

## Registration (Fax Reply)

To: ECPE e.V.  
Att.: Ingrid Bollens

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Register before **10 June 2010**

### Participation fee:

- €530,- \* for industry
  - €395,- \* for universities/institutes
  - €120,- \* for students (shortened seminar package)
- The fee includes dinner, lunch, coffee/soft drinks and a CD with the workshop presentations. A printed version of the workshop handout is available on request (€42,- \*).

With the confirmation of seminar registration you will receive the invoice. (\* plus 19 % VAT)  
In case of cancellation after 10 June 2010 or non-attendance 50 % of the participation fee are payable.

Three participants from each ECPE member company free of charge. Allocation in sequence of registration.

Sender:

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title, given name, name

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company, department

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full address

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phone, fax

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e-mail

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date, signature

## Organizational information

Organizer: ECPE e.V.  
90443 Nuremberg, Germany  
www.ecpe.org

Chairs of seminar: Dr. Martin Rittner  
Robert Bosch GmbH  
Dipl.-Phys. Thomas Harder  
ECPE e.V.

Organization: Ingrid Bollens, ECPE e.V.  
+49 (0)911 / 81 02 88 – 10  
ingrid.bollens@ecpe.org

Place of seminar: Holiday Inn Munich City Centre  
Hochstrasse 3  
81669 Munich, Germany



Further information (hotel list and maps) will be provided after registration.



**ECPE European Center for  
Power Electronics e.V.**

## ECPE Workshop

# Power Electronics Substrates - Materials, Performance, Processing and Reliability

**17 - 18 June 2010  
Holiday Inn Munich City Centre  
Munich, Germany**

in cooperation with



## Introduction

# ECPE Workshop Power Electronics Substrates - Materials, Performance, Processing and Reliability

17 - 18 June 2010  
Munich, Germany

Substrates are key components in power electronics assemblies as they have to provide multiple functions as mechanical carrier as well as for electrical interconnection enabling high currents, electrical insulation providing high breakdown voltages and high thermal conductivity to remove the dissipated heat. Even with the ultra-high efficiencies of today's power electronic systems, the losses are considerable and must be transferred via a heat sink to the ambient. And a higher level of integration with increasing power densities is leading to higher operation temperatures up to 200°C in some applications.

The choice of a substrate material and technology is defining the reliability of a power electronic system due to the thermo-mechanical properties under thermal cycling load.

Apart from the substrate performance, costs is of course an issue for the choice of the right substrate in a specific application. Starting from state of the art Direct Bonded Copper substrates, alternative materials and technologies for ceramic based substrates, insulated metal substrates, PCB based solutions and new approaches using sprayed metal and insulation layers will be presented and discussed.

Furthermore, the process compatibility e.g. regarding soldering, sintering and wire bonding will be discussed together with basic failure modes and reliability aspects.

The workshop is chaired by Dr. M. Rittner (Robert Bosch) together with T. Harder and J. Koszescha (ECPE). All presentations and discussions will be in English.

**There will be a tabletop exhibition in the frame of the workshop.**

## Programme

Thursday, 17 June 2010

- 9:45 **Start of Registration**  
10:15 **Welcome, Opening**  
T. Harder, ECPE e.V.  
M. Rittner, Robert Bosch

### Introduction

- 10:30 **Overview of Power Electronics Substrates and Requirements of Automotive and Industrial Applications**  
M. Rittner, Robert Bosch

### Ceramic based Substrates

- 11:00 **Direct Bonded Copper (DBC) Substrates: Status & Potential**  
K. Exel / A. Meyer, Curamik
- 11:30 **Direct Aluminium Bonded (DAB) Substrates**  
H. Knoll, IXYS Semiconductor
- 12:00 Discussion
- 12:15 *Lunch*
- 13:15 **ALMIC: DAB Substrates for Automotive and High-rely Applications**  
J. Nakamura, Dowa Power Device
- 13:45 **Si<sub>3</sub>N<sub>4</sub> AMB Substrates for Power Electronics**  
M. Nagata / C. Yoneda, Kyocera
- 14:15 Case Study: **Development of Si<sub>3</sub>N<sub>4</sub> based Substrates**  
I. Sichert, ANCeram
- 14:35 **Benchmark: Performance & Reliability of Ceramic based Substrates**  
A. Roth, Fraunhofer IISB, Erlangen
- 15:05 Discussion

15:20 *Coffee Break*

### Insulated Metal Substrates (IMS)

- 15:50 **IMS with Polymer Insulation**  
M. Stoll, Bergquist
- 16:20 **IMS with anorganic Insulation (Anotherm)**  
R. Pierzina, Hauber & Graf Electronics
- 16:50 **PCB with Copper Inlays / Combi-Board**  
T. Gottwald, Schweizer Electronic
- 17:20 Discussion
- 17:35 **End of 1<sup>st</sup> Day**
- 19:30 Dinner at Restaurant "Am Chinesischen Turm"  
Englischer Garten 3, 80538 Munich

## Programme

Friday, 18 June 2010

### Polymer based Substrates (PCB type)

- 8:30 **Highly reliable inorganic Passivation for Power Application**  
J. Leib, MSG Lithoglas
- 9:00 **Massive Copper Conductors & Iceberg Technology**  
C. Lehnberger, Andus Electronic
- 9:30 Case Study: **Soldering Process Compatibility I**  
R. Horn, SEHO Systems
- 9:50 Case Study: **Soldering Process Compatibility II**  
M. Poech, Fraunhofer ISIT, Itzehoe
- 10:10 Discussion

10:25 *Coffee Break*

### Advanced Substrate Technologies

- 10:50 Case Study: **Insulated Molded Leadframe (IML)**  
P. Dubus, Valeo
- 11:10 Case Study: **Substrate Free Molded Power Module**  
F. Osterwald, Danfoss Silicon Power
- 11:30 Case Study: **Cold Gas Spraying (CGS) Metallization based Ceramics Substrates**  
J. Wilde, University of Freiburg/IMTEK
- 11:50 Case Study: **Advanced Surface Finishes for DCB in Power Applications**  
S. Schmitz, Fraunhofer IZM, Berlin
- 12:10 Discussion

12:25 *Lunch*

### Failure Modes and Reliability

- 13:30 **Thermo-mechanics & Failure Modes**  
M. Poech, Fraunhofer ISIT, Itzehoe
- 14:00 **Conductive Anodic Filament Growth (CAF)**  
M. Mayr, Isola
- 14:30 **Partial Discharge on Ceramic and Polymer based Substrates**  
N. Wang, University of Manchester
- 15:00 **Optimization of Thermal Design for PCB Traces**  
L. Coppola, ABB Corporate Research
- 15:30 Wrap up, Final discussion
- 16:00 End of Workshop