meet annually and participate in a rewarding exchange of experience, technical knowledge, and valuable industry connections. This is a rather unique opportunity, which ESREF provides annually. I have been participating in ESREF from the beginning of my career, and look forward to it every year, as a time to see what is up with the field, exchange news with my colleagues, discuss new challenges, and hopefully find solutions or good hints to solve the new problems we encounter in our daily research.

ESREF 2018 will offer something special, giving a particular stress on reliability of power electronics and renewable energy production systems. This year we have reached the impressive number of 14 technical tracks, plus a special session on Reliability in Traction Applications, for a total of 126 papers spread over 31 oral sessions. Seven invited speeches and three best papers from the sister conferences ISTFA, IRPS and IPFA will complete the oral part of the technical session. On top of that, 120 poster papers will be showcased on Tuesday afternoon, for a total of 253 technical contributions, not to mention the five tutorials and four workshops on the hot themes of reliability and failure analysis. All the technical papers will be published as a special issue on Elsevier Microeletronics Reliability. This year there will also be a number of industrial sessions in parallel with the technical ones, which I warmly recommend to attend as unique opportunities to get effectively updated on the state-of-the-art technologies.

I also want to make a special mention of the two keynote speeches during the opening session. The first one will be given by Dr. Paolo Gargini, now chairman of International Roadmap for Devices and Systems (IRDS), who spent almost 35 years with Intel Corp., Santa Clara, where he was Director of Technology Strategy, and developed, among many other things, the building blocks of HMOS III and CHMOS III technologies used in the 1980s for the 80286 and the 80386 processors. Dr Gargini will give a talk titled "How to successfully overcome inflection points, or long live Moore's law". The second keynote speech will be given by Dr. Philip Carne Kjær, who has been with Vestas Wind Systems A/S over the last 15 years, where he has served as Vice President among other roles, and now is Chief Specialist holding principal responsibility for technology and product development of power electronic converters and HV apparatuses. Dr. Kjær will give a talk titled "Vestas' practice in reliability engineering for power electronics".

The exposition comprises 25 companies working on state-of-the-art technologies for reliability investigation and failure analysis. Exhibition booths are located in the large "Foyeren" hall, where buffet lunches and coffee breaks will be served, and a dynamic atmosphere will reign during the entire conference.

I would also like to present shortly the social/technical events which will accompany the conference, such as the Welcome Reception offered by the City of Aalborg, on Monday evening, the Young Professional Reception, on Tuesday evening, the gala dinner, in the majestic Voergård Castle, on Wednesday evening, and the technical visits to Grundfos and Vestas on Friday, all day.
For the lovers of beautiful landscapes, a trip to Skagen, the tip of the Jutland peninsula, will take place on Friday too, in parallel to the technical visits. It is worth to mention the APETT symposium on Thursday afternoon, which showcases the recent findings in the APETT project ("Advanced Power Electronic Technology and Tools") currently running at the department of Energy Technology, Aalborg University.

Attendees will be able to use the free ESREF 2018 App, which will provide a friendly guidance throughout the conference and its related events.

ESREF 2018 would not have been possible without our sponsors, i.e. Danfoss Power Electronics A/S and Grundfos Holding A/S, and the incomparable effort of all the members of the organisation committee. Special thanks to the two foundations who supported the initiative: the Obel Family foundation and Otto Mønsted foundation. It is also worth mentioning our technical sponsors who to a large extent have contributed to the ESREF 2018 success: CELCORR - the centre for Electronic Corrosion, DTU Copenhagen - Mechanical Engineering Department, SPM - the Danish Reliability Association, Bodo's Power, EPE - the European Power Electronics and Drives Association, and ECPE - the European Centre for Power Electronics.

The technical programme chairs, Dr. Mauro Ciappa (ETH Zurich), Prof. Gaudenzio Meneghesso (University of Padua) and Assoc. Prof. Paolo Cova (University of Parma) deserve a special acknowledgment for the immense work done in this edition, comprising, among other thing, the full review process of the almost 400 submitted manuscripts with very tight time constraints. My deepest gratitude goes to the 352 reviewers and mentors and the 30 track chairs whom offered for free their expertise to the review process. ESREF 2018 would simply not be happening without their commitment. Thanks a lot.

Aalborg is a dynamic city, rich in corners, museums, monasteries and old buildings just waiting to be visited. The city downtown offers a unique and cosy atmosphere, with paths and courtyards, where it is lovely to get lost. Enjoy the many cafés, restaurants and beer breweries: you will not ever be able to visit them all! Do not miss the sunset at the long and enjoyable walk at the waterfront of "Limfjorden"– the sea strip joining the North Sea and the Baltic Sea passing through Aalborg city.

I look forward to meeting you all, attendees, exhibitors, organisation committee members and sharing this wonderful experience together.
Warmest regards,

Francesco Iannuzzo
CORPE, Center of Reliable Power Electronics
Department of Energy Technology, Aalborg University

ESREF 2018 General chair

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A - QUALITY AND RELIABILITY ASSESSMENT TECHNIQUES AND METHODS FOR DEVICES AND SYSTEMS
Ninoslav Stojadinovic - University of Nis, Serbia
Cora Salm - UTwente, Netherland

B1 - SI-TECHNOLOGIES & NANOELECTRONICS: HOT CARRIERS, HIGH-K, GATE MATERIALS
Gabriella Ghidini - STMicroeectronics, Italy
Alain Bravaix - ISEN-Toulon, France

B2 - SI-TECHNOLOGIES & NANOELECTRONICS: LOW-K, CU INTERCONNECTS
Eckhard Langer - Globalfoundries, Germany
Hervé Jaouen - STMicroelectronics, France

B3 - SI-TECHNOLOGIES & NANOELECTRONICS: ESD, EMI AND LATCH-UP
Gianluca Boselli - TI, USA
Marise Bafleur - LAAS, France

C - PROGRESS IN FAILURE ANALYSIS: DEFECT DETECTION AND ANALYSIS
Giovanna Mura - University of Cagliari, Italy
Vladimir Popok - Aalborg University, Denmark

D - RELIABILITY OF MICROWAVE AND COMPOUND SEMICONDUCTORS DEVICES
Nathalie Labat - IMS Bordeaux, France
Michael Dammann - Fraunhofer IAF, Germany

E1 - POWER DEVICES RELIABILITY - SILICON AND PASSIVE
Reinhold Bayerer - Infineon, Germany
Huai Wang - Aalborg University, Denmark

E2 - POWER DEVICES RELIABILITY - WIDE BANDGAP DEVICES
Matteo Meneghini - University of Padova, Italy
Joachim Wuerfl - FBH, Germany

F - PACKAGING AND ASSEMBLY RELIABILITY
Kirsten Weide-Zaage - Hannover University, Germany
René Rongen - NXP, Netherlands

G - MEMS, SENSORS AND ORGANIC ELECTRONICS RELIABILITY
Fabio Coccetti - FIALAB, France
Stefan Oberhoff - BOSCH, Germany

H - PHOTONICS RELIABILITY
Massimo Vanzi - University of Cagliari, Italy
Alain Bensoussan - IRT Saint Exupéry, France

I - EXTREME ENVIRONMENTS AND RADIATION
Simone Gerardin - Università di Padova, Italy
Olivier Crepel - Airbus, France

K - RENEWABLE ENERGIES RELIABILITY
Salvo Lombardo - IMM CNR, Italy
Yongheng Yang - Alborg University, Denmark

L - MODELING FOR RELIABILITY
Luca Sponton - Synopsys, Switzerland
Susanna Reggiani - University of Bologna, Italy

SS1 - RELIABILITY IN TRACTION APPLICATIONS (SPECIAL SESSION)
Zoubir Khatir - IFSTTAR, France
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CONFERENCE VENUE

AALBORG CONGRESS & CULTURE CENTRE (AKKC)

Europa Plads 4
9000 Aalborg
akkc@akkc.dk

Open daily from 8 am until end of conference programme
+45 9935 5555 Mon-Thu 9:00-15:30, Fri 9:00-15:00

TRANSPORTATION

AIRPORT

Aalborg Airport is only 10-15 minutes from the city centre by bus and taxi.

BUS

The bus fare is DKK 22 per person, cash only. Foreign currency and credit cards are NOT accepted. You can withdraw cash from ATMs at the airport and in the city centre.

From the airport to Aalborg's central bus terminal:
12 – Universitetet
70 – Aalborg Busterminal
71 – Aalborg Busterminal
200 – Aalborg busterminal

From Aalborg's central bus station to the airport:
12 – Aabybro
70 – Thisted Busterminal
71 – Hjørring Busterminal
200 – Blokhus

Visit www.rejseplanen.dk for bus schedules and route planning. The site combines all public transportation to provide you with the fastest and/or most convenient travel plan.

TRAIN

Aalborg central train station is located a few minutes from Aalborg Congress and Culture Centre by foot. Simply walk through the park Kildeparken.Trains from Aalborg connect you to the rest of Denmark.

TAXI

You can find taxis outside the airport that will take you directly to your hotel. If necessary call +45 9810 1010 (Aalborg Taxi) to request a taxi. The price for a taxi ride between the airport and the city centre is DKK 180-300 depending on hotel location. Most credit cards are accepted.

ESREF 2018 APP

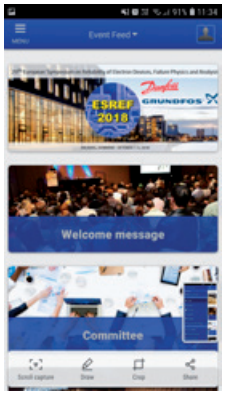
ESREF2018 EVENT APP

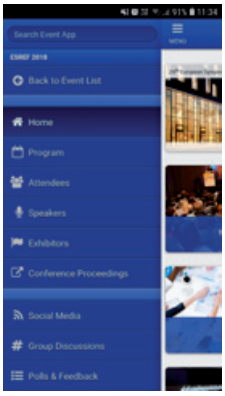
The ESREF2018 Event App is an essential tool to help you navigate the event. You will be able to access the app at any time, thanks to the possibility of installing it on your phone, tablet and/or laptop, and using it offline.

The app contains:

- Full programme
- Speaker profiles
- Presentation details
- Exhibition layout
- Venue map
- Networking features to connect with other attendees
- Personal profile and schedule
- Tool for taking notes and asking questions during presentations
- Surveys, live polls and feedback

Use your email address to log in. Password: 'WelcometoESREF' (case-sensitive).





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Parking is subject to payment during the following hours:
Weekdays: 8.00-19.00
Saturdays: 8.00-16.00
Parking tariffs per hour DKK 7.00 (Max. DKK 35.00 per day)

Once you have parked your car, check in on the car park ticket machine using your credit card. If you park for more than 5 hours on the same day (without moving your car and within payment hours), parking will be free for the rest of the day. Remember to check out! If you forget, you will automatically be checked out 48 hours after arrival.

Parking tariffs at other car parks in Aalborg appear on the signs at the location concerned.

MORE INFORMATION? WWW.ESREF2018CONF.ORG

Charging points for electric vehicles

Electric vehicles can be recharged free of charge from the two charging points that are found at the entrance to the multi-storey car park. The sockets provide 220 Volts, up to 16A each. Charging of electric vehicles is provided free of charge by Aalborg City Council as part of the municipal authority's efforts to promote sustainable traffic. Please note that electric vehicles must pay normal parking tariffs at these charging points.

Visit **https://uk.akkc.dk/about-akkc/getting-there-and-parking/** to see available parking spaces in Aalborg.

If you need to unload something in relation to the conference, you can park outside AKKC's main entrance for a short period of time. Ask for a trolley if necessary.

PRINTING

Printing is available at AKKC. Enquire at the reception and pay with credit card (American Express is NOT accepted)

SMOKING

Smoking is prohibited inside AKKC. If you wish to smoke, please use the courtyard outside the main entrance.

CLOAKROOM

Supervised cloakroom and baggage storage in the basement (enter through exhibition area) is available during the conference opening hours.

COURTESY AREA

The courtesy area can be found in room Gæstesalen on the 1st floor.

WIFI

Network name: ESREF2018
Password: conference2018

INFORMATION FOR PRESENTERS

ORAL PRESENTATIONS

Presentations should be uploaded before the sessions. A member of the organising committee will be present in the author room (Bondestuen - 1st floor) throughout the day to assist you with this process. You will also have technical assistance in the session rooms during your presentation.

POSTER PRESENTATION

Materials to hang the posters will be provided on site. You can hang your posters in room Hall West on Tuesday October 3rd from 8 am. All posters must be removed after the poster session.

RULES AND POLICIES

ADMISSION

Badges are required for admission to all ESREF events and activities, so keep your badge visible at all times. You receive your badge when you register with the conference at Aalborg Congress & Culture Centre (AKKC). ESREF reserves the right to deny admission to any ESREF events or activities if a person fails to present an appropriate badge.

RECORDING AND PHOTOGRAPHING

Video and audio recording is allowed in the exhibition area and public areas of ESREF but nowhere else except with written permission from the Conference Chair. Photographing presentations and other content is prohibited unless permission from the presenter(s) is obtained in advance.

SHOWCASE POLICY

Any attendee who is observed to be soliciting business in the conference area, in another company's booth or in violation of any portion of the exhibition policy will be asked to leave immediately.

EXHIBITORS

Exhibitors may only distribute commercial materials in their booth, at exhibitor seminars, they are conducting and at press conferences, they are holding. ESREF reserves the right to remove any materials in violation of this policy without notice.

NON-EXHIBITORS

Distribution of commercial material in the ESREF 2018 conference area by people or organisations not participating in the exposition is prohibited.

EMERGENCY

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+45 70 150 300 (emergency doctor)

AALBORG HOSPITAL

Hobrovej 18-22
9000 Aalborg

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9000 Aalborg
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+45 99 31 75 00

HIGHLIGHTS

WELCOME RECEPTION AALBORG CITY BUFFET

Seize the opportunity to meet colleagues, world-class scholars and the conference exhibitors with a light buffet in Scandinavian style offered by Aalborg Municipality.
Registration is required.
18:30 – 20:00, Monday October 1
Location: Aalborg Congress & Culture Centre, exhibition area

YOUNG PROFESSIONALS RECEPTION

Please join us for an opportunity to mingle, interact and network with people from across the globe. The Young Professionals Reception at ESREF 2018 gives you the opportunity to meet the young members including students, young engineers and young professors. This event is free and open to all students, young professionals and young engineers, however, registration is required.
A prize will be awarded during the event.
20:00 – 22:00, Tuesday October 2
Location: Studenterhuset (The Student House), Gammel Torv 10, 9000 Aalborg

GALA DINNER

Travel back in time in the beautiful renaissance surroundings at Voergaard Castle. Join us for an evening of history, cultural heritage and exquisite food inspired by Danish cuisine throughout the ages.
Registration is required.

Busses will transport everyone from AKKC to Voergaard Castle and back.
16:40 (meeting place outside AKKC) – 22:30 (busses leave Voergaard Castle), Wednesday October 3
Location: Voergaard Castle

HIGHLIGHTS

APETT SYMPOSIUM - ADVANCED POWER ELECTRONIC TECHNOLOGY AND TOOLS

All registered attendees for the APETT symposium must pick up an entry ticket at the registration office/reception near AKKC's main entrance. Meeting place in Hall West at 13:00 where every participant will get a sandwich bag. The symposium will begin at 14:00 in Hall East. Participation is free but registration is required.

More information and registration on
www.apett.et.aau.dk

13:00 - 17:30, Thursday October 4
Location: Aalborg Congress & Culture Centre, room Hall West and Hall East

TECHNICAL VISITS

VESTAS

The visit will be at the Research and Development drive-train test center.
9:00 – 14:00 (approx.), Friday October 5
Location: VESTAS Wind Systems A/S, Vestas Headquarters, Hedeager 42, 8200 Aarhus

GRUNDFOS

The visit will be at the High-volume fabrication plant.
9:00 – 14:00 (approx.), Friday October 5
Location: Grundfos Holding A/S, Grundfos Headquarters, Poul Due Jensens vej 12, Bjerringbro

SKAGEN

Journey through "The Land of Light" to the migrating sand dune Råbjerg Mile, the picturesque Skagen town and "Grenen", the northernmost point of Denmark. You can experience the collision of the waves of the two seas that meet here; Skagerrak (the North Sea) and Kattegat (the Baltic Sea).

The final excursion programme will be set according to weather and in accordance with flight departures out of Aalborg.
9:00 – 18:00, Friday October 5
Price: DKK 1,175 // EUR 158

ACCOMPANYING PERSON PROGRAMME

Accompanying persons are welcome to participate in the welcome reception/Aalborg City buffet, the gala dinner, the trip to Skagen and the technical visits on Friday. Registration is essential.

TUTORIALS*

RELIABILITY OF SIC AND GAN POWER DEVICES FROM THE INDUSTRIAL PERSPECTIVE

09:00-10:30, Monday October 1
Location: Musiksalen
PART ONE: Thomas Detzel (Infineon)

Abstract: Compact devices with unique switching performance have been the promise of GaN power technology for several years. And now we are experiencing the exciting time when this is becoming reality. This part of the tutorial will first discuss the main reliability responses of normally-off GaN power HEMTs such as gate module reliability, time-dependent dielectric breakdown and dynamic Rdson. Then the industrial qualification procedure will be described covering technology, device and product reliability tests. Focus will also be given to application tests, which are of particular importance for the release of this new material system in power electronics.

PART TWO: Thomas Aichinger (Infineon)

Abstract: Reliability aspects and reliability test methods of SiC are discussed and compared to the well-established Si-based power devices. Strong emphasis is put on the gate oxide system of SiC vs. Si MOSFETs. It is shown, that the high reliability and low failure rates of modern IGBTs can also be achieved with SiC MOS devices using electrical screening and an appropriate dimensioning of the gate oxide with respect to the gate use voltage. Furthermore, the consequences of the higher mechanical stiffness on the packaging technology as well as the issues arising from the handling of 10x higher electrical field in the semiconductor body are discussed and suited test methods are suggested.

DIELECTRIC RELIABILITY IN MICRO-ELECTRONICS: A TIGHT RELATIONSHIP BETWEEN DEGRADATION AND TECHNOLOGY

10:50-12:20, Monday October 1
Location: Laugstuen
Gabriella Ghidini (STMicroelectronics)

Abstract: Dielectrics are the core of most electronic components. Their performance and reliability often determine a technology success and it is for this reason that they have been deeply investigated since the beginning of microelectronics. In this tutorial we will review the most important dielectric applications, active and passive dielectrics, highlighting the critical issues and best characterisation methodology depending on the application. Fast and long lasting electrical tests will be discussed, their correlation and their limits.

RELIABILITY OF PACKAGES FOR POWER DEVICES

10:50-12:20, Monday October 1
Location: Musiksalen
Andreas Middendorf and Olaf Wittler (Fraunhofer IZM)

Abstract: Today, packaging of power devices is a fast developing subject, as new materials and concepts emerge. At the same time reliable operation throughout the lifetime needs to be ensured from the package development. This tutorial will give an overview of the actual trends in power electronic packaging and the related reliability aspect associated within. It will start from a general introduction of the basic methodology. Packaging solution options will be presented ranging from different materials for wire bonding and die attach to different integration concepts (embedding concepts). Associated possible failure mechanisms will be explained as this knowledge is the basis for suitable modelling and test planning. Typical models will be introduced and test examples given. Thus a basis for the design and test for reliability is given.

* EXTRA FEE: 100 EURO

MOISTURE MODELLING IN COMPLEX SYSTEMS

13:10-14:40, Monday October 1
Location: Laugstuen
Matthias Lassmann (Infineon)

Abstract: Within outdoor applications like electrical vehicles or wind turbines the inner electronic system can be exposed to harsh climate conditions from the ambient. Often no dehumidifiers are used to explicitly control the moisture level inside. Therefore, condensation of water, corrosion and material swelling can occur which causes disturbances or even a total loss of the system. Here simulation of the moisture transport helps to understand the system and finally protect it from such moisture induced failures. In the past, methodologies were developed which make use of the analogy between moisture transport – considering diffusion processes – and heat conduction. Also known as thermal-moisture analogies, these methods are implemented by using the thermal simulation domain of commercial finite element (FE) solvers and reinterpreting the material properties to describe the moisture diffusion. Because of the fact that moisture and thermal transport are not fully analogous, especially at bi-material interfaces, these approaches have specific limitations concerning the allowed transient and spatial boundary conditions. For moisture modelling on system level the computational effort of the FE solver is typically too high, therefore, the model complexity has to be simplified. This can be realised by modelling the moisture transport via an equivalent circuit approach in which the moisture resistors and capacitors describe the transport and loading of moisture within the material parts. This approach is suitable even for complex transient mission profiles – given by transient moisture and temperature profiles as input – which cover long periods of time by keeping the computational effort low. This tutorial gives an overview of these common modelling approaches and their specific limitations regarding the allowed boundary conditions and model complexity.

INTRODUCTION TO THE MODERN RELIABILITY BASED ON PHYSICS AND STATISTICS

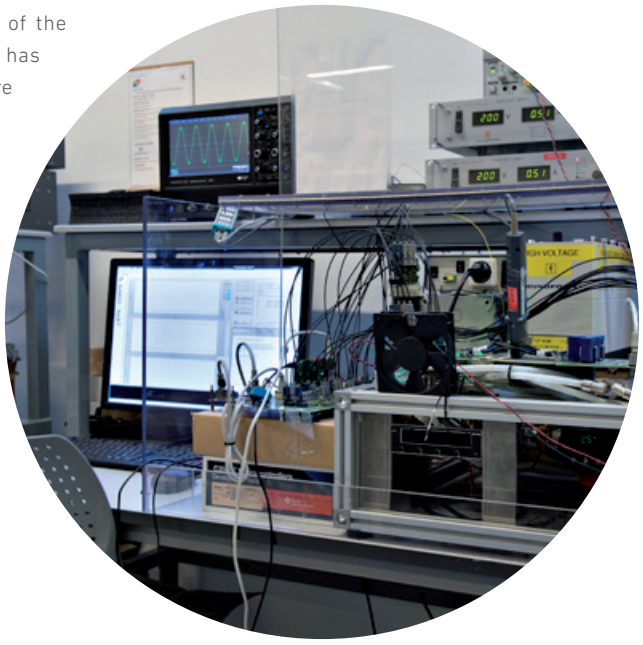
13:10-14:40, Monday October 1
Location: Musiksalen
Peter de Place Rimmen (Danfoss Drives A/S)

Abstract: Product-Reliability is meeting customers' expectations throughout expected use time. The Modern product/component Reliability are based on the physics, statistics and the stress/mission profile the component or design will experience.

The method discussed will make it possible to have the important dialogue with the management to understand the impact of poor reliability and the necessary priorities that always shall be done in a company.

The methods discussed here closes the reliability learning loop from setting up the Reliability Goal, following up during the Design Phases, Production Phases and the values can be compared with Field Failures.

The method is based on the Physics of Failure parameters, Weibull, Mean Cumulative Function and this makes it possible to estimate Warranty cost, which can be transformed to Standard Unit Cost and make it possible to optimise the total product cost. You will have the opportunity to try some of the methods discussed yourself after the tutorial.



KEYNOTE, INVITED SPEAKERS AND EXCHANGE PAPERS

KEYNOTE SPEAKERS

PAOLO GARGINI (CHAIRMAN INTERNATIONAL TECHNOLOGY ROADMAP FOR SEMICONDUCTORS - ITRS)
15:20-16:00, Monday October 1
Location: Hall East
How to successfully overcome inflection points, or long live Moore's law

"Geometrical Scaling" characterised the '70s, '80s and '90s. The NTRS identified major transistors material and structural limitations. To solve these problems the ITRS introduced strained silicon, high-κ/metal gate, FinFET, and other semiconductor materials under "Equivalent Scaling". Horisontal (2D) features will reach a limit beyond 2020. Flash producers have adopted the vertical dimension. Logic producers will follow. IRDS assessed that "3D Power Scaling" will extend Moore's Law for at least another 15 years. Furthermore, computing performance will be substantially improved by monolithically integrating several new heterogeneous memory layers on top of logic layers powered by a combination of CMOS and "new switch" transistors.

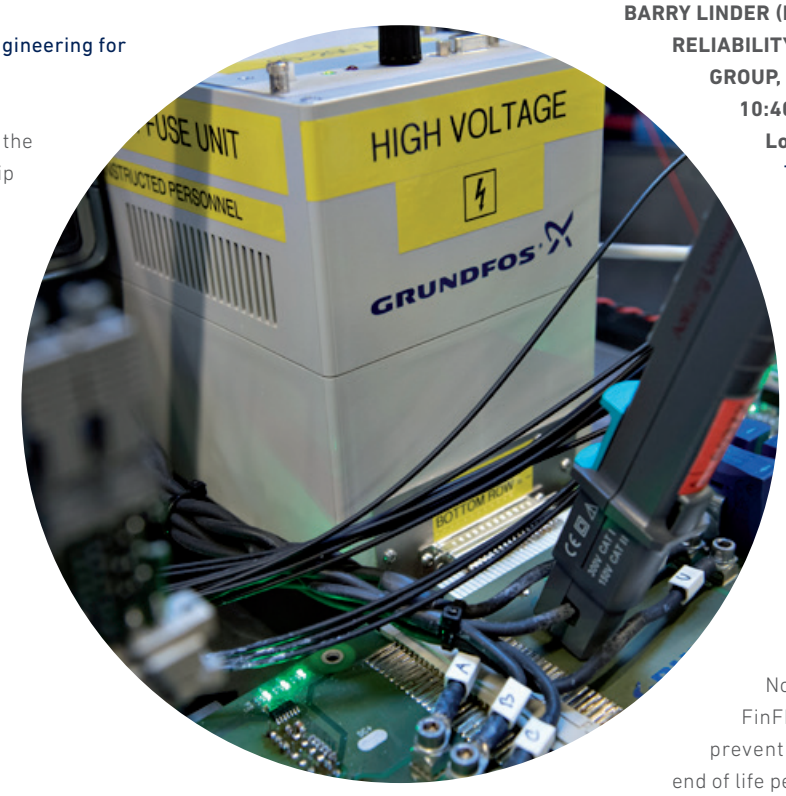
PHILIP CARNE KJÆR (CHIEF SPECIALIST, VESTAS WIND SYSTEMS A/S)
16:00-16:40, Monday October 1
Location: Hall East
Vestas' practice in reliability engineering for power electronics

The last decade has witnessed the wind power industry firm its grip on reliability with reported loss of generated energy coming down from double-digits to below 2%, accompanied by a configurable balance between product CAPEX and service & repair cost. Electrics & electronics taking their fair share have undergone a noticeable reliability engineering journey, through all product lifecycles. The presentation will look back at some of these, and forward to next steps.

INVITED SPEAKERS

MEHDI B. TAHOORI (KARLSRUHE INSTITUTE OF TECHNOLOGY)
10:20-11:00, Wednesday October 3
Location: Musiksalen
Cross-Layer Approaches for Resilient VLSI System Design

As the minimum feature size continues to shrink, a host of vulnerabilities influence the resiliency of VLSI circuits, such as increased process variation as well as workload-dependent runtime variations due to voltage and thermal fluctuations together with various device and interconnect aging effects. Current approaches for variation-aware resilient circuit design consider only a small subset of these factors and typically address each of them in isolation. As a result, an over-pessimistic additive design margin, resulting from these sources, is eroding gains from technology scaling. In this talk, I will discuss cross-layer approaches for holistic modelling of various variation effects in the design stack, by taking into account netlist, layout and workload to capture all spatial and temporal information, and also consider the interplay of various process and runtime variation effects. In addition, I will cover cross-layer variation-aware design optimisation schemes.

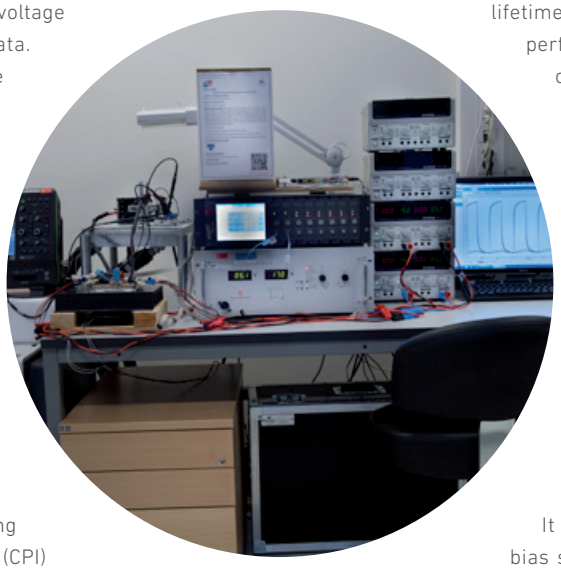


BARRY LINDER (MANAGER, TECHNOLOGY RELIABILITY AND QUALITY, IBM SYSTEMS GROUP, YORKTOWN HEIGHTS, NY)
10:40-11:20, Tuesday October 2
Location: Hall East
The end of gate oxide scaling (for real this time)

Gate Oxide Scaling has traditionally been one of the key enablers of performance enhancement from one node to the next. Back in 1999, it was thought that dielectric breakdown would prevent scaling thinner than ~25A. Model improvement, such as progressive breakdown and power law voltage acceleration, supported scaling below 15A. Now with replacement metal gate FinFETs, dielectric breakdown is not preventing further scaling, but rather end of life performance loss due to excessive NBTI. This talk will explore the optimisation of gate oxide thickness and end of life performance.

PAUL PFÄFFLI (SYNOPSYS SWITZERLAND LLC)
13:20-14:00, Wednesday October 3
Location: Musiksalen
TCAD Modelling for Reliability

Technology Computer Aided Design (TCAD) tools can be used to effectively study and analyse a multitude of reliability issues in semiconductor devices. We first describe Negative-Bias Temperature Instability (NBTI), which is one of the most severe reliability issues. Using the Reaction-Diffusion (RD) model for simulating the NBTI effect, we show that the simulated threshold voltage degradation agrees well with measured data. Based on the simulation results, we propose an on-chip heater to enhance recovery and revert the NBTI degradation. Next, we discuss how to apply the Hot-Carrier Stress (HCS) model to analyse hot carrier degradation in FinFET. We show that the threshold voltage shift agrees well with experiment and use the HCS model for the simulation of breakdown voltage walkout in a LDMOS transistor. Then, we apply process emulation to better understand modern DRAM structures and illustrate the row hammering reliability issue. Finally, we demonstrate a multi-level sub-modelling methodology for chip to package interaction (CPI) and apply the method to study the effect of wafer bending on the reliability of re-distribution layers (RDL).



FRANK ALTMANN (FRAUNHOFER IMWS, CENTER FOR APPLIED MICROSTRUCTURE DIAGNOSTICS CAM)
10:20-11:00, Wednesday October 3
Location: Hall East
Analytics for physics of failure in automotive applications

The robustness margins for automotive electronics are getting smaller due to growing complexity in technology and increasingly challenging use cases. Formal qualification based on electrical testing without microstructure analysis and without EOL testing for deeper understanding of failure risks increases the probability of field returns. Failure root causes include complex interactions between chip, package and system in combination with specific details of the mission profile. In this talk, illustrative examples of complex defect mechanisms will be presented demonstrating the need for robustness validation-oriented physics of failure approaches. It will be shown that robustness validation can benefit from precompetitive research on physics of failure concepts prior to reliability investigation of products.

NINO STOJADINOVIC (FACULTY OF ELECTRONIC ENGINEERING, UNIVERSITY OF NIS, NIŠ, SERBIA)
13:40-14:20, Tuesday October 2
Location: Musiksalen
NBTI and Radiation Related Degradation and Lifetime Estimation in Power VDMOSFETs

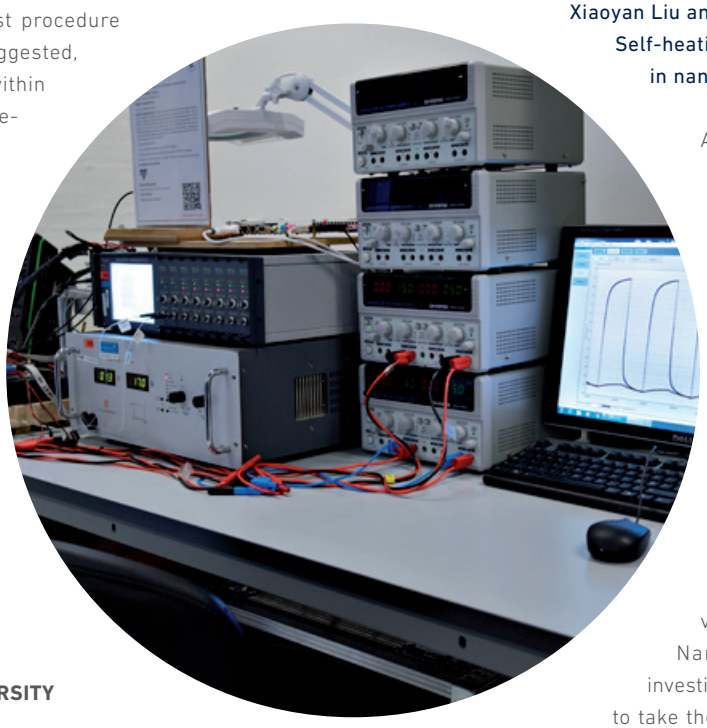
Threshold voltage shifts associated with NBT (Negative Bias Temperature) instability in power VDMOSFETs under the static and pulsed stress conditions are analysed in terms of the effects on device lifetime. For that purpose, the method suitable for performing fast NBT instability measurements on power VDMOSFETs is proposed, and its practical implementation using simple boosting circuit for obtaining required gate stress voltage, and sweep I-V measurements for the threshold voltage shift determination will be presented. Experimental results will be discussed in terms of time necessary to perform interim measurements during NBT stress tests, and it will be shown that the measurements could be done fast enough to intercept dynamic recovery effect in these devices.

It should be emphasised that the pulsed bias stressing is found to cause less significant threshold voltage shifts in comparison with those caused by the static stressing. Accordingly, pulsed gate bias conditions provide much longer device lifetime than the static ones, which is shown by individual use of the 1/VG and 1/T models for extrapolation to normal operation voltage and temperature, as well as by combined use of both models for a double extrapolation successively along both voltage and temperature axes. A double extrapolation approach is shown to allow for construction of the surface area representing the lifetime values corresponding to a full range of device operating voltages and temperatures.

The results of consecutive irradiation and NBT stress experiments performed on power VDMOSFETs will also be presented. It is shown that irradiation of previously NBT stressed devices leads to further increase of threshold voltage shift, while NBT stress effects in previously irradiated devices may depend on gate bias applied during irradiation and on the total dose received. In the case of low-dose irradiation or irradiation without gate bias, the subsequent NBT stress seems to lead to further device degradation, whereas in the case of devices previously irradiated to high doses or with gate bias applied during irradiation, NBT stress seems to have positive role as it practically anneals a part of radiation-induced degradation.

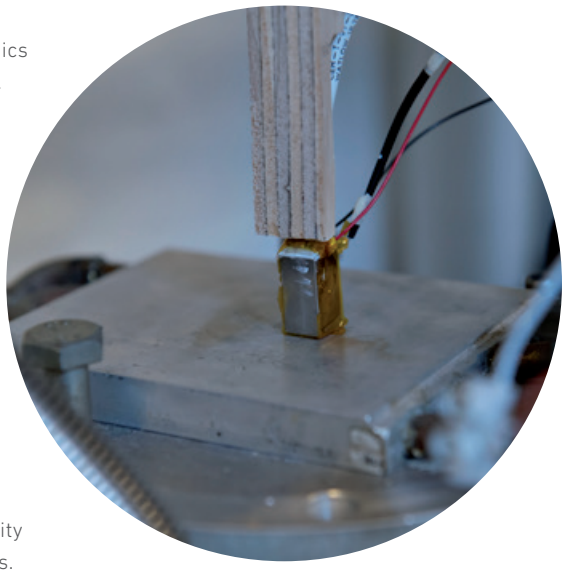
JOSEF LUTZ (UNIVERSITY OF CHEMNITZ)
13:40-14:20, Tuesday October 2
Location: Hall East
Reliability and reliability investigation of WBG power devices

Established reliability test procedures from Si can widely be applied to SiC, however, there are some differences and special challenges. A new test procedure for the gate oxide reliability is suggested, which leads to evaluable results within a reasonable time. Temperature-sensitive electrical parameters (TSEPs), which are necessary for power cycling tests, are investigated. For the SiC MOSFET and the GaN GIT, possible TSEPs are compared and applied to power cycling tests. GaN-based devices have further issues regarding reliability, like charge trapping, dynamic Ron, and degradation effects. The test matrix from Si is not sufficient to cover the reliability requirements for GaN.



RAJAN AMBAT (TECHNICAL UNIVERSITY OF DENMARK)
13:20-14:00, Wednesday October 3
Location: Hall East
Interplay of humidity and electrical functionality imposing reliability problems in electronics

Electronic control units, power modules, and consumer electronics are used today in a wide variety of varying climatic conditions. Varying external climatic conditions of temperature and humidity can cause an uncontrolled local climate inside the device enclosure. Uncontrolled humidity together with number of other factors including the presence of hygroscopic contamination resulting from the PCBA manufacturing process can introduce deviation from desired functionality or even intermittent or permanent failure of the device. Additional factors are the miniaturisation and high-density packing combined with the use of several materials, which can undergo electrochemical corrosion in presence of water film formed due to humidity exposure and bias conditions on the PCBA surface. The aim of this talk is to show how the interplay between humidity (also transient changes in climate) and electrical functionality occurs, which causes several reliability issues on electronics due to electrochemical failure mechanisms.



SISTER CONFERENCES BEST-PAPER PRESENTATIONS

BEST PAPER IPFA 2018
11:20-11:40, Tuesday October 2
Location: Laugstuen

Wangyong Chen, Linlin Cai, Kunliang Wang, Xing Zhang, Xiaoyan Liu and Gang Du

Self-heating induced variability and reliability in nanosheet-FETs based SRAM

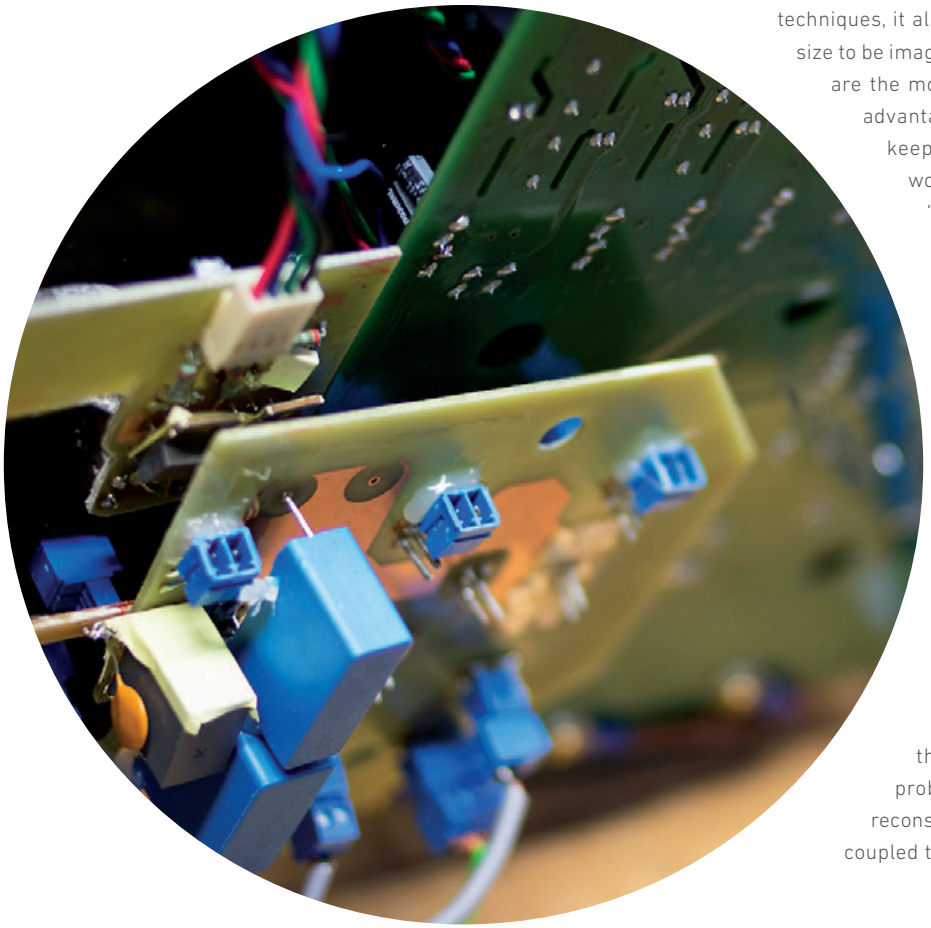
Abstract: In this paper a new methodology is proposed to investigate variability and reliability correlated with self-heating effect (SHE) in digital circuits during random operation. In this methodology, the arbitrary power waveform (APW) self-heating model is applied to carry out self-heating evaluation with the input sequences generated by the power waveform generator (PWG). Based on the proposed method, self-heating induced variability and HCI degradation in Nanosheet-FETs based SRAM are investigated. The results show it is essential to take the self-heating variation into account for circuit design and reliability prediction.

BEST PAPER IRPS 2018
15:20-15:40, Tuesday October 2
Location: Laugstuen

William Vandendaele, Xavier Garros, Thomas Lorin, Erwan Morvan, Alphonse Torres, René Escoffier, Marie-Anne Jaud, Marc Plissonnier and Frédéric Gaillard

A novel insight of pBTI degradation in GaN-on-Si E-mode MOSc-HEMT

Abstract: For the first time, ultrafast AC pBTI measurements are applied to GaN on Si E-mode MOSc-HEMT and compared to DC pBTI. Full recess Al2O3 /GaN MOS gate is submitted to AC signals with various frequencies, duty factors and stress times. The degradation and relaxation characteristics are then modelled through a RC model combined to a CET map and fitted to experimental data. This map reveals the presence of two trap populations, also observed through ΔVth degradation kinetics. Acceleration factors (gate voltage and temperature) are estimated as well as TTF (Time to Failure) under AC conditions and show an extended lifetime compared to DC stress conditions. Finally dynamic variability is studied and indicates that our devices are ruled by normal distributions.



BEST PAPER ISTFA 2017
15:20-15:40, Wednesday October 3
Location: Musiksalen

Edward L. Principe

Steps toward automated deprocessing of integrated circuits

Abstract: Deprocessing of ICs historically employs a variety of mechanical and chemical process tools in combination with one or more imaging modalities to reconstruct the IC architecture. In this work, we explore the development of an extensible programmatic workflow, which can take advantage of evolving technologies in 2D/3D imaging, distributed instrument control, image processing, as well as automated mechanical/chemical deprocessing technology. Initial studies involve automated backside mechanical ultra-thinning of 65 nm node 3.0 cm^2 Opteron IC processor chips in combination with automated montage SEM imaging and lab-based x-ray tomography and microanalysis. Areas as large as 800umX800um were deprocessed using gas-assisted plasma FIB delayering. Ultrathinning the silicon substrate in the packaged device within 1-2 um of the IC device significantly reduces the amount of time required for deprocessing. The computer aided backside ultrathinning approach not only improves the success rate, as compared to manual techniques, it also allows the dense lower layers with smallest feature size to be imaged via high resolution SEM first, while the sample layers are the most uniform. Backside deprocessing has the additional advantage that it can be possible to access the device while keeping it "alive" for in-situ electrical testing. Ongoing work involves enhancing the deprocessing workflow with "intelligent automation" by bridging FIB-SEM instrument control and near real-time data analysis to establish a computationally guided microscopy suite. As described in the text, a common python scripting API architecture between the FIB-SEM platform and the image processing and microanalysis platforms permit rapid development of customised programmatic instrument control with data process integration and feedback. Current studies use smartcards as an archetype to develop automated workflows. Smartcards represent a good architecture to discuss and develop these methods because they are as much as sixteen times smaller area than a 1 cm^2 processor and typically containing far few layers. Yet these small form factor embedded integrated circuits have rapidly become a widespread element of modern society and their security architecture represents an important problem. We demonstrate for the first time; tomographic reconstruction based upon automated back-side ultra-thinning coupled to automated gas-assisted plasma FIB delayering.

WORKSHOPS


EMERGING CHALLENGES FOR A BUILT-IN RELIABILITY IN INNOVATIVE AUTOMOTIVE ICS

11:00-12:20 Session W1, Wednesday October 3
Location: Latinerstuen

ORGANISERS
Alberto Mancaleoni, Automotive & Discrete Group, STMicroelectronics (Italy)
Matteo Medda, Automotive & Discrete Group, STMicroelectronics (Italy)

ABSTRACT
The new automotive applications drive a faster introduction of innovative solutions in silicon design and package construction. In front of the new frontiers of integration, from system on chip to system in package combined with harsh application environment, the reliability mindset should be brought inside the product development cycles since its earliest phases. A deep focus on physics of degradation and physics of failure has become a mandatory pre-requirement to drive the correct choices on materials, process bricks, design rules, complying with an increasing variety of application and operating environment constraints. In parallel, a more accurate analysis and understanding of mission profiles is a key factor to drive a coherent evolution of qualification methodologies and standards. A future scenario may include self-diagnostic capabilities and their correlation with the actual failure process activation on the stressed unit.

APPLIED ROBUSTNESS VALIDATION

14:00-15:40 Session W2, Wednesday October 3
Location: Latinerstuen

ORGANISER
Ulrich Abelein, Infineon Technologies AG (Germany)

ABSTRACT
The Robustness Validation Methodology has been available in the industry for more than 10 years. Sometimes misinterpreted as a qualification concept it provides a rather powerful development toolset, which can enhance the build-in reliability of a product significantly. Taking advantage of this concept does not necessarily always lead to the same overarching Robustness Validation based development flow. Successful implementation of certain aspects of Robustness Validation tailored to a company's development flow can boost the achievable reliability targets as well.


ECPE WORKSHOP FRONTIERS IN RELIABILITY ENGINEERING: RAILWAY TRACTION, RENEWABLES, INDUSTRY

08:40-10:20 Session W3, Thursday October 4
Location: Latinerstuen

ORGANISERS
Eckhard Wolfgang, ECPE e. V. (Germany)
Huai Wang, Aalborg University (Denmark)

ABSTRACT
The basic idea of this Workshop is to get an impression of the challenges the different branches have to face. The situation of automotive electronics will be discussed in other Workshops at this conference.

HEALTH AND CONDITION MONITORING FOR POWER ELECTRONICS – BRING IN THE WHITE MAGIC!

10:40-12:20 Session W4, Thursday October 4
Location: Latinerstuen

ORGANISER
Stefan Mollov, Ph.D., Head of Research – Power Electronic Systems Division, Mitsubishi Electric (France)

ABSTRACT
With progressing electrification of our lives, the question of controlling and even decreasing the life-cycle cost of power electronic products is becoming increasingly pertinent. Health and Condition Monitoring (HCM) is the technological answer to that question, by catering for the most expensive segment of the product post-sale life, the maintenance. Through sustained effort of researching the reliability of vulnerable components, a better understanding of damage precursors was gained, resulting in more precise and cost-effective HCM solutions. Recognising that, a number of commercial offerings are finding their way onto the market, mostly serving safety-critical or mission-critical applications, such as transportation and power generation/distribution, but also factory automation systems, riding on the extensive information infrastructure.

PANELISTS
Frede Blaabjerg, Aalborg University; Michel Guyennet, Supergrid; Mark Johhnson, Nottingham University; Michel Piton, ALSTOM

INDUSTRIAL SESSIONS

ZURICH INSTRUMENTS

DIGITAL SIGNAL PROCESSING FOR FA
8:40 – 9:00, Tuesday October 2
Location: Latinerstuen

With shrinking feature dimensions in semiconductor devices, the signals measured during device investigation become weaker all the time. While the signals get smaller, they are also exposed to interfering signals and to increasing electronic noise. At this point, failure analysis can take advantage from the strategies employed in advanced physics laboratories in order to boost the signal-to-noise ratio of measurements. Effective signal processing approaches are today performed utilising fast analogue-to-digital converters and field programmable gate arrays (FPGA). Join this presentation if you would like to brush-up your signal processing knowledge that can be employed for failure analysis.

Presenter: Stephan Koch

PARK SYSTEMS

AUTOMATISING ATOMIC FORCE MICROSCOPY – NEWEST TECHNOLOGICAL SOLUTIONS IN ADVANCED APPLICATIONS FOR FAILURE ANALYSIS
9:20 – 9:40, Tuesday October 2
Location: Latinerstuen

Semiconductor device feature dimensions have been getting smaller and smaller to meet market demand for faster and more efficient designs every year. To address this challenge, manufacturers must have the capability to fulfil metrology requirements that simultaneously call for enhancements in resolution, accuracy and reliability. Current technological solutions were designed to enable engineers to use Atomic Force Microscopy to acquire accurate and repeatable nanoscale images of target devices for various applications as needed in failure analysis. Here we present the impactful latest developments, which guarantee more throughput, higher accuracy and reliability for topography measurements but also for electrical characterisation.

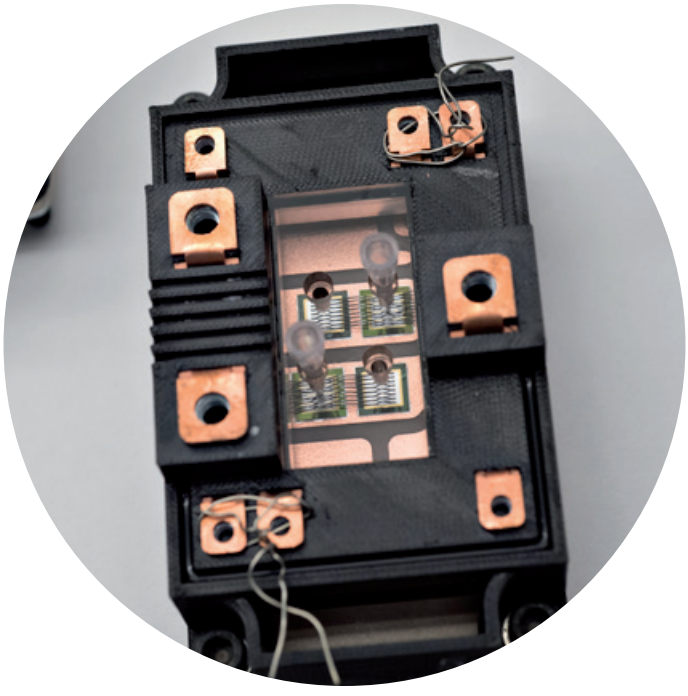
Presenter: Ludger Weisser

MASER ENGINEERING

NEXT GENERATION ACCELERATED LIFE TEST SYSTEMS FOR INDIVIDUAL SUB-40NM NODE IC'S
9:00 – 9:20, Tuesday October 2
Location: Latinerstuen

The continuous developments in CMOS IC technology towards 7/10nm FINFET EUV devices, the final product reliability qualification approach is impacted too. The introduction of new materials, process steps and smaller geometries lack long term reliability test exposure and results. The behavior of these devices have an individual character with a large deviation in the junction temperature. In order to balance the stress parameters (Tj) for a proper statistical processing of the test lot results, an individual device approach is required. Also the lower core voltages, higher currents and build in test capabilities have to be addressed by the HTOL system. MASER Engineering will present its latest extension of our wide qualification test offerings in Enschede, NL.

Presenter: Kees Revenberg



INSIDIX TDM

TDM COMPACT3: MULTI-PHYSICAL PLATFORM FOR ADVANCED WARPAGE AND STRAIN MEASUREMENT MEASUREMENTS
9:40 – 10:00, Tuesday October 2
Location: Latinerstuen

TDM® (Topography and Deformation Measurements) system was developed by Insidix to answer new issues of the electronic industries, and permits to characterise deformation of boards, wafer, components and assemblies when they see thermomechanical loads, as those typically imposed during assembly processes or operating conditions (gluing, reflow, aging, etc).

A new multi-physical platform for advanced warpage and strain measurement has been launched by Insidix: the TDM Compact 3. It has been designed to meet the new challenges for warpage measurements and includes numerous unique features.

Two types of heating technology are implemented to match the two main applications:

- Reflow simulation: Radiative heating
- Reliability testing: Convection heating cooling

3D Strain and warpage of objects having a surface from 0.5 x 0.5 mm to 300 x 375 mm can be characterised simultaneously on the same system from -65°C to 400°C. The 3D sensor is equipped with a rotative carousel to adjust various optics allowing to enhance the (x,y,z) resolution of the system to match the object size and application.

Two unique patented modules are introduced in the Compact 3 system:

- The scanning module offers the possibility to inspect small areas within a large surface.
- The 3D sensor can move on top of the object to acquire a high resolution image of multiple small areas. Applications cover the high resolution characterisation of units on stripes, wafer or WLP or of package area on PCB board.

The multiscale analysis can be used in combination of the scanning mode. It consist of several acquisition of the same object at a given temperature using various magnification. Therefore, the effect of various scale in the deformation can be studied.

Presenter: Diane Ecoiffier

SELA

ADVANCED SOLUTIONS FOR CROSS-SECTION OF VISIBLE AND BURIED DEFECTS
11:20 – 11:40, Tuesday October 2
Location: Latinerstuen

SELA continues to deliver best in the industry cleaving solutions for the cross-sectioning of the crystalline materials. New smart cleaving set of the MC20 provides capability of the wining micro-cleaving technology for cleaving of visible and buried targets, observation and cross-sectioning from the top and bottom of the wafer samples and dies in front end and back end failure analysis.

Presenter: Vladimir Zheleznyak

MSSCORPS

INSIDE OF 10 NM TECHNOLOGY NODE
11:40 – 12:00, Tuesday October 2
Location: Latinerstuen

The presentation will be divided into two parts: For the first part, I will introduce MSSCORPS (MSS in short). MSS is a service lab based in Hsinchu, Taiwan. Its high-quality material analysis (MA) is now at the leading position in the world. In order to demonstrate its MA capability, the second part of the presentation, two advanced CPU chips from iPhone (A11) and Samsung (Exynos8895) were used. The fabrication technology for these two chips is 10 nm, where A11 was fabricated by tsmc and Exynos8895 was by Samsung. With the help of high spatial resolution transmission electron microscopy (TEM) and energy dispersive X-ray spectroscopy (EDS), details of processes can be clearly unveiled and analysed. Exynos8895 has a higher fin height and broader fin width, A11, on the other hand, has shorter fin pitch and thinner interconnection thickness. More detailed differences between these two chips will be presented.

Presenter: Shih-Hsin Chang

MITSUBISHI ELECTRIC

RECENT SIC MODULE PROGRESS AND RELATED APPLICATIONS
12:00-12:20, Tuesday October 2
Location: Latinerstuen

Mitsubishi Electric has started development of SiC devices in early 1990s. Since then, we have done several research works both in SiC modules and inverters, and launched world-first SiC-equipped Air conditioner in 2010, solar power conditioner in 2011, Railway converters in 2013, etc. This presentation reviews our typical system examples, together with high-performance SiC power modules and SiC MOSFET technology that has been used in these works. There are many tradeoffs to realise the high-performance modules, and these tradeoffs will also be addressed. Finally future performance enhancement such as trench MOSFET and SBD-embedded MOSFET will be discussed.

Presenter: Dr. Harufusa Kondo

LATTICEGEAR

SCRIBING AND CLEAVING SOLUTIONS IN NANOFAB AND RESEARCH – TECHNOLOGIES, WORKFLOWS AND USES CASES
14:20 – 14:40, Tuesday October 2
Location: Latinerstuen

Scribeless cleaving method for glass, sapphire, III-V, SiC and even cleaves freestanding structures deposited by e-beam lithography and silicon down to 1-mm. Surface touchless scribing tool to protect frontside features, ideal for compound substrates and off-crystalline cleaving. Nanofab cleanroom compatible.

Presenter: Efrat Moyal

ULTRA TEC/ ASAP-1 IPS

'IN SITU' PREPARATION SYSTEM
14:40 – 15:00, Tuesday October 2
Location: Latinerstuen

ULTRA TEC will describe new measurement and alignment improvements available for selected area preparation techniques - in particular the use of 'In situ' Remaining Silicon Thickness (RST) Measurement along with the ability to OVERLAY X-RAY and C-SAM images with live alignment coordinates. Upgrades to the user interface on our ASAP-1 IPS product will be described and how these techniques further assist in ensuring the highest quality sample preparation results.

Presenter: Tim Hazeldine

PROGRAMME

MONDAY OCTOBER 1

08:00 REGISTRATION OPENS

09:00-10:30 SESSION T1: TUTORIAL

Location: Musiksalen

Thomas Detzel and Thomas Aichinger

Reliability issues in power SiC and GaN

10:30-10:50 COFFEE BREAK

10:50-12:20 SESSION T2: TUTORIAL

Location: Laugstuen

Gabriella Ghidini

Dielectric reliability in microelectronics: a tight relationship between degradation and technology

10:50-12:20 SESSION T3: TUTORIAL

Location: Musiksalen

Andreas Middendorf and Olaf Wittler

Reliability of packages for power devices

12:20-13:10 LUNCH

13:10-14:40 SESSION T4: TUTORIAL

Location: Laugstuen

Matthias Lassmann

Moisture Modelling in Complex Systems

13:10-14:40 SESSION T5: TUTORIAL

Location: Musiksalen

Peter Rimmen

Introduction to the modern Reliability based on physics and statistics

14:40-15:20 CONFERENCE OPENING

Location: Hall East

Chair: Francesco Iannuzzo

15:20-16:40 SESSION KN: KEYNOTES

Location: Hall East

Chair: Mauro Ciappa

15:20 Paolo Gargini

How to successfully overcome inflection points, or long live Moore's law

16:00 Philip Carne Kjær

Vestas' practice in reliability engineering for power electronics

16:40-17:00 COFFEE BREAK

17:00-18:00 SESSION E1-1: CAPACITOR RELIABILITY

Location: Hall East

Chairs: Reinhold Bayerer and Huai Wang

17:00 Hao Niu, Shujuan Wang, Xuerong Ye, Huai Wang and Frede Blaabjerg

Lifetime prediction of aluminum electrolytic capacitors in LED drivers considering parameter shifts

17:20 Hiroaki Matsumori, Kazuki Urata, Toshihisa Shimizu, Koushi Takano and Hitoshi Ishii

Capacitor loss analysis method for power electronics converters

17:40 Kazunori Hasegawa, Shin-Ichi Nishizawa and Ichiro Omura

ESR and capacitance monitoring of a dc-link capacitor used in a three-phase PWM inverter with a front-end diode rectifier

17:00-18:00 SESSION F-1: PCB SOLDER JOINTS

Location: Musiksalen

Chairs: Paolo Cova and Kristine Weide-Zaage

17:00 Stéphane Zanella, Aurélien Lecavelier Des Etangs-Levallois, Eric Charkaluk, Wilson Maia Filho and Andrei Constantinescu

Importance of electric resistance monitoring in shear test

17:20 Jie Mei, Ralf Haug, Olivier Lanier, Tobias Grözinger and André Zimmermann

Effect of Joule heating on the reliability of solder joints under power cycling conditions

17:40 Takashi Fujiwara, Ken Yamamoto and Hidehiko Kimura

Quantification of lead-free solder fatigue by EBSD analysis

17:00-18:00 SESSION C-1: PHOTOEMISSION AND LASER TECHNIQUES IN DEFECT ANALYSIS

Location: Laugstuen

Chairs: Giovanna Mura and Vladimir Popok

17:00 Venkat Krishnan Ravikumar, Gabriel Lim, Jiann Min Chin, Kin Leong Pey and Joel K.W. Yang

Understanding spatial resolution of laser voltage imaging

17:20 Emanuele Villa, Audrey Garnier and Antoine Reverdy

Exploitation of Laser Voltage techniques for identification and complete characterisation of a scan chain transition fail issue using the second harmonic approach

17:40 Anne Beyreuther, Norbert Herfurth, Elham Amini, Tomonori Nakamura, Ingrid De Wolf and Christian Boit Photon emission as a characterisation tool for bipolar parasitics in FinFET technology

17:00-17:40 SESSION K-1: PHOTOVOLTAIC CHARACTERISATION, MONITORING AND PROTECTION

Location: Latinerstuen

Chairs: Salvo Lombardo and Yongheng Yang

17:00 Fabio Ricco Galluzzo, Andrea Scuto, Cosimo Gerardi, Anna Battaglia, Andrea Canino and Salvatore Lombardo

Performance increase of tandem amorphous/microcrystalline Si PV devices under variable illumination and temperature conditions

17:20 Ahsan Razvi, Kamran Niazi, Hassan Khan and Yongheng Yang

Hotspots and performance evaluation of crystalline-silicon and thin-film photovoltaic modules

18:30-20.00 WELCOME RECEPTION - AALBORG CITY BUFFET

Location: Exhibition area

TUESDAY OCTOBER 2

08:40-10:20 SESSION E1-2: POWER SEMICONDUCTOR RELIABILITY

Location: Hall East

Chairs: Reinhold Bayerer and Huai Wang

08:40 Paolo Magnone, Giacomo Barletta and Angelo Magrì
Investigation of degradation mechanisms in low-voltage p-channel power MOSFETs under high temperature gate bias stress

09:00 Nausicaa Dornic, Ali Ibrahim, Zoubir Khatir, Jeffrey Ewanchuk and Stefan Mollov
Analysis of the degradation mechanisms occurring in the topside interconnections of IGBT power devices during power cycling

09:20 Mauro Ciappa, Ying Pang and Chenchen Sun
Experimental characterization of critical high-electric field spots in power semiconductors by planar and scanning collimated alpha sources

09:40 Akihiko Watanabe and Ichiro Omura
A power cycling degradation inspector of power semiconductor devices

10:00 Charalampos Papadopoulos, Chiara Corvasce, Arnost Kopta, Daniel Schneider, Gontran Paques and Munaf Rahimo
The influence of humidity on the high voltage blocking reliability of power IGBT modules and means of protection

08:40-10:20 SESSION A-1: QUALITY AND RELIABILITY ASSESSMENT TECHNIQUES AND METHODS FOR DEVICES AND SYSTEMS

Location: Musiksalen

Chairs: Cora Salm and Ninoslav Stojadinovic

08:40 Marianne Unterreitmeier, Oliver Nagler, Lothar Pfitzner, Robert Weigel and Rainer Holmer
An acoustic emission sensor system for thin layer crack detection

09:00 Ivo Vogt, Tomonori Nakamura, Babak Motamedi and Christian Boit
Device characterisation of 16/14nm FinFETs for reliability assessment with infrared emission spectra

09:20 Morgane Mousnier, Kévin Sanchez, Elsa Locatelli, Thierry Lebey and Vincent Bley
Lock-in Thermography for defect localisation and thermal characterisation for space application

09:40 Abdellatif Bey Temsamani, Steven Kauffmann, Stijn Helsen, Tim Gaens and Vital Driesen
Physics-of-Failure (PoF) methodology for qualification and lifetime assessment of supercapacitors for industrial applications

10:00 N. Baker and F. Iannuzzo
Smart SiC MOSFET accelerated lifetime testing

08:40-10:20 SESSION K-2: SYSTEM-LEVEL RELIABILITY AND CONDITION MONITORING OF PHOTOVOLTAIC AND WIND SYSTEMS

Location: Laugstuen

Chairs: Salvo Lombardo and Yongheng Yang

08:40 Ionut Vernica, Huai Wang and Frede Blaabjerg
Uncertainty analysis of capacitor reliability prediction due to uneven thermal loading in photovoltaic applications

09:00 E.M.S. Brito, A.F. Cupertino, P.D. Reigosa, Y. Yang, V.F. Mendes and H.A. Pereira
Impact of meteorological variations on the lifetime of grid-connected PV inverters

09:20 Saeed Peyghami, Pooya Davari, Huai Wang and Frede Blaabjerg
System-level reliability enhancement of dc/dc stage of a single-phase PV inverter

09:40 Ariya Sangwongwanich, Dao Zhou, Elizaveta Liivik and Frede Blaabjerg
Mission profile resolution impacts on the thermal stress and reliability of power devices in PV inverters

10:00 Bjorn Rannestad, Peter Nielsen, Stig Munk-Nielsen, Kristian Gadgaard and Soren Jorgensen
Converter monitoring in a wind turbine application

10:20-10:40 COFFEE BREAK

10:40-11:20 SESSION INV1

Location: Hall East

Barry Linder
The end of gate oxide scaling (for real this time)

11:20-12:20 SESSION E1-3: SYSTEM APPLICATION RELIABILITY

Location: Hall East

Chairs: Reinhold Bayerer and Huai Wang

11:20 Keting Hu, Zhigang Liu, Francesco Iannuzzo and Frede Blaabjerg
Simple and effective open switch fault diagnosis of single-phase PWM rectifier

11:40 Julio Brandelero, Jeffrey Ewanchuk, Nicolas Degrenne and Stefan Mollov
Lifetime extension through Tj equalisation by use of intelligent gate driver with multi-chip power module

12:00 Sebastian Kremp and Oliver Schilling
Humidity robustness for high voltage power modules: limiting mechanisms and improvement of lifetime

TUESDAY OCTOBER 2

11:20-12:20 SESSION A-2: QUALITY AND RELIABILITY ASSESSMENT TECHNIQUES AND METHODS FOR DEVICES AND SYSTEMS

Location: Musiksalen

Chairs: Cora Salm and Ninoslav Stojadinovic

11:20 Elham Amini, Anne Beyreuther, Norbert Herfurth, Ruslan Muydinov, Bernd Szyszka and Christian Boit
IC security and quality improvement by protection of chip backside against hardware attacks

11:40 Omar Chihani, Loic Theolier, Alain Bensoussan, Jean-Yves Deletage, André Durier and Eric Woirgard and Giovanna Mura
Reliability concerns from the gray market

12:00 Bahar Ahmadi, Pouya Tavousi, Joseph Favata, Peiman Shahbeigi-Roodposhti, Rengarajan Pelapur and Sina Shahbazmohamadi
A novel crowdsourcing platform for microelectronics counterfeit defect detection

11:20-11:40 BEST PAPER IPFA 2018

Location: Laugstuen

Chairs: Alain Bravaix and Gabriella Ghidini

Wangyong Chen, Linlin Cai, Kunliang Wang, Xing Zhang, Xiaoyan Liu and Gang Du
Self-heating induced variability and reliability in nanosheet-FETs based SRAM

11:40-12:20 SESSION B1-1: SI-TECHNOLOGIES & NANOELECTRONICS: HOT CARRIERS, HIGH-K, GATE MATERIALS

Location: Laugstuen

Chairs: Alain Bravaix and Gabriella Ghidini

11:40 Feng Xuan, Nagarajan Raghavan, Sen Mei, Kin Leong Pey and Hei Wong
Statistical nature of hard breakdown recovery in high-dielectric stacks studied using ramp voltage stress

12:00 Alberto Rodriguez Fernandez, Jordi Muñoz-Gorriz, Jordi Suñe and Enrique Miranda
A new method for estimating the conductive filament temperature in OxRAM devices based on escape rate theory

12:20-13:40 LUNCH

13:40-14:20 SESSION INV2: INVITED

Location: Hall East

Chair: Reinhold Bayerer

Josef Lutz
Reliability and reliability investigation of WBG power devices

13:40-14:20 SESSION INV3: INVITED

Location: Musiksalen

Chair: Alain Bravaix

Ninoslav Stojadinovic
NBTI and irradiation related degradation mechanisms in power VDMOS transistors

14:20-16:00 SESSION E2-1: SIC AND GAN DEVICE RELIABILITY (1)

Location: Hall East

Chairs: Matteo Meneghini and Joachim Wuerfl

14:20 Besar Asllani, Asad Fayyaz, Alberto Castellazzi, Hervé Morel and Dominque Planson
VTH subthreshold hysteresis technology and temperature dependence in commercial 4H-SiC MOSFETs

14:40 Matteo Borga, Matteo Meneghini, Steve Stoffels, Marleen Van Hove, Ming Zhao, Xiangdong Li, Stefaan Decoutere, Enrico Zanoni and Gaudenzio Meneghesso
Impact of the substrate and buffer design on the performance of GaN on Si power HEMTs

15:00 Elena Fabris, Matteo Meneghini, Carlo De Santi, Zongyang Hu, Wenshen Li, Kazuki Nomoto, Debdeep Jena, Huili Grace Xing, Xiang Gao, Gaudenzio Meneghesso and Enrico Zanoni
Degradation of GaN-on-GaN vertical diodes submitted to high current stress

15:20 Fausto Stella, Olufisayo Olanrewaju, Zineng Yang, Alberto Castellazzi and Gianmario Pellegrino
Experimentally validated methodology for real-time temperature cycle tracking in SiC power modules

15:40 Paula Diaz Reigosa, Francesco Iannuzzo and Lorenzo Ceccarelli
Effect of short-circuit stress on the degradation of the SiO2 dielectric in SiC power MOSFETs

14:20-16:00 SESSION A-3: QUALITY AND RELIABILITY ASSESSMENT TECHNIQUES AND METHODS FOR DEVICES AND SYSTEMS

Location: Musiksalen

Chairs: Cora Salm and Ninoslav Stojadinovic

14:20 S.M. Pazos, F.L. Aguirre, F. Palumbo and F. Silveira
Performance-reliability trade-offs in short range RF power amplifier design

14:40 Wen-Chieh Chen and Ming-Dou Ker
Surge protection design with surge-to-digital converter for microelectronic circuits and systems

15:00 Julien Coutet, François Marc, Flavien Dozolme, Romain Guetard, Aurélien Janvresse, Pierre Lebosse, Antonin Pastre and Jean-Claude Clement
Influence of temperature of storage, write and read operations on multiple level cells NAND Flash memories

15:20 Hassen Aziza, Basma Hajri, Mohammad M. Mansour, Ali Chehab and Annie Perez
A lightweight write-assist scheme for reduced RRAM variability and power

15:40 M. Baszynski, P. Rydygier and M. Wójcik
Experimental studies of: laminate composition, drill bit wear out, and chloride ion concentration as factors affecting CAF formation rate

TUESDAY OCTOBER 2

14:20-15:20 SESSION B1-2: SI-TECHNOLOGIES & NANOELECTRONICS

Location: Laugstuen

Chairs: Alain Bravaix and Hervé Jaouen

14:20 Maurits de Jong, Cora Salm and Jurriaan Schmitz
Towards Understanding Recovery of Hot-Carrier Induced Degradation

14:40 Vincenzo Della Marca, Jérémy Postel-Pellerin, Thibault Kempf, Arnaud Regnier, Philippe Chiquet and Marc Bocquet
Quantitative correlation between Flash and equivalent transistor for endurance electrical parameters extraction

15:00 Daniel Beckmeier and Andreas Martin
Variation-resilient quantifiable plasma process induced damage monitoring

15:20-15:40 BEST PAPER IRPS 2018

Location: Laugstuen

Chairs: Alain Bravaix and Herve Jaouen

William Vandendaele, Xavier Garros, Thomas Lorin, Erwan Morvan, Alphonse Torres, René Escoffier, Marie-Anne Jaud, Marc Plissonnier and Frédéric Gaillard
A novel insight of pBTI degradation in GaN-on-Si E-mode MOSc-HEMT

16:00-16:20 COFFEE BREAK

16:20-17:40 SESSION E2-2: GAN/SIC TRAPPING AND FAILURE

Location: Hall East

Chairs: Matteo Meneghini and Joachim Wuerfl

16:20 François Boige, Frédéric Richardeau, Stéphane Lefebvre, Jean-Marc Blaquière and Gerald Guibaud
Ensure an original and safe "Fail-to-Open" mode in planar and trench power SiC MOSFET devices in extreme short-circuit operation

16:40 Tomoyuki Mannen and Keiji Wada
Operating-waveform analysis based reliability evaluation of power MOSFETs used for a leg short-circuit initial charge method

17:00 Jose Ortiz Gonzalez and Olayiwola Alatise
Bias temperature instability and condition monitoring in SiC power MOSFETs

17:20 Dario Pagnano, Giorgia Longobardi, Florin Udrea, Jinming Sun, Mohamed Imam, Reenu Garg, Hyeongnam Kim and Alain Charles
On the impact of substrate electron injection on dynamic Ron in GaN-on-Si HEMTs

16:20-17:40 SESSION H: PHOTONICS RELIABILITY

Location: Musiksalen

Chairs: Alain Bensoussan and Massimo Vanzi

16:20 M. Buffolo, M. Pietrobon, C. De Santi, F. Samparisi, M.L. Davenport, J.E. Bowers, G. Meneghesso, E. Zanoni and M. Meneghini
Degradation mechanisms of heterogeneous III-V/Silicon loop-mirror laser diodes for photonic integrated circuits

16:40 Nicola Trivellin, Desiree Monti, Carlo De Santi, Matteo Buffolo, Gaudenzio Meneghesso, Enrico Zanoni and Matteo Meneghini
Current induced degradation study on state of the art DUV LEDs

17:00 Massimo Vanzi, Giovanna Mura and Martines Giovanni
Further improvements of an extended Hakki-Paoli method

17:20 Desiree Monti, Matteo Meneghini, Carlo De Santi, Agata Bojarska, Piotr Perlin, Gaudenzio Meneghesso and Enrico Zanoni
Impact of dislocations on DLTS spectra and degradation of InGaN-based laser diodes

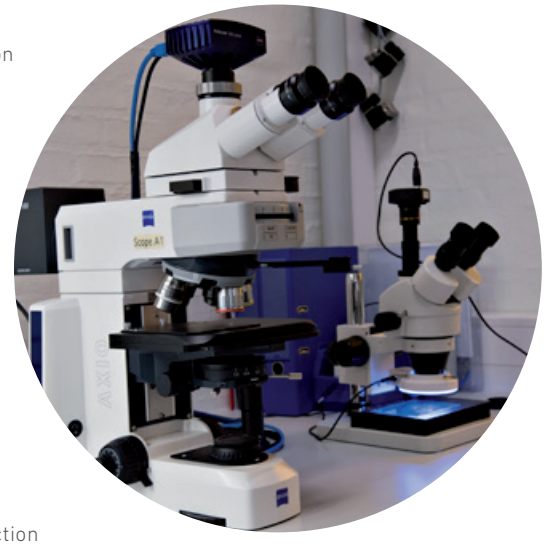
16:20-17:00 SESSION B3: EOS AND MEMORY UPSET

Location: Laugstuen

Chairs: Marise Bafleur and Gianluca Boselli

16:20 Steffen Holland and Rolf Brenner
Voltage oscillations during surge pulses induced by self-extinguishing non-destructive second breakdown in pn-junction diodes

16:40 Roger Goerl, Paulo Villa, Letícia Poehls, Eduardo Bezerra and Fabian Vargas
An efficient EDAC approach for handling multiple bit upsets in memory array



TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - A: QUALITY AND RELIABILITY ASSESSMENT TECHNIQUES AND METHODS FOR DEVICES AND SYSTEMS

Location: Hall West

Pham Luu Trung Duong, Xuechu Xu, Qing Yang and Nagarajan Raghavan
Gaussian process regression approach for robust design and yield enhancement of self-assembled nanostructures

Pham Luu Trung Duong, Hyunseok Park and Nagarajan Raghavan
Application of multi-output Gaussian process regression for remaining useful life prediction of light emitting diodes

Thiago Ferreira de Paiva Leite, Laurent Fesquet and Rodrigo Possamai Bastos
A body built-in cell for detecting transient faults and dynamically biasing subcircuits of integrated systems

Leonardo Moraes, Alexandra Zimpeck, Cristina Meinhardt and Ricardo Reis
Evaluation of variability using Schmitt Trigger on full adders layout

Alexandra Lackmann Zimpeck, Cristina Meinhardt, Laurent Artola, Guillaume Hubert, Fernanda Kastensmidt and Ricardo Reis
Impact of different transistor arrangements on gate variability

Xiaoman Sun, Meng Huang, Yi Liu and Xiaoming Zha
Investigation of artificial neural network algorithm based IGBT online condition monitoring

O. Dixon-Luinenburg and J. Finee
In-situ transistor reliability measurements through nanoprobing

Mingyao Ma, Kaiqi Chu, Mingyue Zhan, Ye Wang and Fang Liu
Statistical analysis of characteristic of ageing precursor of IGBT based on synthetic effect of multi-physical fields

Prathiba G, Santhi M and Ahilan A
Design and implementation of reliable Flash ADC for microwave applications

Xuerong Ye, Yigang Lin, Qingmin Wang, Hao Niu and Guofu Zhai
Manufacturing process-based storage degradation modelling and reliability assessment

Raphael Viera, Jean-Max Dutertre, Marie-Lise Flottes, Olivier Potin, Giorgio Di Natale, Bruno Rouzeyre and Rodrigo Possamai Bastos
Assessing body built-in current sensors for detection of multiple transient faults

17:40-19:40 SESSION POSTER - B1: SI-TECHNOLOGIES & NANOELECTRONICS: HOT CARRIERS, HIGH-K, GATE MATERIALS

Location: Hall West

Gang-Jun Kim, Nam-Hyun Lee, Jongkyun Kim, Jung Eun Seok and Yunsung Lee
Effect of DC/AC stress on the reliability of cell capacitor in DRAM

Yeohyeok Yun, Gang-Jun Kim, Ji-Hoon Seo, Donghee Son and Bongkoo Kang
Method to extract parameters of power law for nano-scale SiON pMOSFETs under Negative Bias Temperature Instability

Shunqiang Xu, Hongyi Wang, Jianfei Wu, Liming Zheng and Jietao Diao
A new multitime programmable non-volatile memory cell using high voltage NMOS

Roberto Almeida, Cleiton M. Marques, Paulo F. Butzen, Fábio R. G. Silva, Ricardo A. L. Reis and Cristina Meinhardt
Analysis of 6T SRAM cell in sub-45nm CMOS and FinFET technologies

Yeohyeok Yun, Ji-Hoon Seo, Donghee Son and Bongkoo Kang
Method to estimate profile of threshold voltage degradation in MOSFETs due to electrical stress

Guicui Fu, Yutai Su, Wendi Guo, Bo Wan, Zhongqing Zhang and Ye Wang
Life prediction methodology of system-in-package based on physics of failure

Jongkyun Kim, Namhyun Lee, Gang-Jun Kim, Young-Yun Lee, Jungeun Seok and Yunsung Lee
Effect of OFF-State stress on Reliability of nMOSFET in SWD circuits of DRAM

17:40-19:40 SESSION POSTER - B3: SI-TECHNOLOGIES & NANOELECTRONICS: ESD, EMI AND LATCH-UP

Location: Hall West

Zhen Zhang, Yaoting Xue, Ruiqing Ma and Yongheng Yang
An easy-implemented confidence filter for signal processing in the complex electromagnetic environment

R. Baburske, F.-J. Niedernostheide, H.-J. Schulze, R. Bhojani, J. Kowalsky and J. Lutz
Unified view on energy and electrical failure of the short-circuit operation of IGBTs

Jianfei Wu, Wei Zhu, Binhong Li, Yafei Li, Hongyi Wang and Mengjun Wang
Investigations on immunity of interfaces between intelligent media processor and DDR3 SDRAM memory

Shawki Douzi, Moncef Kadi, Habib Boulzazen, Mohamed Tlig and Jaleleddine Ben Hadj Slama
Conducted EMI Evolution of power SiC MOSFET in a Back Converter after Short-Circuit Aging Tests

TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - C: PROGRESS IN FAILURE ANALYSIS: DEFECT DETECTION AND ANALYSIS

Location: Hall West

Hye-Young Kim, Jae-Yeon Kim, Ki-Tae Yoo, Won-Jon Yang and Jai-Won Byeon
Failure mechanism of Ag nanowire-coated conductive transparent electrode for wearable devices under folding and torsional fatigue condition

Bahar Ahmadi, Bahram Javidi and Sina Shahbazmomhamadi
Automated detection of counterfeit ICs using machine learning

Guilherme Cardoso Medeiros, Leticia Maria Bolzani Poehls, Mottaqiallah Taouil, Fabian Luis Vargas and Said Hamdioui
A defect-oriented test approach using on-chip current sensors for resistive defects in FinFET SRAMs

Zhongliang Li, Zhixue Zheng and Rachid Outbib
A prognostic methodology for power MOSFETs under thermal stress using echo state network and particle filter

Pierpaolo Barbarino, Giuseppe Sciuto, Virginia Triolo, Antonia Conte, Rosalia Germanà, Giuditta Settani and Domenico Mello
Case study: OBIC Fault Isolation technique applied for Yield Loss in VIPower device technology

Katsuyoshi Miura, Atsuki Seko and Koji Nakamae
Simulation-based evaluation of probing attacks to arbiter PUFs using a time-resolved emission microscope

Ivo Vogt, Tomonori Nakamura, Ingrid De Wolf and Christian Boit
Detection of failure mechanisms in 24-40nm FinFETs with (Spectral) photon emission techniques using InGaAs camera

Shaalini Chithambaram, Pik Kee Tan, Yuzhe Zhao, Binghai Liu, Yinzhe Ma, Alfred Quah, Dayanand Nagalingam, Yanlin Pan and Zhihong Mai
Failure analysis on 14nm FinFET devices with ESD CDM failure

Pik Kee Tan, Yuzhe Zhao, Fransiscus Rivai, Binghai Liu, Yanlin Pan, Ran He, Hao Tan and Zhihong Mai
Cross-sectional nanoprobing sample preparation on sub-micron device with fast laser grooving technique

Yi Chao Low, P.K. Tan, S.L. Tan, Y.Z. Zhao and J. Lam and Marc van Veenhuizen
Void detection in solder bumps with deep learning

Xuerong Ye, Cen Chen and Guofu Zhai
Fault location of a switched mode power supply based on extended integer-coded dictionary method

P. Dreher, R. Schmidt, A. Vetter, J. Hepp, A. Karl and C.J. Brabec
Non-destructive imaging of defects in Ag-sinter die attach layers – a comparative study including X-Ray, Scanning Acoustic Microscopy and thermography

17:40-19:40 SESSION POSTER - D: RELIABILITY OF MICROWAVE AND COMPOUND SEMICONDUCTORS DEVICES

Location: Hall West

Omar Chihani, Loïc Théolier, Alain Bensoussan, Jean-Yves Deletage, André Durier and Eric Woirgard
Effect of HTRB lifetest on AlGaN/GaN HEMTs under different voltages and temperatures stress

Dany Hachem, David Trémouilles, Frédéric Morancho and Gaëtan Toulon
A new electro-optical transmission line measurement method revealing a possible contribution of source and drain contact resistances to GaN HEMT dynamic on-resistance

M. Oualli, C. Dua, O. Patard, P. Altuntas, S. Piotrowicz, P. Gamarra, C. Lacam, J.-C. Jacquet, L. Teisseire, D. Lancereau, E. Chartier, C. Potier and S.L. Delage
Stability and robustness of InAlGaN/GaN HEMT in short-term DC tests for different passivation schemes

TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - E1: POWER DEVICES RELIABILITY - SILICON AND PASSIVE

Location: Hall West

Abbate Carmine, Giovanni Busatto, Annunziata Sanseverino, Davide Tedesco and Francesco Velardi
Measure of high frequency input impedance to study the instability of power devices in short circuit

Ole Kristensen, Pooya Davari and Francesco Iannuzzo
Investigation of acoustic emission as a non-invasive method for detection of power semiconductor aging

Nga Man Li, Subramani Manoharan, Diganta Das and Patrick McCluskey
Analysis of indentation measured mechanical properties on Multilayer Ceramic Capacitors (MLCCs)

Haoran Wang and Huai Wang
An analytical circuit based nonlinear thermal model for capacitor banks

Th. Stiasny, O. Quittard, Ch. Waltisberg and U. Meier
Reliability evaluation of IGCT from accelerated testing, quality monitoring and field return analysis

Felix Wuest, Stefan Trampert, Sergei Janzen, Stefan Straube and Martin Schneider-Ramelow
Comparison of temperature sensitive electrical parameter based methods for junction temperature determination during accelerated ageing of power electronics

Y. Peng, Y.J. Zhang, D.T. Liu and L.S. Liu
Degradation estimation using feature increment stepwise linear regression for PWM Inverter of Electro-Mechanical Actuator

Zhongxu Wang, Huai Wang, Yi Zhang and Frede Blaabjerg
A multi-port thermal coupling model for multi-chip power modules suitable for circuit simulators

M.H. Mohamed Sathik, S. Prasanth, F. Sasongko and J. Pou
Online condition monitoring of igbt modules using voltage change rate identification

Masanori Tsukuda, Seiya Abe, Kazunori Hasegawa, Tamotsu Ninomiya and Ichiro Omura
Bias voltage criteria of gate shielding effect for protecting IGBTs from shoot-through phenomena

Ravi Nath Tripathi, Masanori Tsukuda and Ichiro Omura
A fully digital feedback control of gate driver for current balancing of parallel connected power devices

Bat-Otgon Bat-Ochir, Battuvshin Bayarkhuu, Kazunori Hasegawa, Masanori Tsukuda, Bayasgalan Dugarjav and Ichiro Omura
Envelop tracking based embedded current measurement for monitoring of IGBT and power converter system

V. Samavatian, Y. Avenas and H. Iman-Eini
Mutual and self-aging effects of power semiconductors on the thermal behaviour of DC-DC boost power converter

17:40-19:40 SESSION POSTER - E2: POWER DEVICES RELIABILITY - WIDE BANDGAP DEVICES

Location: Hall West

Asad Fayyaz, Besar Asllani, Alberto Castellazzi, Michele Riccio and Andrea Irace
Avalanche ruggedness of parallel SiC power MOSFETs

Abbate Carmine, Giovanni Busatto, Annunziata Sanseverino, Davide Tedesco and Francesco Velardi
Failure Analysis of 650V Enhancement Mode GaN HEMT after Short Circuit Tests

M. Elharizi, F. Zaki, A. Ibrahim, Z. Khatir and J.P. Ousten
Effect of power cycling tests on traps under the gate of Al2O3/AlGaN/GaN normally-ON devices

He Du, Paula Diaz Reigosa, Francesco Iannuzzo and Lorenzo Ceccarelli
Investigation on the degradation indicators of short-circuit tests in 1.2 kV SiC MOSFET power modules

Tien Anh Nguyen, Stéphane Lefebvre and Stéphane Azzopardi
Effect of short circuit aging on safe operating area of SiC MOSFET

Thomas Lorin, William Vandendaele, Romain Gwoziecki, Charlotte Gillot, Jérome Biscarrat, Gérard Ghibaudo and Fred Gaillard
Study of forward AC stress degradation of GaN-on-Si Schottky diodes

Jian Zhi Fu, François Fouquet, Moncef Kadi and Pascal Dherbecourt
Evolution of C-V and I-V characteristics for a commercial 600V GaN GIT power device under repetitive short-circui tests (abstract)

Lorenzo Ceccarelli, Haoze Luo and Francesco Iannuzzo
Investigating SiC MOSFET body diode's light emission as Temperature-Sensitive Electrical Parameter

Quentin Molin, Mehdi Kanoun, Christophe Raynaud and Hervé Morel
Measurement and analysis SiC-MOSFET threshold voltage shift

Teng Zhang, Bruno Allard and Jinshun Bi
The synergetic effects of high temperature gate bias and total ionization dose on 1.2kV SiC devices

Oriol Avino-Salvado, Hervé Morel, Cyril Buttay, Denis Labrousse and Stéphane Lefebvre
Threshold voltage instability in SiC MOSFETs as a consequence of current conduction in their body diode

TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - F: PACKAGING AND ASSEMBLY RELIABILITY

Location: Hall West

Cheryl Selvanayagam, Rathin Mandal and Nagarajan Raghavan
Comparison of experimental, analytical and simulation methods to estimate substrate material properties for warpage reliability analysis

Ui-Min Choi, Soren Jorgensen, Francesco Iannuzzo and Frede Blaabjerg
Power cycling test of transfer molded IGBT modules by advanced power cycler under different junction temperature swings

Yi Zhang, Huai Wang, Zhongxu Wang and Frede Blaabjerg
An empirical model for thermal interface materials based on experimental characterizations under realistic conditions

Mattia Antonini, Paolo Cova, Nicola Delmonte and Alberto Castellazzi
GaN transistors efficient cooling by graphene foam

Dongjin Kim, Chuantong Chen, Aiji Suetake, Chanyang Choe, Tohru Sugahara, Shijo Nagao and Katsuaki Suganuma
Development of thermal shock-resistant of GaN/DBC die-attached module by using Ag sinter paste and thermal stress relaxation structure

Paolo Cova, Nicola Delmonte, Diego Chiozzi, Marco Portesine, Filippo Vaccaro and Emanuele Mantegazza
Water cold plates for high power converters: a software tool for easy optimized design

Allen Jose George, Juergen Zipprich, Marlies Breitenbach, Markus Klingler and Mathias Nowottnick
Reliability investigation of large area solder joints in power electronics modules and its simulative representation

Sanghun Jin, Min-Su Kim, Shutetsu Kanayama and Hiroshi Nishikawa
Shear properties of In-Bi alloy joints with Cu substrates during thermal aging

Faical Arabi, Alexandrine Gracia, Jean-Yves Deletage and Helene Fremont
Sequential combined thermal cycling and vibration test and simulation of printed circuit board

Mads Brincker, Peter K. Kristensen, Stefan Söhl, Ronald Eisele and Vladimir N. Popok
Low temperature transient liquid phase bonded Cu-Sn-Mo and Cu-Sn-Ag-Mo interconnects – a novel approach for hybrid metal baseplates

Guang Zeng, Felix Wenisch-Kober and Josef Lutz
Study on power cycling test with different control strategies

17:40-19:40 SESSION POSTER - G: MEMS, SENSORS AND ORGANIC ELECTRONICS RELIABILITY

Location: Hall West

Hee Pyung Park, Sang Woo Kim, Joong Woon Shin, Won Ju Cho and Jong Tae Park
Effects of the compositional ratios of sputtering target on the device performance and instability in amorphous InGaZnO thin film transistors

Marco Buonomo, Lorenzo Torto, Marco Barbato, Nicola Wrachien, Antonio Rizzo, Suren A. Gevorgyan, Frederik C. Krebs and Andrea Cester
Analysis of the effects of voltage pulses on P3HT:PCBM polymeric solar cells by means of TLP technique

Marco Buonomo, Nicola Wrachien, Nicolò Lago, Giuseppe Cantarella and Andrea Cester
Effects of stair-case Gate bias stress in IGZO/Al2O3 flexible TFTs

17:40-19:40 SESSION POSTER - H: PHOTONICS RELIABILITY

Location: Hall West

Nicola Renso, Matteo Buffolo, Carlo De Santi, Matteo Ronzani, Gaudenzio Meneghesso, Enrico Zanoni and Matteo Meneghini
Failure limits and electro-optical characteristics of GaN-based LEDs under electrical overstress

D.S. Kim, J.H. Choi, N.C. Park, S.I. Chan and Y.C. Jeong
Analysis of Semiconductor Fault using DS (Damped Sinusoidal) HPEM Injection

TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - I: EXTREME ENVIRONMENTS AND RADIATION

Location: Hall West

Qingkui Yu, Yi Sun, Zheng Li, Bo Mei, Xiaoliang Li, He Lv, Pengwei Li and Min Tang
Experimental and simulation study of the correlation between displacement damage and incident proton energy for GaAs devices

M. Zerarka and O. Crepel
Radiation robustness of normally-off GaN/HEMT power transistors (COTS)

J. Wang, B. Li, Y. Huang, K. Zhao, F. Yu, Q. Zheng, Q. Guo, L. Xu, J. Gao, X. Cai and Y. Cui
The total ionizing dose response of Leading-edge FDSOI NMOSFET

Ying Pang and Mauro Ciappa
Charge and energy deposition in thick silicon depletion layers by environmental ionizing radiation and terrestrial cosmic rays

Binhong Li, Yang Huang, Jianfei Wu, Yunbo Huang, Bo Li, Qingzhu Zhang, Ling Yang, Fayu Wan, Jiajun Luo, Zhengsheng Han and Huaxiang Yin
Constant voltage stress characterisation of nFinFET transistor during total ionizing dose experiment

B. Li, Y.-B. Huang, L. Yang, Q.-Z. Zhang, Z.-S. Zheng, B.-H. Li, H.-P. Zhu, J.-H. Bu, H.-X. Yin, J.-J. Luo, Z.-S. Han and H.-B. Wang
Process variation dependence of total ionizing dose effects in bulk nFinFETs

Aleksandr S. Petrov, Konstantin I. Tapero, Viktor N. Ulimov and Aleksandr M. Chlenov
Impact of elevated temperature applied during low dose rate irradiation on the degradation of BiCMOS operational amplifiers

Hoang Nguyen, Axel Rodriguez, Frederic Wrobel, Alain Michez, Francoise Bezerra, Nathalie Chatry and Benjamin Vandevelde
TCAD simulation of radiation-induced leakage current in 1T1C SDRAM

Nilson Maciel, Elaine Crespo Marques, Lirida Naviner and Hao Cai
Single-event transient effects on dynamic comparator in 28nm FDSOI CMOS technology

Chihiro Kawahara, Yukihiko Wada, Shinichi Kinouchi and Hiroshi Kobayashi
Non-destructive estimation method on cosmic ray ruggedness of power semiconductors using repetitive monitoring technique

17:40-19:40 SESSION POSTER - K: RENEWABLE ENERGIES RELIABILITY

Location: Hall West

Paolo Cova, Nicola Delmonte and Massimo Lazzaroni
Photovoltaic plant maintainability optimization and degradation detection: modelling and characterization

Muhammad S. Tariq, Saad A. Butt and Hassan A. Khan
Impact of module and inverter failures on the performance of central-, string-, and micro-inverter PV systems

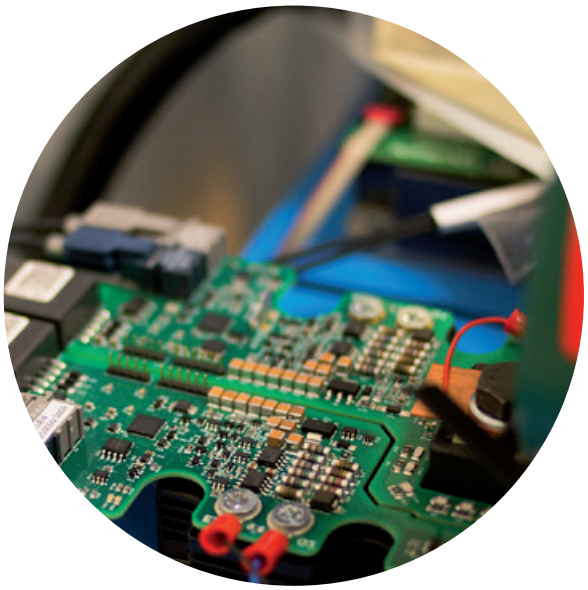
J.H. Qin, L. Wang, S.S. Yang and R. Huang
The effect of solar cell internal resistance change on the bus voltage ripple in spacecraft power system

Rodrigo Barros, Erick Brito, Allan Cupertino, Victor Mendes and Heverton A. Pereira
Lifetime evaluation of a multifunctional pv single-phase inverter during harmonic current compensation

Ranjith Kumar Gatla, Wei Chen, Guorong Zhu, Dingjun Zeng and Ramchander Nirudi
Lifetime estimation of modular cascaded H-bridge MLPVI for grid-connected PV systems considering mission profile

Renata Sousa, João Victor Farias, Allan Cupertino and Heverton Pereira
Life consumption of a MMC-STATCOM supporting wind power plants: impact of the modulation strategies

Guoliang Yang, Chuntian Fu, Haitao Yi, Chunhua Chai, Bingxu Huang, Shuai Hao and Zhe Chen
Direct power control of three-level NPC grid-connected system combined with fault-tolerant technology



TUESDAY OCTOBER 2

17:40-19:40 SESSION POSTER - L: MODELING FOR RELIABILITY

Location: Hall West

S. Bahrebar, D. Zhou, S. Rastayesh, H. Wang and F. Blaabjerg
Reliability assessment of power conditioner considering maintenance in a pem fuel cell system

Zhipeng Ye, Jiawei Zhu, Qian Li, Bing Mo, Baimao Lei, Yaqiu Li, Chunhui Wang and Chuangmian Huang
A novel method of reliability-centered process optimisation for additive manufacturing

Flaviu-Bogdan Simon, Sebastian Amadeus Letz and Andreas Schletz
Influence of the pulse length and temperature swing on the relative lifetime estimation for sintered/soldered chip-on-substrate samples via FE-simulation of power cycles

Daniela Cavallaro, Rosario Greco and Gaetano Bazzano
Effect of solder material thickness on Power MOSFET reliability by Electro-Thermo-Mechanical Simulations

Hongpeng Liu, Wentao Wu, Panbao Wang, Hui Wu and Wei Wang
Lifetime prediction of a modified Y-source inverter in photovoltaic application

Samuel Pin, Alexandrine Guédon-Gracia, Jean-Yves Delétage and Hélène Frémont
Creep measurement and choice of creep laws for BGA assemblies' reliability simulation

Tao Zheng, Meng Huang, Yi Liu and Xiaoming Zha
Reliability model of bond wire fatigue for IGBT in MMC with system redundancy consideration

Jingge Hu, Meng Huang, Yi Liu and Xiaoming Zha
Transient junction temperature estimation of IGBT using improved thermal model

17:40-19:40 SESSION POSTER - SS1: RELIABILITY IN TRACTION APPLICATIONS

Location: Hall West

Guoning Xu, Xiaowei Du, Zhaojie Li, Xiaojun Zhang, Minxin Zheng, Ying Miao, Yang Gao and Qianshi Liu
Reliability design of battery management system for power battery

Ramin Parvari, Mostafa Zarghani and Shahriyar Kaboli
RCD snubber design based on reliability consideration: A case study for thermal balancing in power electronic converters

Hong Li, Zhongya Guo, Chen Liu and Trillion Q. Zheng
An extensible stability analysis method in time domain for cascaded dc-dc converters in electrical vehicles

Shuai Lin, Xiaochun Fang, Fei Lin, Zhongping Yang and Xiaofan Wang
Reliability of rail transit traction drive system—a review

Zhao Liu, Shuai Wang, Zhendong Ji, Xiaopeng Ji and Yunyun Xie
A novel fault-tolerant control for battery-energy-storage system based on cascade multilevel converter with battery/BMS failure

Michel Piton, Bertrand Chauchat and Jean-François Serviere
Implementation of direct chip junction temperature measurement in high power IGBT module in operation - railway traction converter

B. Sivasankari, A. Ahilan, R. Jothin and A. Jasmine Gnana Malar
Reliable N sleep shuffled phase damping design for ground bouncing noise mitigation

Mei Fei, Miao Huiyu, Pan Yi, Sha Haoyuan, Liu Ning and Zheng Jianyong
On-line fault diagnosis model for locomotive traction inverter based on wavelet transform and support vector machine

Tiezhou Wu, Zhihao Cheng, Jiasheng Zhang and Zhangqing He
A PCH strong tracking control strategy for power coordinated allocation of Li-SC HESS

Jingda Gu, Xiaofeng Yang and Trillion Q. Zheng
Influence factors analysis of rail potential in urban rail transit

Dan Zhang and Jianguo Jiang
A reliable speed controller for suppressing low frequency concussion of electric vehicle

20:00-22:00 YOUNG PROFESSIONAL RECEPTION

Location: Studenterhuset

WEDNESDAY OCTOBER 3

08:40-10:00 SESSION E2-3: SIC AND GAN DEVICE RELIABILITY (2)

Location: Hall East

Chairs: Matteo Meneghini and Joachim Wuerfl

08:40 Xi Jiang, Jun Wang, Jiwu Lu, Jianjun Chen, Xin Yang, Zongjian Li, Chunming Tu and Z. John Shen
Failure modes and mechanism analysis of SiC MOSFET under short-circuit conditions

09:00 Alaleh Tajalli, Eleonora Canato, Matteo Meneghini, Arno Stockman, Peter Moens, Enrico Zanoni and Gaudenzio Meneghesso
Impact of sidewall etching on the dynamic performance of GaN-on-Si E-mode transistors

09:20 Haoze Luo, Paula Diaz Reigosa, Francesco Iannuzzo and Frede Blaabjerg
On-line solder layer degradation measurement for SiC-MOSFET modules under accelerated power cycling condition

09:40 Maria Ruzzarin, Matteo Meneghini, Carlo De Santi, Min Sun, Tomas Palacios, Gaudenzio Meneghesso and Enrico Zanoni
Degradation of vertical GaN-on-GaN fin transistors: step-stress and constant voltage experiments

08:40-10:00 SESSION SS1-1: STATE OF HEALTH OF LI-ION BATTERIES

Location: Laugstuen

Chairs: Frede Blaabjerg and Zoubir Khatir

08:40 Yongquan Sun, Xueling Hao, Michael Pecht and Yapeng Zhou
Remaining useful life prediction for lithium-ion batteries based on an integrated health indicator

09:00 Jinhao Meng, Lei Cai, Guangzhao Luo, Daniel-Ioan Stroe and Remus Teodorescu
Lithium-ion battery state of health estimation with short-term current pulse test and support vector machine

09:20 Jinsong Yu, Weiqi Tang, Diyin Tang and Jiuqing Wan
A prediction method for discharge voltage of lithium-ion batteries under unknown dynamic loads

09:40 Yuanci Zhang, Olivier Briat, Jean-Yves Deletage, Cyril Martin, Nicolas Chadourne and Jean-Michel Vinassa
Efficient state of health estimation of Li-ion battery under several ageing types for aeronautic applications

08:40-10:00 SESSION L-1: MODELING CHALLANGES FOR DEVICES RELIABILITY

Location: Musiksalen

Chairs: Giorgia Longobardi and Denis Rideau

08:40 S. Reggiani, M. Rossetti, A. Gnudi, A.N. Tallarico, A. Molfese, S. Manzini, R. Depetro, G. Croce, E. Sangiorgi and C. Fiegna
TCAD investigation on hot-electron injection in new-generation technologies

09:00 Susanna Reggiani, Luigi Balestra, Antonio Gnudi, Elena Gnani, Giorgio Baccarani, Jagoda Dobrzynska, Jan Vobecky and Carlo Tosi
TCAD study of DLC coatings for large-area high-power diodes

09:20 Tommaso Cilento, Chan-Su Yun, Arsen Terterian, Chang Hwi Lee, Jung Eon Moon, Si Woo Lee, Hyoungcheol Kwon, Manho Seung and Seokkiu Lee
Investigation of layout effects in diode-triggered SCRs under very-fast TLP stress through full-size, calibrated 3D TCAD simulation

09:40 Fabio Alberto Velarde Gonzalez, Andre Lange, Roland Jancke and Sonja Crocoll
NBTI and HCI models for circuit level aging simulations in different EDA environments

10:00-10:20 COFFEE BREAK

10:20-11:00 SESSION INV4: INVITED

Location: Hall East

Chair: Vladimir Popok

Frank Altmann
Analytics for physics of failure in automotive applications

10:20-11:00 SESSION INV5: INVITED

Location: Musiksalen

Chair: Francesco Iannuzzo

Mehdi B. Tahoori
Cross-Layer Approaches for Resilient VLSI System Design

WEDNESDAY OCTOBER 3

11:00-12:20 SESSION F-2: DEVICE INTERNAL SOLDER JOINTS

Location: Hall East

Chairs: Andreas Middendorf and Kristine Weide-Zaage

11:00 Seungjun Noh, Hao Zhang, Jeyun Yeom, Chuantong Chen, Caifu Li and Katsuaki Suganuma
Large area die-attachment by silver stress migration bonding for power device applications

11:20 C. Uhrenfeldt, S. Munk-Nielsen and S. Beczkowski
Frequency domain scanning acoustic microscopy for power electronics: physics-based feature identification and selectivity

11:40 Chanyang Choe, Seungjun Noh, Chuantong Chen, Dongjin Kim and Katsuaki Suganuma
Influence of thermal exposure upon mechanical/electrical properties and microstructure of sintered micro-porous silver

12:00 Elisabeth Kolbinger, Stefan Wagner, Astrid Gollhardt, Olaf Rämer and Klaus-Dieter Lang
Corrosion behaviour of sintered silver under maritime environmental conditions

11:00-12:20 SESSION SS1-2: AUTOMOTIVE SYSTEMS RELIABILITY

Location: Laugstuen

Chairs: Zoubir Khatir and Hong Li

11:00 Peng Fan, Shoudao Huang, Huai Wang, Derong Luo, Huimin Li and Meidi Sun
Fundamental frequency region-based thermal control of power electronics modules in high power motor drive

11:20 Eduardo Redondo-Iglesias, Pascal Venet and Serge Pelissier
Calendar and cycling ageing combination of batteries in electric vehicles

11:40 Mingyao Ma, Zhiyu Sun, Ye Wang, Jianing Wang and Rui Wang
Method of junction temperature estimation and over temperature protection used for electric vehicle's IGBT power modules

12:00 Ana-Irina Stroe, Vaclav Knap and Daniel-Ioan Stroe
Comparison of Lithium-ion battery performance at beginning-of-life and end-of-life

11:00-12:20 SESSION L-2: NUMERICAL MODELING OF BACK-END PROCESSES AND ASSEMBLY

Location: Musiksalen

Chairs: Susanna Reggiani and Luca Sponton

11:00 M.D. Hook, S. Hunter and M. Mayer
Deriving lifetime predictions for wire bonds at high temperatures

11:20 Sebastian Letz, Azin Farooghian, Flaviu-Bogdan Simon and Andreas Schletz
Modeling the rate-dependent inelastic deformation behavior of porous polycrystalline silver films

11:40 Yanfeng Shen, Huai Wang and Frede Blaabjerg
Thermal resistance modelling and design optimization of PCB vias

12:00 M. Balmont, I. Bord Majek, B. Poupard, L. Bechou and Y. Ousten
Highlighting two integration technologies based on vias: Through Silicon Vias and embedded components into PCB. Strengths and weaknesses for manufacturing and reliability

WEDNESDAY OCTOBER 3

11:00-12:20 SESSION W1: WORKSHOP: EMERGING CHALLENGES FOR A BUILT-IN RELIABILITY IN INNOVATIVE AUTOMOTIVE ICs

Location: Latinerstuen

Alberto Mancaleoni

Emerging challenges for a built-in reliability in innovative Automotive ICs

12:20-13:20 LUNCH

13:20-14:00 SESSION INV6: INVITED

Location: Hall East

Chairs: Helene Fremont and René Rongen

Rajan Ambat

Interplay of humidity and electrical functionality imposing reliability problems in electronics

13:20-14:00 SESSION INV7: INVITED

Location: Musiksalen

Chairs: Susanna Reggiani and Luca Sponton

Paul Pfaeffli

TCAD modelling for reliability

14:00-15:40 SESSION F-3: MATERIAL & CONSTRUCTION

Location: Hall East

Chairs: Helene Fremont and Rene Rongen

14:00 Bernhard Czerny and Golta Khatibi

Cyclic robustness of heavy wire bonds: Al, AlMg, Cu and CucorAl

14:20 Yoann Pascal, Denis Labrousse, Mickael Petit, Stéphane Lefebvre and François Costa

Experimental investigation of the reliability of Printed Circuit Board (PCB)-embedded power dies with pressed contact made of metal foam

14:40 Subramani Manoharan, Chandradip Patel, Stevan Hunter and Patrick McCluskey

Mechanism of Wire Bond Shear Testing

15:00 Davide Cornigli, Susanna Reggiani, Antonio Gnudi, Elena Gnani, Giorgio Baccarani, Davide Fabiani, Dhanoop Varghese, Enis Tuncer, Srikanth Krishnan and Luu Nguyen

Electrical characterisation of epoxy-based molding compounds for next generation HV ICs in presence of moisture

15:20 Thomas Walter, Golta Khatibi, Michael Nelhiebel and Mario Stefenelli

Characterisation of cyclic delamination behavior of thin film multilayers

14:00-15:40 SESSION SS1-3: RELIABILITY ASSESSMENT AND FAULT TOLERANT CONTROL

Location: Laugstuen

Chairs: Stefan Mollov and Zheng Trillion Q.

14:00 Ding Feng, Sheng Lin, Xiaojun Sun and Zhengyou He

Reliability assessment for traction power supply system based on quantification of margins and uncertainties

14:20 Mingyao Ma, Rui Wang, Fei Li, Jianing Wang and Shuying Yang

A fault-tolerant control strategy for switched reluctance motor drive for electric vehicles under short-fault condition

14:40 Ping Liu, Huai Wang, Yi Liu and Frede Blaabjerg

Thermal stress reduction of quasi-Z source inverter drive by model predictive control

15:00 Sai Tang, Xin Yin, Daming Wang, Chao Zhang, Zhikang Shuai, Xin Yang, Z. John Shen and Jun Wang

Detection and identification of power switch failures for fault-tolerant operation of flying capacitor buck-boost converters

15:20 Ji Shu, Shunliang Wang, Tianqi Liu, Ning Jiao and Yanbo Wang

A novel current-limiting circuit based on resistive-type SFCL for fault in DC power system

14:00-15:40 SESSION L-3: SIMULATION OF SYSTEM AND MODULE RELIABILITY

Location: Musiksalen

Chairs: Susanna Reggiani and Luca Sponton

14:00 Yi Liu, Ping Liu, Huai Wang, Meng Huang and Xiaoming Zha

Two-thermal-states model predictive control for IGBT in three-phase inverter

14:20 Jorge Daniel Aguirre Morales, François Marc, Alain Bensoussan and André Durier

Simulation and modelling of long-term reliability of digital circuits implemented in FPGA

14:40 Mohsen Akbari, Amir Sajjad Bahman, Paula Diaz Reigosa, Francesco Iannuzzo and Mohammad Tavakoli Bina

Thermal modelling of wire-bonded power modules considering non-uniform temperature and electric current interactions

15:00 Jun Yang, Xiao Shi and Jianchun Zhang

A new processing method for accelerated degradation data based on quantile regression and pseudo-failure lifetime

14:00-15:40 SESSION W2: WORKSHOP: APPLIED ROBUSTNESS VALIDATION

Location: Latinerstuen

Chair: Ulrich Abelein

15:20-15:40 BEST PAPER ISTFA 2017

Location: Musiksalen

Chairs: Susanna Reggiani and Luca Sponton

Edward L. Principe

Steps toward automated deprocessing of integrated circuits

16:40-22:30 TOUR AND GALA DINNER

Location: Voergaard Castle

Meet-up outside AKKC main entrance 16:40.

Busses leave Voergaard Castle 22.30.

THURSDAY OCTOBER 4

08:40-10:20 SESSION G: MEMS, SENSORS AND ORGANIC ELECTRONICS RELIABILITY

Location: Laugstuen

Chairs: Fabio Coccetti and Stefan Oberhoff

08:40 I. Marozau, M. Auchlin, V. Pejchal, F. Souchon, D. Vogel, M. Lahti, N. Saillen and O. Sereda
Reliability assessment and failure mode analysis of MEMS accelerometers for space applications

09:00 Daniel Monteiro Diniz Reis, Sven Rzepka and Karla Hiller
Reliability testing of integrated low-temperature PVD PZT films

09:20 Chun-Lin Lu, Pei-Rong Ni and Meng-Kao Yeh
Stress Analysis of CMOS-MEMS Microphone under Shock Loading by Taguchi Method

09:40 Fahimeh Saghaeian, Jozef Keckes, Kai-Alexander Schreiber and Tobias Mittereder
Design and development of MEMS-based structures for in-situ characterization of thermo-mechanical behaviour of thin metal films

10:00 Dimitrios Birmpiliotis, Matroni Koutsoureli, John Kohylas, George Papaioannou and Afshin Ziaei
Charging mechanisms in Y2O3 dielectric films for MEMS capacitive switches

08:40-10:20 SESSION I-1: RADIATION EFFECTS IN ADVANCED DEVICES

Location: Musiksalen

Chairs: Olivier Crepel and Simone Gerardin

08:40 Ygor Q. Aguiar, Frédéric Wrobel, Jean-Luc Autran, Paul Leroux, Frédéric Saigné, Antoine D. Touboul and Vincent Pouget
Analysis of the charge sharing effect in the SET sensitivity of bulk 45nm standard cell layouts under heavy ions

09:00 Abbate Carmine, Giovanni Busatto, Annunziata Sanseverino, Davide Tedesco and Francesco Velardi
Progressive drain damage in SiC power MOSFETs exposed to ionizing radiation

09:20 Jinshun Bi, Yuan Duan, Kai Xi and Bo Li
Total ionizing dose and single event effects of 1Mb HfO2-based resistive-random-access memory

09:40 Maxime Girard, Tristan Dubois, Patrick Hoffmann and Genevieve Duchamp
Effects of HPEM stress on GaAs low-noise amplifier from circuit to component scale

10:00 Haibin Wang, Xixi Dai, Yangsheng Wang, Jinshun Bi, Bo Li, Gang Guo, Li Chen and Sang Baeg
A single event upset tolerant latch design

08:40-10:20 SESSION C-2: DEFECT DETECTION USING MICROSCOPY AND PROBING TECHNIQUES

Location: Hall East

Chairs: Giovanna Mura and Vladimir Popok

08:40 Yuji Yamagishi and Yasuo Cho
High-resolution observation of defects at SiO2/4H-SiC interfaces by time-resolved scanning nonlinear dielectric microscopy

09:00 Michael Hertl, Nicolas Vivet, Fabien Allanic, Sandra Dureau, Armelle Minguet, Nicolas Porcher, Isaline Richard and Pauline Serre
Use of golden samples for the assessment of the quality and reproducibility of scanning acoustic microscopy images of electronics samples

09:20 Nabil El Belghiti Alaoui, Alexandre Boyer, Patrick Tounsi and Arnaud Viard
New defect detection approach using near electromagnetic field probing for high density PCBAs

09:40 Giulia Marcello, Eleonora Meda and Matteo Medda
Complex Automotive ICs defect localisation driven by Quiescent Power Supply Current: three cases study

10:00 Eva Kozic, René Hammer, Jördis Rosc, Bernhard Sartory, Joerg Siegert, Franz Schrank and Roland Brunner
Metallization defect detection in 3D integrated components using scanning acoustic microscopy and acoustic simulations

08:40-10:20 SESSION W3: ECPE WORKSHOP:FRONTIERS IN RELIABILITY ENGINEERING: RAILWAY TRACTION, RENEWABLES, INDUSTRY

Location: Latinerstuen

Chairs: Huai Wang and Eckhard Wolfgang

10:20-10:40 COFFEE BREAK

THURSDAY OCTOBER 4

10:40-12:20 SESSION D: RELIABILITY AND QUALIFICATION OF MICROWAVE GAN TECHNOLOGIES

Location: Laugstuen

Chairs: Michael Dammann and Nathalie Labat

10:40 Wardhana Sasangka, Yu Gao, Chee Lip Gan and Carl V. Thompson
Impact of carbon impurities on the initial leakage current of AlGaN/GaN high electron mobility transistors

11:00 M. Dammann, M. Baeumler, P. Brückner, T. Kemmer, H. Konstanzer, A. Graff, M. Simon-Najasek and R. Quay
Comparison of Reliability of 100 nm AlGaN/GaN HEMTs with T-Gate and SAG-Gate Technology

11:20 M. Rzin, A. Chini, C. De Santi, M. Meneghini, A. Hugger, M. Hollmer, H. Stieglauer, M. Madel, J. Splettstößer, D. Sommer, J. Grünenpütt, K. Beilenhoff, H. Blanck, J.-T. Chen, O. Kordina, G. Meneghesso and E. Zanoni
On-wafer RF stress and trapping kinetics of Fe-doped AlGaN/GaN HEMTs

11:40 F.P. Pribahsnik, M. Bernardoni, M. Nelhiebel, M. Mataln and A. Lindemann
Combined experimental and numerical approach to study electro-mechanical resonant phenomena in GaN-on-Si heterostructures

12:00 A. Barnes, F. Heliere, P. Villar, H. Stuhldreier, C. Beaurain, D. Bouw, M. Grunwald, E. Moess, T. Muck, C. Schildbach, T. Ayles, A. Kramer and B. Bildner
Qualification of GaN microwave transistors for the European Space Agency Biomass mission

10:40-12:20 SESSION I-2: ANALYSIS AND MITIGATION OF RADIATION EFFECTS IN COMPLEX CHIPS

Location: Musiksalen

Chairs: Olivier Crepel and Simone Gerardin

10:40 Marcio Gonçalves, Mateus Saquetti and José Rodrigo Azambuja
Evaluating the reliability of a GPU pipeline to SEU and the impacts of software-based and hardware-based fault tolerance techniques

11:00 Iuri Albandes, Alejandro Serrano, Mayler Martins, Antonio Martínez-Álvarez, Sergio Cuenca and Fernanda Kastensmidt
Design of Approximate-TMR using Approximate Library and Heuristic Approaches

11:20 Manuel Peña-Fernandez, Almudena Lindoso, Luis Entrena, Mario Garcia-Valderas, Yolanda Morilla and Pedro Martin-Holgado
PTM-based hybrid error-detection architecture for ARM microprocessors

11:40 S. Azimi, L. Sterpone, B. Du and L. Boragno
On the analysis of radiation-induced single event transients on SRAM-based FPGAs

12:00 José Iván Isaza-González, Felipe Restrepo-Calle, Antonio Martínez-Álvarez and Sergio Cuenca-Asensi
SHARC: Efficient Metric for Selective Protection of Software against Soft Errors

10:40-12:00 SESSION C-3: MANUFACTURING WEAKNESSES LEADING TO FAILURE

Location: Hall East

Chairs: Giovanna Mura and Vladimir Popok

10:40 T. Schaffus, P. Albert, W. Breuer, D. Debie, M. Graml, C. Hollerith, F. Kroninger, W. Mack, H. Pfaff, M. Schaffus and J. Walter
Influence of sample preparation on intrinsic stresses inside a model chip - first results of partial decapsulation

11:00 Amir Sajjad Bahman, Simon Mosbjerg Jensen and Francesco Iannuzzo
Failure mechanism analysis of fuses subjected to manufacturing and operational thermal stresses

11:20 Yi Chao Low, Pik Kee Tan, Soon Leng Tan, Yuzhe Zhao and Jeffrey Lam
Solving 28nm I/O circuit reliability issue due to design weakness

11:40 Tan Li, Hosung Lee, Geunyong Bak and Sanghyeon Baeg
Failure signature analysis of power-opens in DDR3 SDRAMs

10:40-12:20 SESSION W4: WORKSHOP: CONDITION AND HEALTH MONITORING

Location: Latinerstuen

Chair: Stefan Mollov

12:20-13:00 CONFERENCE CLOSING

Location: Hall East

Chair: Francesco Iannuzzo

13:00-17:30 APETT SYMPOSIUM

Location: Hall West and Hall East

APETT SYMPOSIUM

APETT - ADVANCED POWER ELECTRONIC TECHNOLOGY AND TOOLS

AN INNOVATION FUND DENMARK PROJECT
1ST APETT SYMPOSIUM
13:00-17:30, Thursday October 4

Location: Hall West and Hall East

Participation is free, however, registration is necessary. All attendees must pick up an entry ticket for APETT at the registration office near AKKC's main entrance.

Meeting place in Hall West at 13:00 where participants will get a sandwich. The symposium will begin at 14:00 in Hall East.

THE APETT PROJECT

Energy efficient systems and solutions require more use of power electronics in which Danish industries and universities have a stronghold. However, the technologies and competencies built up during the last three decades are challenged from two aspects. Firstly, new fast switching technologies, which promise radical size, efficiency and performance improvements, but require new competencies, designs, test methods and workflows.

Secondly, more stringent reliability requirements to reduce the Cost-of-Energy demand new tools for designing reliability and robustness into power electronic products in the early development phase under constrained cost and time.

Thirdly, existing solutions based on current technologies and tools are copied rapidly. To maintain our stronghold, we need simulation driven development methods and reliability-oriented tools to master the complexity of the new technologies, exploit the promised improvement opportunities and reduce time to market. Cooperation between universities and companies is vital both to acquire and develop the new technologies and to develop new adequate workflows, utilizing the benefits of a "digital twin" of the physical product as described in "Industry 4.0". Ability to sense physical world key states from field use and transmitting them to "digital twin" enabling real time scenario scoping of lower level performance conditions: energy utilisation, power density and stress levels. This enables higher-level decisions: failure predictions and health diagnoses, influencing product service programmes and design phase. Value creation through converting vast data streams by smart algorithms into intuitive human friendly decision tools, secondly, a design platform based on actual product field performance enabling more cost efficient designs.

The majority of the products and solutions in scope of this project are applied into critical infrastructure and in a huge variety of industrial and commercial applications globally, they target attractive markets and it is hence crucial that we maintain the competitive edge during the technology transition.

The project aims to prepare for a paradigm shift in power electronics that will boost the spread of smart electrical energy systems and secure competitiveness and growth of the power electronics industry in the next decade.

New competences and work methods shall further significantly improve reliability-oriented design and testing, prototyping/development time of power electronics products for energy systems. The outcomes will advance the power electronics technologies and new multi-disciplinary design tool development to overcome the abovementioned three aspects of great challenges. It has the three specific goals below:

1) A factor of 3 volume and weight improvement of kW converters used in variable speed drives and power supplies

2) Reduce the power electronics products reliability testing time by 20%, and the maintenance cost and return rates by 50%.

3) Develop a Design for Reliability and Robustness Tool (DfR2 Tool) platform for industry product design or field operation lifetime extension; contribute to the reduction of LCoE of renewables and LCC of energy utilizations.

The collaborators are Aalborg University, South Denmark University, Grundfos, Danfoss, Vestas Wind Systems, Danfysik, Horsodan, KK Wind Solutions and CityU from Hong Kong

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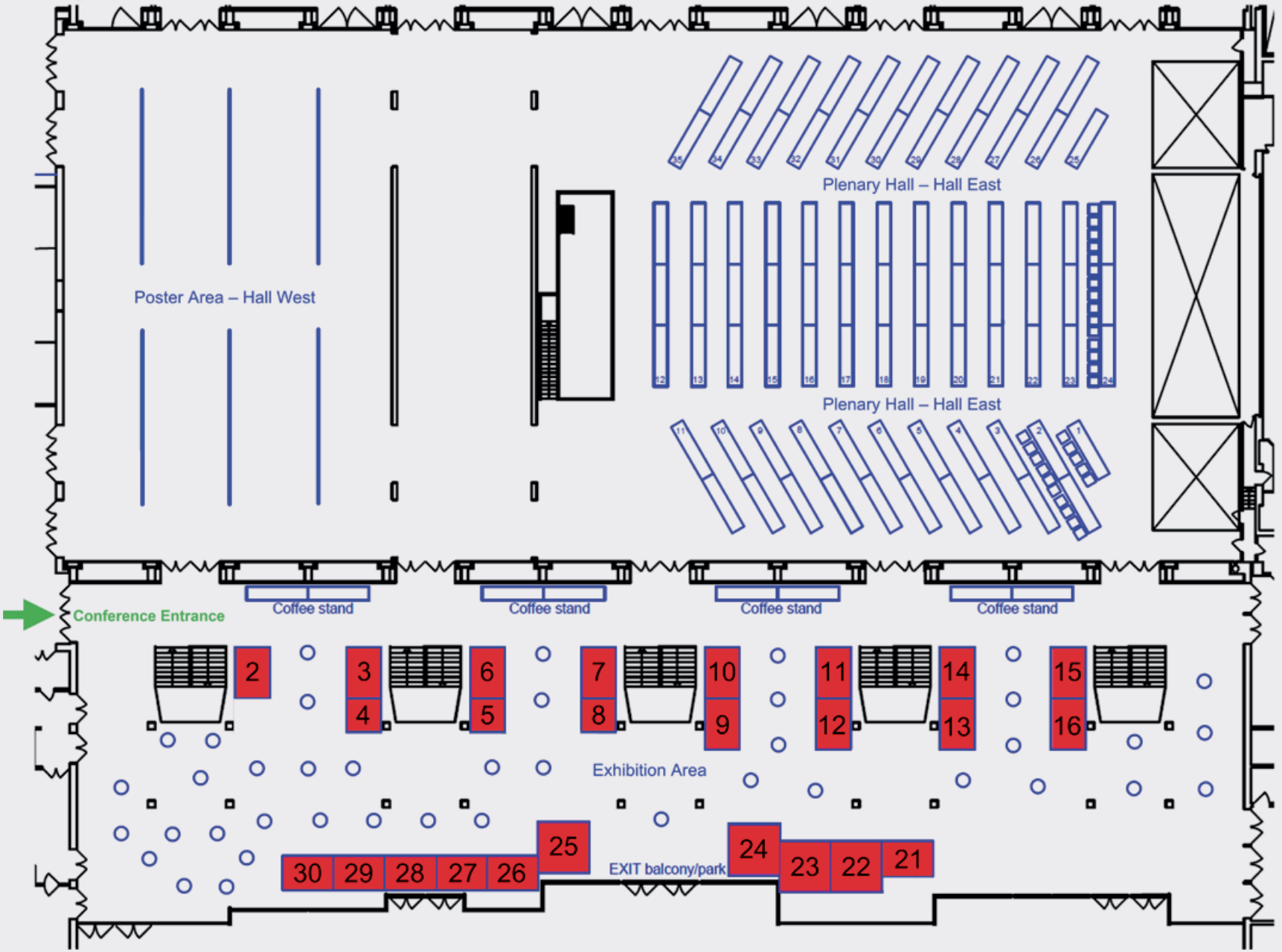

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2. ZURICH INSTRUMENTS
3. ALLIED
4. HITACHI
5. NANOELEC
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28. Nordson SONOSCAN
29. METRONIC ApS
30. ZEISS

EXHIBITORS

ZURICH INSTRUMENTS AG

Booth number: 2

Zurich Instruments is a test and measurement company based in Zurich, Switzerland, developing and selling measurement instruments and delivering customer support in key markets around the world, either directly or with carefully selected partners. Our core offering includes lock-in amplifiers, phase-locked loops, arbitrary waveform generator, impedance analysers, digitisers and boxcar averagers.
We believe that system integration is good. We believe that system integration leads to significant time savings, reduced lab setup complexity, efficient workflows and reliable, accurate measurements.

ALLIED HIGH TECH PRODUCTS INC.

Booth number: 3

For over 35 years, Allied High Tech Products has provided quality products for metallographic sample preparation and analysis. Allied manufactures a state-of-the-art precision milling machine, sectioning saws, and grinding/polishing systems.

HITACHI POWER SOLUTIONS CO., LTD.

Booth number: 4

Hitachi Power Solutions develops and provides our original Scanning Acoustic Tomographs and their transducers. Our product lineup consists of FineSAT series, FS-Line series, Wafer-Line and ES-5100. The FineSAT series can be utilized for non-destructive testing of a wide variety of electronic devices and materials not only in laboratories but also in mass-production lines. FS-Line series are optimum for large-scale mechanical parts and materials such as sputtering targets. The Wafer-Line is an automated system for bonded Si wafers. ES-5100 can realise extremely high-speed testing in combination with phased array transducers. We can also provide optimum transducers from our wide variety of transducers to customer's samples.

PLATFORM FOR ADVANCED CHARACTERISATION – GRENOBLE (PAC-G) AND SERMA TECHNOLOGIES

Booth number: 5

In Grenoble SERMA TECHNOLOGIES and the Platform for Advanced Characterisation-Grenoble (PAC-G) provide consulting and commercial material characterisation services, dedicated to micro and nano-electronics.

KLEINDIEK NANOTECHNIK GMHH

Booth number: 6

Kleindiek Nanotechnik provides ultra compact nanoprobing and failure analysis solutions for light microscopy, SEM, and/or FIB/SEM. The ProbeWorkstation, consisting of a Prober Shuttle as well as as a suite of Advanced Probing Tools, provides a turn-key solution for a host of fault isolation tasks. The Prober Shuttle can be introduced into the SEM or FIB/SEM chamber via the load lock improving chamber cleanliness, ease of use, and reducing time-to-result. A guided workflow assists the operator in landing probe tips on any technology node - even as low as 7 nm and beyond. Once the probe tips are in contact with the sample, the system's excellent stability allows for stable, long-duration measurements without the need for probe position adjustments.

TEPLA GMHH

Booth number: 7

PVA TePla Analytical Systems designs and manufactures state of the art Scanning Acoustic Microscopes. The company is owned by PVA TePla AG, a leading supplier of crystal growing systems for the semiconductor industry and photovoltaic applications. Technological developments have focused on the detection of structural defects and materials characterisation within opaque materials. Scanning Acoustic Microscope (SAM) utilizes ultrasound to non-destructively examine surfaces and internal structures of a solid sample. Voids, inclusions, cracks and even density variations are all defects sensitive to the technique of acoustic microscopy. During the last 10 years our company has introduced fully automated inline inspection SAMs for Si quality control, bonding inspection of MEMS, wafers and 3D integration products. PVA TePla operates an international sales and service network with own application laboratories in the US, Japan, Singapore and Malaysia. We cooperate with a large number of university facilities. Analytical Systems GmbH participates in a large number of funding projects and takes an active part in research and development in respect of ultrasound methodology and transducer development.

Our company is well known for its qualified personnel, high quality, short reaction times, customised solutions and years of experience. Our application engineers offer the most qualified know-how resource of SAM.

MITSUBISHI ELECTRIC

Booth number: 8

Mitsubishi Electric offers a variety of semiconductor and electronic devices that are contributing to the advancement of information processing and telecommunications. The company develops and manufactures power devices that provide higher operation stability and efficiency, next-generation optical devices that support today's rapidly evolving optical telecommunications networks, high-frequency devices that are utilized in everything from mobile telephones to telecommunications satellites and leading-edge TFT-LCD modules for industrial use.

HAMAMATSU PHOTONICS DEUTSCHLAND GMBH

Booth number: 9

Hamamatsu Photonics is a worldwide leading manufacturer of opto-electronic components and systems. Our extensive range of products includes sensors and systems for spectroscopy (including ultra fast), scientific-grade cameras, beam monitoring solutions, photon counting detectors and systems, photomultipliers, photodiodes, IR detectors. Our key products for ESREF are: Systems for failure localisation on integrated circuits based on emission microscopy (EMMI), laser-based techniques (OBIRCH, OBIC, SDL, EOP) and lock-in thermography techniques (LIT).

SECTOR TECHNOLOGIES

Booth number: 10

SECTOR TECHNOLOGIES is a distributor Company for high-tech products within the European Semiconductor Industry . Our focus is mainly the distribution of failure analysis high-end equipment.

The acceleration of new technology introduction requires new tools for design debug, yield enhancement and customer return. Time to market is key for success and the failure analysis lab is one of the very important bricks of that process. Tools and products must be adapted to the technology challenges but methodology and knowledge are key to the results; this is why we like to say that we provide solutions to our customers.
Tools for complex packages failure analysis has become a must, specifically for non-destructive analysis.
Lock-in Thermography (Elite), EMMI and laser scanning microscopy application (Meridian family) and nanoprobing (nProber III, Flexprober, Hyperion) from ThermoFisher ; 3D Xray CT (Zeiss Xradia Versa products) ;Terahertz TDR (EOTPR 2000 from Teraview) are products specifically targeted for process development, yield improvement , failure analysis for complex electronics components.

Samples preparation and backside silicon thinning has also become a significant challenge; varioMill from Varioscale allows outstanding automated backside preparation on single die but also on stacked dies assembly.
We also have new products to present in the test and debug area (Mutest, Teseda, Focused Test), test analysis software (GAT), probing station (SEMICS).

Our latest partner Nanotronics offers Automated Optical Inspection system for quality and metrology labs, Wafer inspection and Package line inspection.

PREDICTIVE IMAGE

Booth number: 11

Predictive Image is a specialised lab in acoustic microscopy, 2D X-Ray radiography and 3D X-Ray tomography. Our team of experts carries out analyses, always striving for Excellence and Quality. Our experience and know-how in NDT (Non Destructive Testing) can support all customers who value Quality as a strategic development goal. In conjunction with the lab activities, PI is the Distributor of Insight KK's scanning acoustic microscopes in Europe, as well as training provider for both technics: ultrasound and X-Ray.

MASER ENGINEERING B.V.

Booth number: 12

MASER Engineering is an independent engineering service provider for reliability test and failure analysis of micro-electronic components and systems. We offer advanced facilities for Integrated Device Manufacturers, Fabless and Lableess IC manufacturers as well as the Original Equipment Manufacturing companies in our main lab in Enschede, The Netherlands.

ATTOLIGTH AG

Booth number: 13

We build fast, high resolution, technology-enabling defect inspection tools, based on quantitative cathodoluminescence: a unique combination of electron and optical microscopy. Transition from fast, large scale characterisation, to nanometer scale inspection is seamless within the same device.

PARK SYSTEMS EUROPE GMBH

Booth number: 14

Playing a critical role in the development of AFM technology, Park Systems has remained the leading innovator in nanoscale microscopy and metrology throughout its 25-year-history and continues to invest in the development of new emerging technologies. We offer a complete range of products for researchers and industry engineers in chemistry, materials, physics, life sciences, and semiconductor and data storage industries. Our comprehensive line of AFMs, with revolutionary features like True Non-Contact™ mode, offers users unparalleled accuracy and ease of use. Our tools are trusted to deliver ultra-high resolution with extremely precise measurements quickly and easily.

IMINA TECHNOLOGIES SA

Booth number: 15

Imina Technologies SA design manufacture and distribute complete lines of robotics solutions for electron and light microscopes. Using a novel mobile motion technology, our robots for microscopes combine nanometer resolution of positioning, unprecedented ease-of-use and flexibility. Their ultra-compact design provides high stability ensuring steady pose over long measurement sequence while preventing sample damages. Our robots can be easily integrated onto optics based investigation tools or inside an SEM for micro- or nano-probing investigations. Overall, this enables FA Engineers to quickly gather data to understand the failure cause.

TESCAN

Booth number: 16

TESCAN ORSAY HOLDING is a multi-national company established by the merger of the Czech company TESCAN, a leading global developer and supplier of scanning electron microscopes (SEMs) and focused ion beam (FIB) workstations, and the French company ORSAY PHYSICS, a world leader in customised Focused Ion Beam and Electron Beam technology.

The TESCAN brand has within 25 years of existence built a formidable reputation for designing and manufacturing scanning electron microscopes and system solutions for micro and nanotechnology and related applications. TESCAN's products consist of a series of tailored systems especially designed for fulfilling the needs arising from all fields of science and technology such as materials science, life sciences, forensic sciences, mineralogy and the semiconductor industry. Over 2500 SEMs installed in more than 80 countries bear testament to TESCAN's first-class quality, proven technology and excellence. TESCAN's portfolio includes thermionic emission systems, field emission SEM and FIB-SEM systems, correlative microscopy and multimodal holographic microscopes. TESCAN also focuses on developing special tools and detectors for diverse analytical purposes in a wide range of disciplines.

The continuous involvement of TESCAN in top research projects has resulted in great scientific and technical achievements, and the growth of the whole holding still continues. This year, the new generation of TESCAN microscopes was introduced.

OPSENS

Booth number: 21

Opsens Solutions design and manufacture fiber optic sensors to monitor the temperature inside IGBT and power modules. Immune to electromagnetic and radiofrequency interferences, these non-invasive sensors provide a very fast response time, and are specifically designed for ageing simulation, thermal stress analysis & modelling assessment, and permanent temperature monitoring during service.

FRAUNHOFER IMWS AND FRAUNHOFER IZM

Booth number: 22

Fraunhofer IMWS-CAM is a leading service provider of failure diagnostics and material assessment for industry including semiconductor technologies, microelectronic components, microsystems and nanostructured materials. We consider the entire workflow from non-destructive defect localisation over high precision target preparation to cutting-edge nanoanalytics supplemented by micro-mechanical testing, finite element modelling and numerical simulation. Our goal is to support cooperation partners in introducing innovative materials and technologies, improving manufacturing process steps, securing reliable field use of components, analysing field returns, and consequently optimising manufacturing yield, product quality, reliability, and cost efficiency. In addition, we are collaborating with suppliers of microstructure diagnostics and material testing equipment in developing innovative failure analysis methods and instrumentation, problem-adapted workflows for quality and reliability control, and new industry-compatible applications for future markets.

Fraunhofer IZM specialises in industry-oriented applied research. Fraunhofer IZM develops assembly and interconnection technology, also known as electronic packaging. Almost invisible and undervalued by many, electronic packaging is at the heart of every electronic application. Our technologies connect the individual components, protect components and devices from vibration and moisture, and reliably dissipate heat. Fraunhofer IZM thus ensures that electronic devices continue to function reliably in even the harshest conditions. Modern packaging technologies make developing smaller and smaller products possible. We process ICs thinner than a sheet of paper. The institute, founded in 1993, has a staff of more than 300 and disposes of a lab area of more than 8,000 sqm. More than 80 percent of our turnover in 2017 was earned through contract research.

OMNI TECHNOLOGIES

Booth number: 23

Featuring the LatticeGear scribing and cleaving range for substrate downsizing and sample preparation for Failure Analysis, together with the Alpha Plasma range of microwave plasma products for resist ashing, descum, surface activation and dencapsulation. Omni also provides a wide range of other thin film deposition and etching technology including atomic layer deposition, sputtering, plasma etching, PECVD, ion beam etch & deposition, together with mask & wafer cleaning systems, process gas analysers, magnetrons and sputter controllers. Omni & EM Analytical also provide an open access service at Alderley Park, Manchester, UK where customers can use some the above equipment as well as advanced imaging and characterisation service under the guidance of our experienced engineers.

KUMMER SEMICONDUCTOR LIMITED

Booth number: 24

The John P. Kummer Group has served as a specialist distributor of instruments, used in the manufacturing of semiconductors, for several decades. Taking advantage of our long established relationships within the worldwide Industry, we bring the newest and most technologically advanced products to the European Microelectronics Community. The focus of John P. Kummer Group combines equipment for failure analysis, reliability testing and process tools as well as specialty adhesives for use in advanced technology applications. The fields of product applications are various as semiconductor, hybrids microelectronics, circuit/electronic assembly, medical devices and optical materials.

DIGIT CONCEPT

Booth number: 25

Worldwide leader in IC DECAPSULATION equipment's, over 25 years of experience, we provide the right tool and recipe for full or part Decapsulation, Bonding cut, Cross Sectioning, by ACID, LASER, PLASMA, MECHANICAL with Artifact Free

- SESAMEACID™ - New ISA777 for ESREF2018
- SESAMELASER™ - New DeCap Software for ESREF2018
- SESAMELASER™ - New SL_MicroMachining before FIB for ESREF2018
- SESAMEMECHANICAL™
- SESAMEPLASMA™ - New ICE_MIP for ESREF2018
- SESAMETHERMAL™
- iPanel ™

SMARACT GMHH

Booth number: 26

We at SmarAct develop, produce and distribute piezo-based high-performance micro- and nanopositioners, advanced control systems and micro-tools. Furthermore, we manufacture complete miniaturized manipulation systems, ranging from single linear axes and rotary positioners to XY tables and compact 6D manipulators to multi-manipulator systems. Our microscopy products, which can be applied in normal pressure as well as in vacuum conditions, are used in a wide range of industries. Our customers benefit from our over 10 years of experience in several scientific fields. This, accompanied by the entire value-added chain of development, production, distribution and a professional service, enables us to react fast to almost any of your demands, when it comes to customisation and complexity.

MSSCORPS CO., LTD.

Booth number: 27

Located in Hsinchu, Taiwan and founded in 2005, MSSCORPS CO., LTD. is a service lab providing material analysis, failure analysis, and FIB circuit repair/editing. As a qualified lab, we have received three certifications, ISO 9001, ISO IEC 17025, and ISO 27001:2013. With continuous investment of new cutting-edge analytic facilities, our high quality service can meet our customers' expectation. MSSCORPS is not just solving customers' problems but is also their reliable and best R&D partner. Our services include TEM, EDS, EELS, FIB, FIB circuit repair/editing, SEM, EMMI, InGaAs, OBIRCH, AFM, C-AFM, nanoprobe, CP, X-RAY, and Decapsulation. Please visit our web page or contact us directly for more information.

NORDSON SONOSCAN

Booth number: 28

Nordson SONSOCAN®, Inc. is a worldwide leader and innovator in Acoustic Micro Imaging (AMI) technology. We manufacture acoustic microscope instruments and automated inspection equipment to nondestructively inspect and analyse products. Our C-SAM® scanning acoustic microscope provides unmatched accuracy and robustness setting the standard in AMI for the inspection of products for hidden internal defects such as poor bonding, delaminations between layers, cracks and voids. In addition, we offer analytical services through regional testing laboratories in Asia, Europe and the U.S. and educational workshops for beginners to advance users on AMI technology.

METRONIC APS

Booth number: 29

Metronic ApS is a leading provider of test and measurement equipment in Denmark. Metronic represents the best brands in this area, including:

- Teledyne LeCroy: Produces high quality oscilloscopes, for example. 8 channel 12 bit oscilloscopes with very high aqusition memory. Teledyne LeCroy is the only manufacturer that offers 12 bit oscilloscopes with 20GS/s and 5Giga memory. Teledyne LeCroy also manufactures a wide range of current probes and differential probes. For example, high voltage fiber probe with common mode voltage up to 35kV (fiber optic isolation) and CMMR on 140dB.
- Yokogawa: Produces the world's most accurate powermeter. We offer power meters from 1 channel and up to 6 channels. With a basic accuracy of 0.01%, Yokogawa power meter is the best choice for compliance test. With engine option, speed and torque can also be measured. This allows the efficiency of a motor to be measured very accurately.
- Optris: Is a German manufacturer of infrared pyrometers and thermocameras. With replaceable lenses, thermocameras can be used for many different measurement tasks. For example, microscope optics where it can be measured with a 28um optical resolution. Microscope optics are especially suitable for measuring on print and components to see the heat development. With "hot spot" function, the warmest point can be pinpointed. This is an indispensable tool in the design phase of products/printboards.

ZEISS

Booth number: 30

ZEISS has the most comprehensive portfolio of light, x-ray, electron beam and ion beam imaging technologies in the industry and is a leading solution provider to the global semiconductor community. Solutions span semiconductor manufacturing from wafer fab through packaging and assembly. For mask making and lithography, ZEISS provides unique solutions in the areas of zero defect, in-die metrology, critical dimension/registration and overlay control. ZEISS innovative process control and failure analysis solutions deliver actionable information to both wafer fab and packaging/assembly processes to meet the semiconductor industry's challenges for next-generation devices.


Pumps use
at least 10%
of the world's total electricity.
We can reduce almost half of that
with energy-efficient pumps.
be
think
innovate
GRUNDFOS

Celebrating 50 years of passion for drives

Wilson - A Danfoss employee

At Danfoss Drives, our passion is to develop some of the most versatile AC drives in the world. For 50 years, we've be a pioneer in the AC-drives business, working together with you, our partners, to innovate the technology that tackles today's issues. Your challenges drive us forwards, and motivate us to continue to fight for a cleaner future and to ensure you succeed.

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#danfossdrives50

ENGINEERING TOMORROW

Danfoss

DKDDPA489A102

1 Aalborg Congress & Culture Centre
Europa Plads 4
akkc@akkc.dk, +45 9935 5555

2 Studenterhuset - The Student House

3 Aalborg Bus Terminal

4 Aalborg Train Station

5 Tourist information, VisitAalborg

6 Aalborg Airport (5 km)

7 Voergaard Castle (41 km)

8 Scandic Aalborg City
Europa Plads 1

9 Comwell Hvide Hus Aalborg
Vesterbro 2

10 Hotel Gestus
Vesterbro 36

11 CABINN Aalborg
Fjordgade 20

12 Kunsten Museum of Modern Art Aalborg
Mon: Closed, Tue: 10am - 5pm, Wed: 10am - 9pm,
Thu-Sun: 10am - 5pm
Admission: DKK 110 (adult)/ DKK 60 (student)

13 Utzon Centre
Mon: 10am -5pm, Tue-Fri: 10am - 5pm (Thu until 9pm),
Sat-Sun: 10am - 5pm
Admission: DKK 60 (adult)/ DKK 40 (student)

14 Gråbrødrekloster Museum
The Franciscan Monastery Museum
Tue-Sat: 10am – 5pm
Admission by self-service via the lift tower by the department store "Salling" in Algade.
Lift down will be closed at 4:30pm. You can drive up until 5pm. Admission: DKK 40 per lift (coins only)

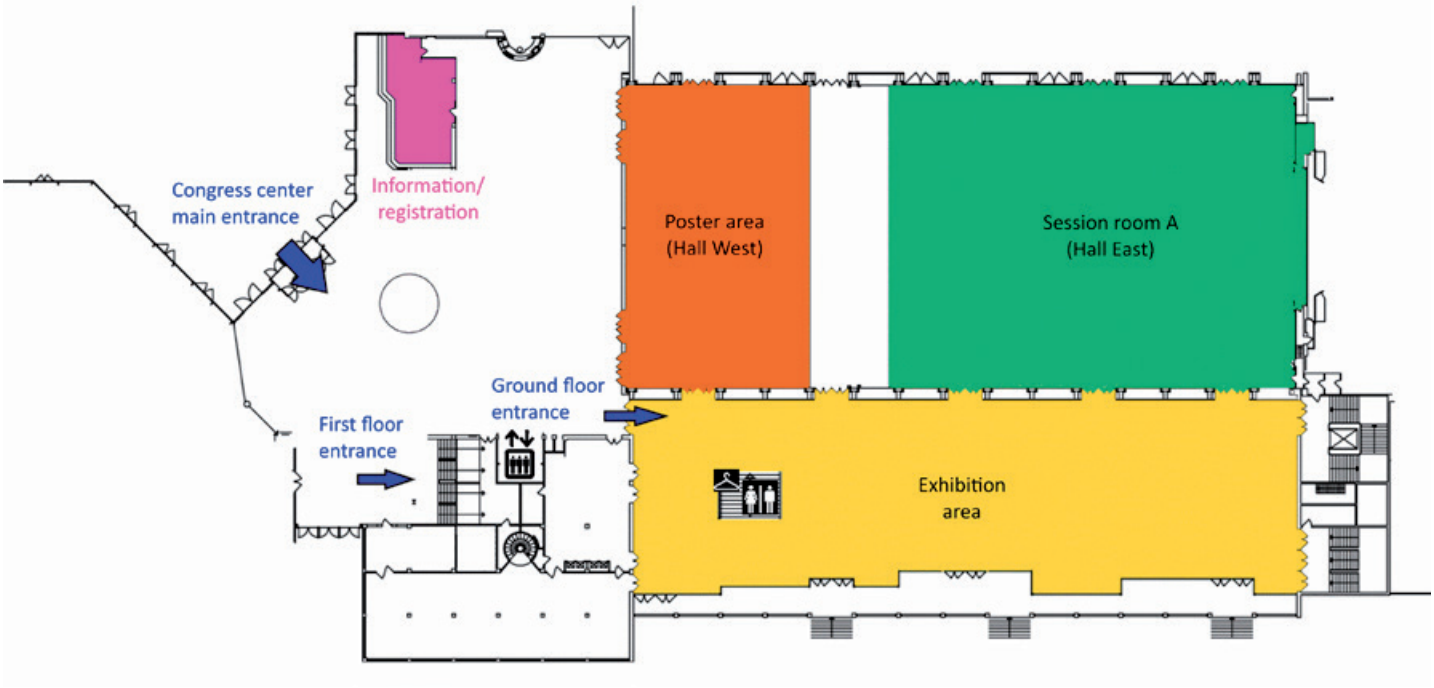
15 Aalborg Historical Museum
Tue-Sat: 10am – 5pm
Admission: DKK 40 (adult)/ DKK 30 (student)

16 Musikkens Hus - House of Music
All days 10am – 10pm. Free admission

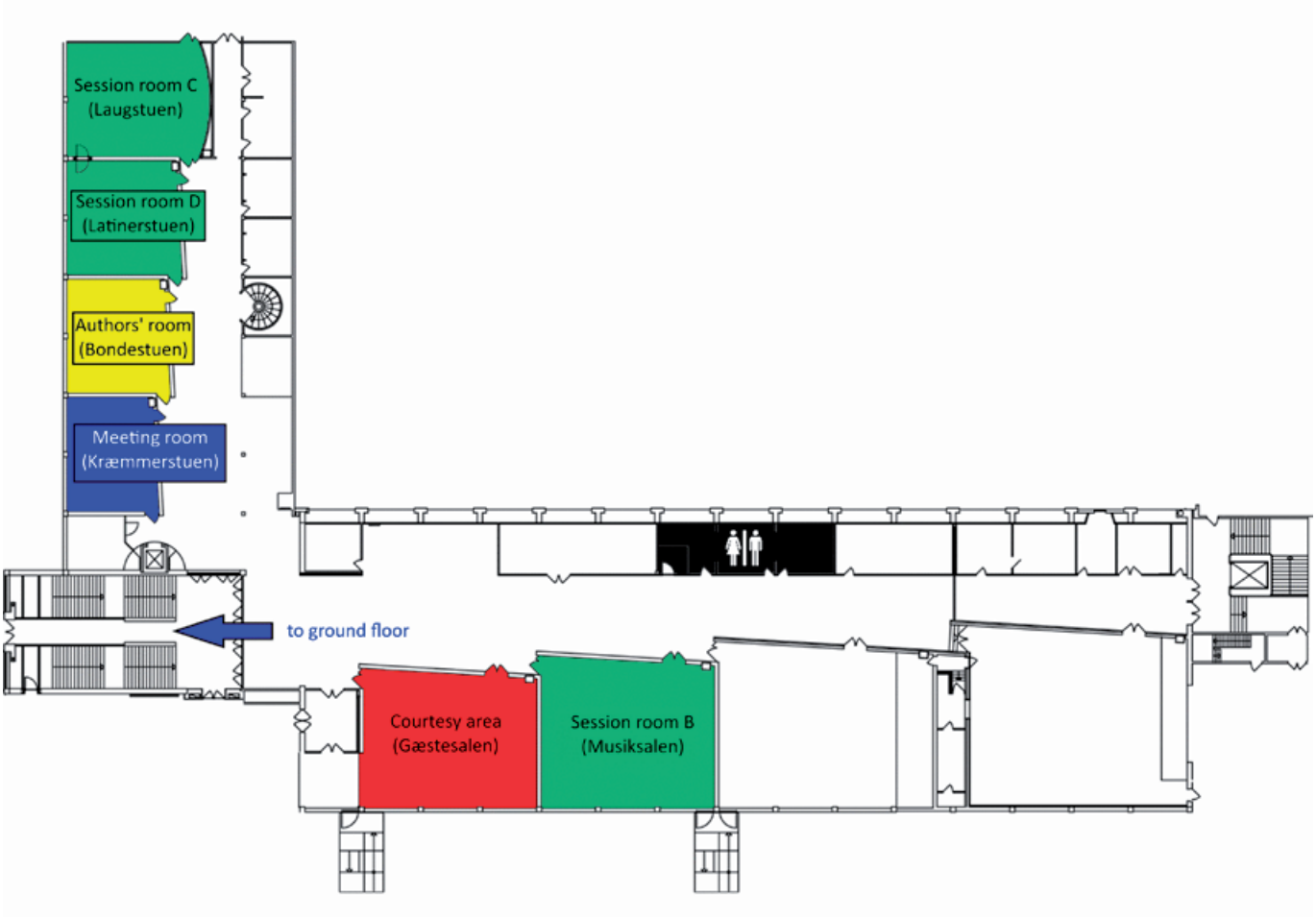
17 Kunsthal NORD
Tue-Fri: 11am - 5pm, Sat-Sun: 11am - 4pm.
Free admission

AKKC FLOOR PLAN

GROUND FLOOR



FIRST FLOOR



NOTES

1st CALL FOR PAPERS

ESREF 2019, the 30th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis, will take place in Toulouse (France) from 23th to 26th September 2019 at *Centre de Congrès Pierre Baudis*.

This international symposium continues to focus on recent developments and future directions in Quality and Reliability Management of materials, devices and circuits for micro-, nano-, and optoelectronics. It provides a European forum for developing all aspects of reliability management and innovative analysis techniques for present and future electronic applications.

A word from the conference chairs

ESREF 2019 will be held in Toulouse - world center for aeronautics with Airbus assembly line, European capital of the space industry and leader in France for embedded electronic systems. Toulouse, called "Ville rose" (Pink city) for its characteristic architecture based on terra cotta bricks, combines a strong living spirit with a brilliant past. It is the third French university with more than 100,000 students and 147 laboratories. It is definitely turned towards the future with a large number of cutting-edge businesses in aeronautics, information technologies and spatial industries, as well as many research institutes. Hosting ESREF 2019 in this rich environment is a great opportunity since reliability in these particular applications is a very hot topic with strong challenges such as zero ppm failure and harsh environments. For this 30th edition, in addition to the core topics of the conference, we would like to involve the major actors of aeronautics, space and embedded systems industry to provide specific topics such as radiation hardening, very long-term reliability, high/low temperature challenges, obsolescence and counterfeit issues, wide bandgap power devices for the more electric aircraft and other embedded system applications. A special session for Nanosatellite reliability is proposed. In the continuity of previous conferences, ESREF 2019 is also hosting several workshops and welcomes new ones related to these specific topics.

We are looking forward to welcoming you for a memorable experience!

Nicolas NOLHIER — ESREF 2019 Chair
Guillaume BASCOUL — ESREF 2019 Vice-Chair

Technical Program Chair: Fabrice CAIGNET, Hélène FREMONT, Nathalie LABAT, François MARC

SCOPE OF PAPERS

Papers are requested on the following topics:

Quality and Reliability assessment techniques and methods for Devices and Systems
Physical Modeling and Simulation for Reliability Prediction
Advanced Failure Analysis: Defect Detection and Analysis
Failure Mechanisms in New Materials and Transistors
Failure analysis and Reliability of Advanced and Nanoscale electronics
Focused Ion Beam (EFUG)
Power Devices Reliability and Failure Analysis
Packaging and Assembly Reliability and Failure Analysis
Space, Aeronautic and embedded systems

***Special session*: Nanosatellite Reliability**

Tutorials by experts will provide review presentation of relevant topics and **Invited papers** will introduce the mainstream topics.

Workshops organized in correlation with the ESREF conference will give the opportunity to exchange the know-how and field returns on specific topics. For further information concerning the Scientific Program, please contact: **esref2019-event@sciencesconf.org**

Exhibition - The Symposium will feature the latest in service providers, equipment manufacturers and suppliers in these fields. You can enjoy early signups (Fall 2018) and early bird (up to June 2019) discounts. For further information concerning the equipment exhibition, please contact: **esref2019-expo@sciencesconf.org**

Sponsor the event and get advantages of sponsor packages (platinum, gold and silver). Combine sponsorship with early sign up at exhibition and get impressive discounts and advantages. For further information concerning the sponsoring, please contact: **esref2019-sponsor@sciencesconf.org**

DEADLINES

11 March 2019 — **Submission of four-page extended summary to be uploaded at: http://esref2019.sciencesconf.org**
29 April 2019 — **Notification of acceptance**
20 May 2019 — **Submission of extended paper**

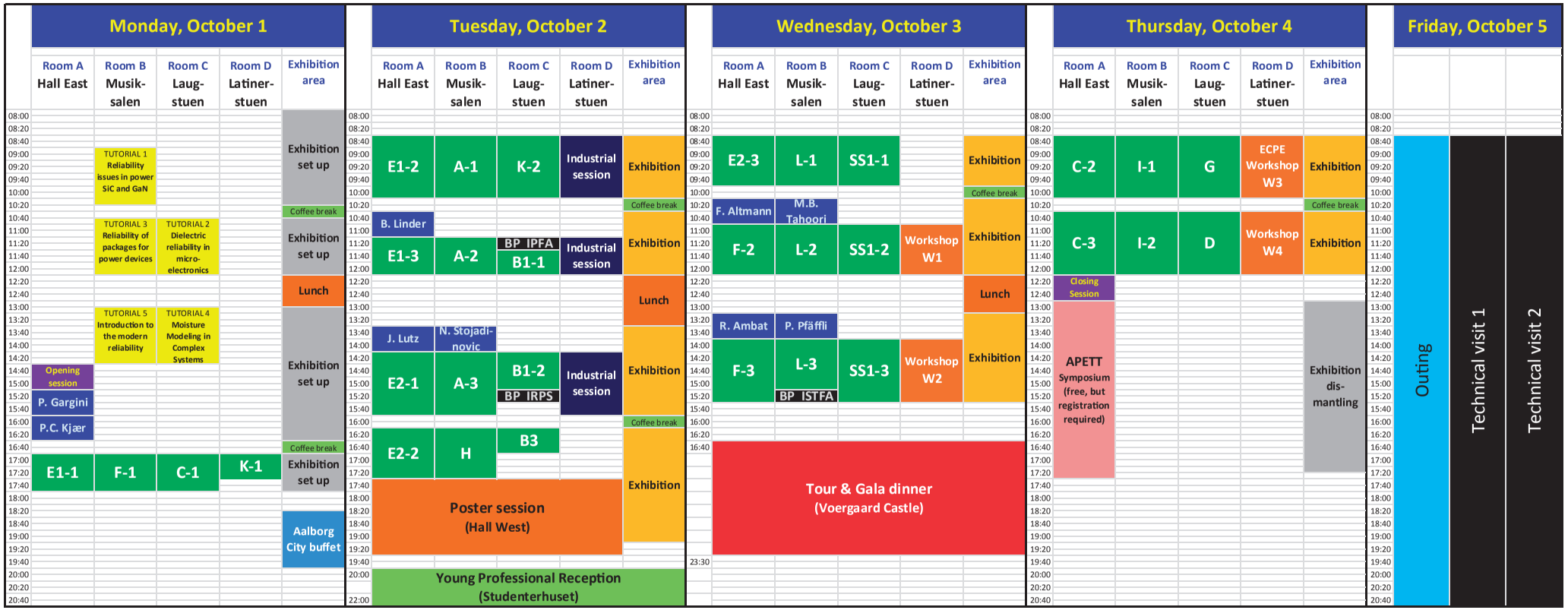
Elsevier Ltd will publish the ESREF 2019 proceedings as a special issue of the Microelectronics Reliability journal.

10 June 2019 — **Upload of final paper to the online Elsevier Editorial System (EES)**

organized by:

Conference Website : **http://esref2019.sciencesconf.org** */ Contact :* **esref2019@sciencesconf.org**

ESREF 2018: Schedule at a glance



Tracks

A - Quality and Reliability Assessment Techniques and Methods for Devices and Systems
B1 - Si-Technologies & Nanoelectronics: Hot Carriers, High-K, Gate Materials
B2 - Si-Technologies & Nanoelectronics: Low-K, Cu Interconnects
B3 - Si-Technologies & Nanoelectronics: ESD, EMI and Latch-up
C - Progress in Failure Analysis: Defect Detection and Analysis
D - Reliability of Microwave and Compound Semiconductors Devices
E1 - Power Devices Reliability - Silicon and Passive
F - Packaging and Assembly Reliability
G - MEMS, Sensors and Organic Electronics Reliability
H - Photonics Reliability
I - Extreme Environments and Radiation
K - Renewable Energies Reliability
L - Modeling for Reliability
SS1- Reliability in Traction Applications