Registration (Fax Reply)

To: ECPE e.V.
Att.: Ingrid Bollens
Fax: +49 (0)911 / 81 02 88 – 28

Register before **12 November 2008**

Participation fee:

Adv. Cooling 20 Nov. 2008	Power PCB 21 Nov. 2008	Both Work-shop Days	
¨ 350.00 €	¨ 350.00 €	¨ 590.00 €	Industry
¨ 260.00 €	¨ 260.00 €	¨ 440.00 €	University
¨ 80.00 €	¨ 80.00 €	¨ 140.00 €	Students

With the confirmation of registration you will receive the invoice.
In case of cancellation after 12 November 2008 or non-attendance 50 % of the participation fee is payable.

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

Sender:

_____
title, given name, name

_____
company, department

_____
full address

_____
phone, fax

_____
e-mail

_____
date, signature

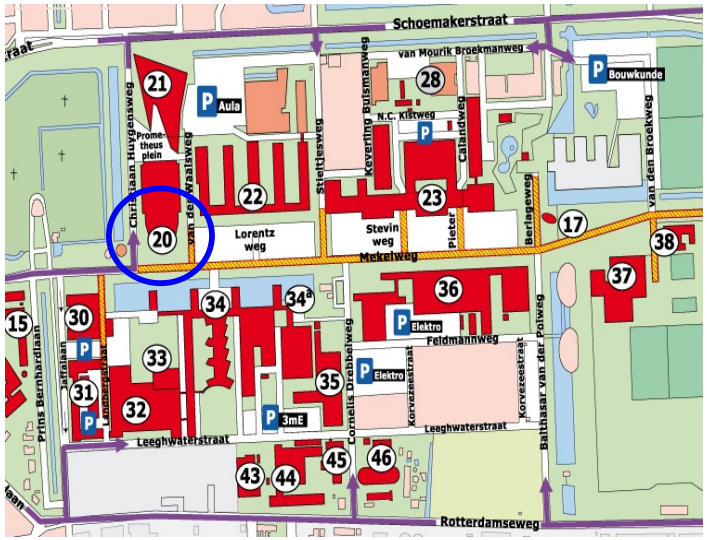
Organisational information

Organiser: ECPE e.V.
90443 Nürnberg, Germany
www.ecpe.org

Chairmen: Prof. E. Wolfgang, ECPE
Prof. J.A. Ferreira, TU Delft
T. Harder, ECPE

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

Place of workshop: Delft University of Technology
Congress Centre, Senatszaal
Mekelweg 5
NL-2628 CC Delft



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

Draft Programme

ECPE European Center for Power Electronics e.V.

Workshops

Advanced Cooling
20 November 2008

Power PCBs & Busbars
21 November 2008

Delft University of Technology
Delft, The Netherlands

in cooperation with

EUROPEAN POWER ELECTRONICS AND DRIVES

TU Delft
Delft University of Technology

Advanced Cooling

Thursday, 20 November 2008

Thermal management and reliability are, besides the costs, the most challenging issues in power electronics. Depending on the application, certain types of cooling are permitted which reach from natural convection to pool boiling as the most efficient cooling technique. The workshop will address the sources of heat generation in a power electronic system as well as the basics and possibilities of heat exchange. In the focus of the workshop are advanced cooling techniques, like two phase cooling and double-sided liquid cooling as well as new materials and heat pipes for heat conduction. Case studies will show typical applications for several industrial applications.

Prof. Dr. E. Wolfgang will chair the workshop together with Thomas Harder (ECPE).

9:00 Start of Registration

9:30 **Introduction**
T. Harder, E. Wolfgang, ECPE (D)

9:50 **Losses in Power Electronic Systems**
M. Maerz, Fraunhofer Institute IISB (D)

10:20 **Heat Spreading: Not a Trivial Issue**
C.J.M. Lasance, Philips Research Labs (NL)

10:50 Coffee break

11:10 **Comparisons of Cooling Technologies**
M. Johnson, University of Nottingham (UK)

11:40 **Two Phase Cooling Concepts**
D. Saums, DS&A LLC (USA)

12:10 **Heat Pipes**
G. Diemunsch, Aavid Thermalloy (I)

12:40 Lunch

13:40 **Advanced Materials and TIMs (Part I)**
S. Levchuk, Siemens (D)

14:10 **Advanced Materials and TIMs (Part II)**
B. Jarrett, Indium Corporation (USA)

Case Studies

14:40 **ShowerPower® Cooling Concept and Applications**
K. Olesen, Danfoss Silicon Power (D)

Programme

15:00 Coffee break

15:30 **Heat Pipe Characterisations**
Siemens

15:50 **Water Cooler**
K. Laufs, AMS Technologies (D)

16:10 Panel Discussion
Reliability of Cooling Systems

17:00 End of workshop

17:15 Joint lab tour at TU Delft, EPP (1 hour) for interested participants of both workshop days

19:30 Joint Dinner at "deBrasserij", Brasserskade 2a 2612 CE Delft, (: +31 (0)15 214 5385

Power PCBs and Busbars

Friday, 21 November 2008

Printed circuit boards (PCBs) are traditionally associated with low power electronic circuits. In power electronics, PCBs are mostly used as the main carrier for low power converters. In the higher power range, PCBs are used as carriers for passives, driver and control circuits and interconnected to the power devices by means of busbars. An ongoing industry trend is to push the power capability of PCBs towards higher power, reaching 50kW or even 100 kW. From the system integration point of view, this is expected to bring cost benefits together with achieving more compact design and higher performance. The aim of this seminar is to explore the limits and boundaries of power PCB and bus bars for high power applications.

The seminar will cover various aspects of power PCBs, including evaluation of power PCB limits, thermal management considerations and techniques as well as novel enabling PCB and busbar technologies such as high current thick copper PCB technologies, miniature heat pipes for PCBs etc. Furthermore, advanced integration PCB technologies such as EMPIC and Power Sandwich PCB technology will be presented.

Prof. Dr. J.A. Ferreira (Delft University of Technology) will chair the workshop together with Thomas Harder (ECPE).

Programme

8:00 Registration

8:30 **Introduction**
T. Harder, ECPE, J.A. Ferreira, TU Delft

8:40 **PCB Integration Technology Overview**
J.A. Ferreira, TU Delft (NL)

9:10 **High Current PCBs and Suitable Connection Techniques**
M. Poech, Fraunhofer Institute ISIT (D)

9:40 **Busbars ?**
J.-L. Schanen, LEG-ENSIEG Grenoble (F)

10:10 Coffee break

10:30 **Thermal Management on PCBs I**
- Heat Spreading and Shielding
A. Schletz, Fraunhofer Institute IISB (D)

10:50 **Thermal Management on PCBs II**
- Simulation/Ampacity?
J. Adam, Flomerics (D)

11:10 **Embedded Copper High Current PCBs**
T. Mang, Korsten & Gossens (D)

11:40 **High current PCBs - Buildups and Design**
C. Lehnberger, ANDUS ELECTRONIC (D)

12:10 **Flat Miniature Heat Pipes in PCBs**
W. Wits, University of Twente (NL)

12:40 Lunch

13:30 **Powerboard PCB Technologies and Busbars for High Current Applications**
N.N., Wuerth Elektronik ICS (D) ?

14:00 **PCB Embedded Passives (EmPIC)**
E. Waffenschmidt, Philips Research (D)

14:30 **Power Sandwich PCB Integration Technology**
I. Josifovic, TU Delft (NL)

15:00 Case studies:
Guideline for PCB tracks design from thermal point of view 7; DC/DC 12 V/360V 1 kW converter for marine application
Y. Wang, TU Delft (NL)

Power PCB Application
NN

15:40 Panel discussion with speakers

16:15 End of workshop