Course site: ***38th ISSE 2015 Conference, Eger, Hungary***
Hotel Saliris, Forrás street 6, Egerszalók, H-3394, Hungary

Program: 6th May, 2015

19:00-22:00 Reception & Get-together Dinner

Program: 7th May, 2015

9:00-10:30 Oral Session 1

Title: **Heterointegration of Multifunctional Systems**

Author: *Karlheinz Bock*

Institute: *Professor at the Institute for Electronics Packaging, TU Dresden, Germany*

Abstract:

The development of electronic systems as a smart structure has become an important field of research in industry and at research institutions worldwide. Main objectives are the integration of different electronic components and functionalities like batteries, displays, microcontroller ICs, sensors and passive components on a substrate flexible, board or interposer. In particular a free form factor integration concept allows placing of systems on curved surfaces or in very thin housings. It also enables the integration of various sensing, controlling and acting functionalities into anything on rigid, thin as well as on flexible and bendable surfaces. Thin silicon chips, foil integration technologies and 3D stacking of functional layers as well as interposer technologies enable these new system concepts. These aspects are of relevance for the technical vision of functional electronic surface i.e. “electronic skin” integrated to many things for “the internet of things” or highly performant 3D integrated communication systems in the future.

Title: **Development of Driver Assistance Sensor Technology in Automotive Industry**

Authors: *Csaba Szabó[1)], András Szabó[2)], László Jakab[3)]*

Institutes:
[1)] Robert Bosch Elektronika Ltd., Budapest, Hungary
[2)] Robert Bosch Elektronika Ltd., Hatvan, Hungary
[3)] Department of Electronics Technology, Budapest University of Technology and Economics, Budapest, Hungary

Abstract:

The main target of the Robert Bosch Company is to make the transport, make the vehicles even safer. To obtain this target, new technologies and new sensors have to be implemented in vehicles. The most important thing is to avoid the risk of the personal injuries; however it is also important to avoid property damage. To reach this, one must use accident statistics and has to find ways in which accidents can be prevented by using modern sensor technology. The driver assistance systems contain a set of sensors and actuators, but it is hard to implement that they must operate in accordance with the drivers. In the relationship between the man and the machine, the machine helps in the dangerous situations. Bosch has developed the predictive emergency braking system and the predictive pedestrian protection. Predictive emergency braking system assists in avoiding rear-end collisions and mitigating the consequences. The systems have to operate at any time of the day, in any climate conditions. The reliability of the applied sensors is essential, which has to be taken into account during the design period of the electronic product. A special attention has to be paid to the production of the automotive electronics, because only high quality is acceptable. A driver support system can use multiple sensors, like the predictive emergency braking system uses the radar (mid-range, longrange) and video signals. After a sensor has been incorporated into a car for a special function, the sensor can be assigned to other functions also, such as the mid-range radar sensor is assigned to the lane change assist system also. The high degree of sensor integration proves a good solution to reduce the number and severity of accidents.

EuroTraining (GA No.: 316526) – Funded by the European Union

Title: **Low-Temperature Properties of Capacitors Embedded into Printed Circuit Boards**

Authors: *Andrzej Dziedzic, T. Świetlik, P. Winiarski;*

Institute: *Wroclaw University of Technology, Poland*

Title: **Placement of Embedded Temperature Sensors in a Printed Circuit Board for a Manufacturing Process**

Authors: *Arne Neiser, D. Seehase, A. Fink, M. Nowottnick*

Institute: *Rostock University, Germany*

10:30-11:00 Coffee break

11:00-13:00 Oral Session 2

Title: **Nanomanufacturing R&D for Electronics Packaging**

Author: *James E. Morris*

Institute: *Department of Electrical & Computer Engineering, Portland State University, Portland, Oregon, USA*

Abstract:

Nanotechnologies are beginning to find applications in all fields of engineering, including microelectronics packaging, with nanoparticles, carbon nanotubes, nanowires, graphene, and more all being assessed for possible solutions to the primary packaging problems of the day, which include primarily thermal dissipation, nanoscale interconnect, embedded passives, and the drive towards 3D system integration. The presentation will mention many such applications, but its focus will be the various fabrication techniques being developed to bring these technologies to fruition.

The early enthusiasm for melting point depression in solder nanoparticles to lower no lead solder process temperatures has given way to silver sintering for die attach, for interconnections (especially for flex applications,) and as the enabler for low resistivity isotropic conductive adhesives. Many variations of silver sintering nanofabrication techniques are well known, but there are many alternative fabrication techniques for other microelectronic packaging applications still under development.

Carbon nanotube applications are focused on electrical interconnect and thermal dissipation, but electrical shielding was one of the earliest studied. Fabrication issues can be classified broadly as dispersion improvement, transfer of films after growth to the application site, or growth *in situ*. For many such applications, restrictions on growth temperatures limit them to multiwall nanotubes where single wall would be more desirable. Of course, electrical interconnects need metallic tubes rather than semiconducting, and removal of the latter is more difficult than just burning out the former for transistor channels.

While (metallic) nanoparticles and carbon nanotubes account for most of the packaging work to date, there are related technologies attracting interest. Graphene shares many of the attributes of carbon nanotubes and is similarly being studied for thermal and electrical applications, e.g. as a heat spreader and for electrical interconnections. This area has recently broadened dramatically with growing interest in MoS2 and other 2D materials. One can also regard carbon nanowires as related to the nanotubes, albeit with less dramatic properties, but with less fabrication impediments. A final category of nanotechnologies for packaging is that of simple scaling, i.e. the dimensional reduction of an established technique to the nanoscale. In a sense, this is what has been done so successfully in packaging nano-CMOS. Of course, most material processing relies and material interactions at the nanoscale, but one of these, transient liquid phase sintering/soldering is generating a lot of interest as electrical interconnections also approach nano-dimensions.

The presentation will survey some selected technologies as examples, focusing on fabrication.

Title: ***More than Moore, how much more?***

Author: *József Gyulai*

Institute: *Member of the Hungarian Academy of Sciences; Professor Emeritus at the Department of Electron Devices, Budapest University of Technology and Economics, Budapest, Hungary*

Abstract:

The talk commemorates fiftieth anniversary of the so-called Moore's Law. Through this review, even personal hints on past development are presented. Present and potential future of front end technologies will be summarized. Changes in philosophy of International Technology Roadmap for Semiconductors reflect development of the field towards merging with telecommunication and with sensorics. Some conclusions for a country with medium development illustrate possible and still success bringing directions.

Title: **Grain Size and Porosity Dependence of Titanium Dioxide Nano-paste on Sintering Temperature for Gas Sensing Application**

Authors: *Goran Miscovic, M. Hrovat, S. Drnovsek, M.V. Nikolic, O.S. Aleksic, G. Radosavljevic*

Institute: *Vienna University of Technology, Austria*

Title: **Study of Carbon-Fiber-Reinforced Polymers Conductivity's Dependence on a Mechanical Strain**

Authors: *Ievgen Kharabet, I. Patsora, H. Heuer, D. Joneit, D. Tatarchuk*

Institute: *Technical University of Dresden, Germany*

Title: **Interface of a Single ZnO-Nanowire Assembled onto Custom-Fabricated Nanogap Device for UV Sensing Applications**

Authors: *Beatrice Miccoli, A. Bonanno, V. Cauda, A. Sanginario, D. Demarchi*

Institute: *Politecnico di Torino, Italy*

13:00-14:00 Lunch break

14:00-16:00 Oral Session 3

Title: **Electronics, Microelectronics, Nanoelectronics…**

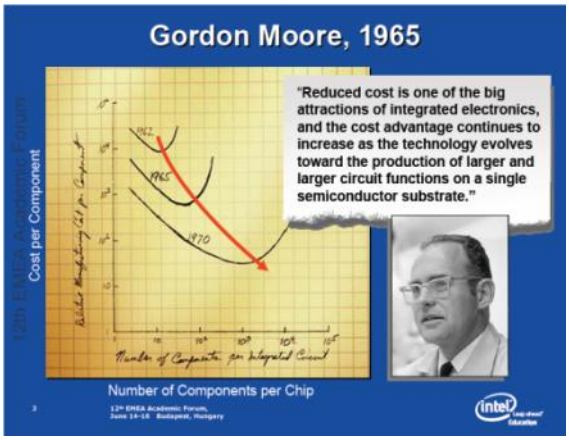
Author: *János Mizsei*

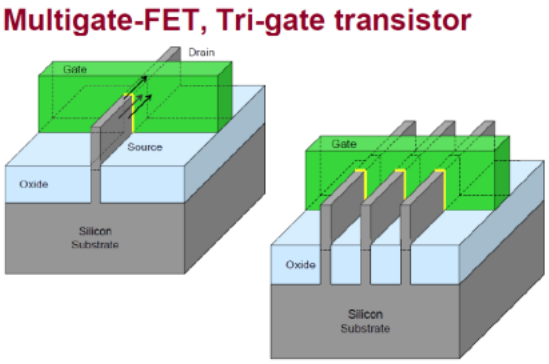
Institute: *Department of Electron Devices, Budapest University of Technology and Economics, Budapest, Hungary*

Abstract:

Until now, the continuous development of electronics has been characterized by Moore's law. The scale down resulted in the nanosized CMOS integrated circuits, pushing the "red brick wall" towards the lower dimensions. On the other hand, there are many new ideas for building atomic or molecular scale devices for the information technology. However, there is still a gap between the up-to-date "top-down" CMOS technology and the "bottom-up" devices, i.e. molecular electronics, nanotubes, single electron transistors.

Motivation: Scale down and its limits



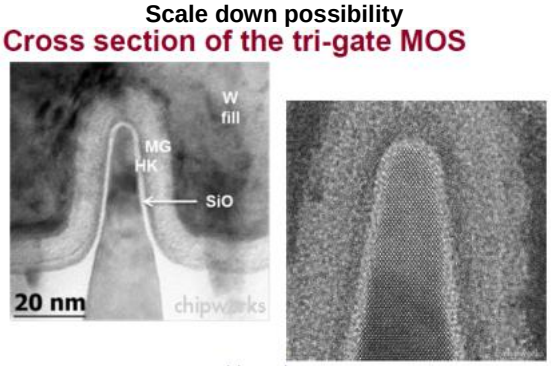


Real three dimension structure!

Limits of the scale down:

- tunnel effects (direct tunnel distance limit: 2 nm)
- technology (light wavelength, photoresist resolution, atomic dimensions)
- fluctuations (doping density)
- heat dissipation
- thermodynamical energy limit
- Heisenberg uncertainty energy limit

Scale down possibility



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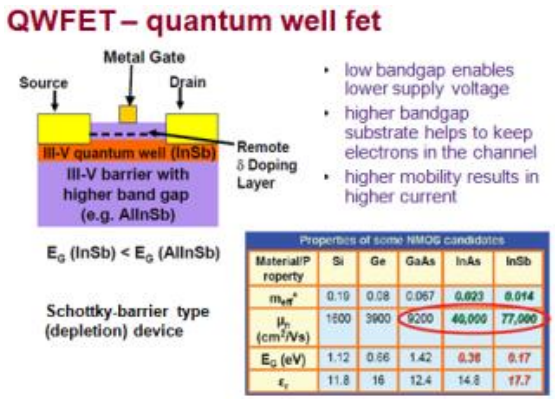
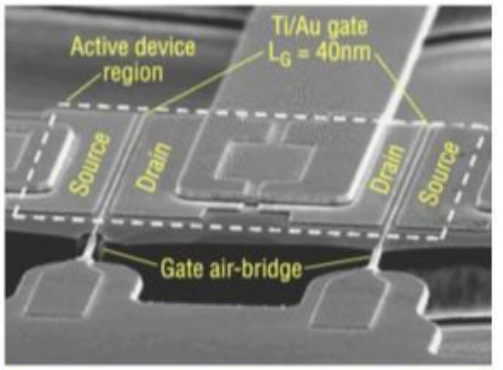
Scale down possibilities





Problem: compound semiconductor in Si based technology

Conclusions: Recent efforts for the solution: nanotechnology

- scale down conventional ICs
- new devices: single electron devices, QWFET, nanotubes, nanorelays, organic molecular integrated circuits, oxide electronics, vacuumelectronics, spintronics, thermal computing, quantum-computing.

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Title: **Energy Efficient Nanoelectronics**

Author: *Hervé Fanet*

Institute: *CEA-Léti, Minatec Campus, Grenoble, France*

Abstract:

Motivation: Why less power is so important?

Power dissipation limitations are crucial for portable systems but also for supercomputers and all electronic applications because:

- the number of portables (notebooks, laptops, games, mobile phones, DVD and MP3 players, GPS, etc.) are increasing;
- there is a need for the access to powerful computation from any location that requires the restrictions of size, weight and power, and small but powerful batteries.

Fig. 1: Why less power? (From J. Rabaey, ASPDAC 2008)

Discussion: Power optimization

Power optimization at component & circuit level :

- Applications and metrics
- How to reduce supply voltage
- Interest of steep slope devices

Power dissipation at architecture level:

- Trade-off flexibility-power
- Optimization of voltage and frequency
- Optimization of threshold voltages
- Optimization of SRAMS
- Low power processors
- Adiabatic and reversible computing

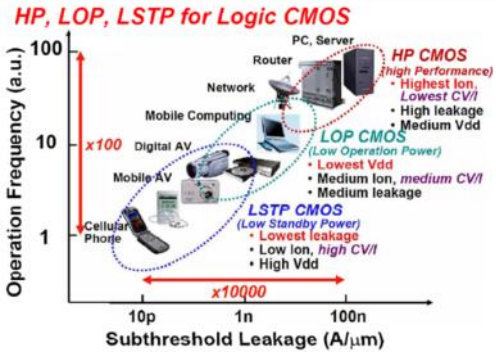

Fig. 2: The effect of the architecture
(Source: 2007 ITRS Winter Public Conference)

Conclusions: **Energy efficiency is the main nanoelectronic driver**

- Many improvements have been done and more innovations are needed at circuit level.
- New switches (Tunnel FET and NEMS) have to be confirmed for future ultra low power electronics but FDSOI and FinFETs are the solutions of today.
- Adiabatic logic in association with new switches has to be investigated.

Title: **Thermal-Electronic Devices and Thermal-Electronic Logic Circuits (TELC)**

Authors: *Éva Jelinek, J. Mizsei, M. C. Bein, L. Juhász*

Institute: *Department of Electron Devices, Budapest University of Technology and Economics, Hungary*

Title: **Perspective Methods of Creating Conductive Paths by Aerosol Jet Printing Technology**

Authors: *Jiri Navratil, A. Hamacek, J. Reboun, R. Soukup*

Institute: *University of West Bohemia, Pilsen, Czech Republic*

Title: **Aerosol Jet® Printing of Optical Waveguides**

Authors: *Thomas Reitberger, J. Hoerber, R. Schramm, S. Sennefelder, J. Franke*

Institute: *Friedrich-Alexander University, Erlangen-Nuremberg, Germany*

16:00-16:15 Coffee break

16:15-18:15 Poster Session 1

Title:	**Carbon Nanotube Dispersion Preparation and Deposition of Thin Layers for Gas Sensors**
Authors:	*J. Stulik, M. Kroupa, T. Blecha, A. Hamacek*
Institute:	*University of West Bohemia, Pilsen, Czech Republic*

Title:	**Relation between Tin Whiskering Ability Sn/Ag/Cu Solder Alloys and Current Load**
Authors:	*B. Illés, N. Fehérvári*
Institute:	*Budapest University of Technology and Economics, Hungary*

Title:	**Corrosion investigations on Lead-Free Micro-alloyed Solder Alloys used in Electronics**
Authors:	*B. Medgyes, P. Tamási, F. Hajdu, R. Murányi, M. Lakatos-Varsányi, L. Gál, G. Harsányi*
Institute:	*Budapest University of Technology and Economics, Hungary*

Title:	**The Smart City - Integrated green energy system**
Authors:	*E. Ceuca, G. Corsiuc*
Institute:	*University "1 December 1918" of Alba Iulia, Romania*

Title:	**Environmental Aspects of LED–Lighting Systems: Functional Units and Colour Conversion Materials**
Authors:	*M. Franz, J. Nicolics*
Institute:	*Vienna University of Technology, Austria*

Title:	**UWB Antenna Based on Nanoparticles of Silver on Polyimide Substrate**
Authors:	*P. Lukacs, A. Pietrikova, J. Potencki, G. Tomaszewski*
Institute:	*Technical University of Kosice, Slovakia*

Title:	**Electrical Properties of Inkjet Printed Graphene Patterns on PET-based Substrate**
Authors:	*Č. Žlebič, L. Živanov, M. Kisić, N. Blaž, A. Menićanin, D. RanĐelović, M. Damnjanović*
Institute:	*University of Novi Sad, Serbia*

Title:	**Enhancing Plasmonic Biosensors with Nanotechnology**
Authors:	*A. Bonyár*
Institute:	*Budapest University of Technology and Economics, Hungary*

Title:	**Investigation of Surface Mechanical Properties of the Copper-Solder Interface by Atomic Force Microscopy**
Authors:	*J. Kámán, A. Bonyár, T. Hurtony, G. Harsányi*
Institute:	*Budapest University of Technology and Economics, Hungary*

Title:	**Measurement System for Sensitive Layers of Carbon Nanotubes**
Authors:	*T. Blecha, J. Stulik, J. Cengery, V. Smitka*
Institute:	*University of West Bohemia in Pilsen, Czech Republic*

Title:	**Examination and Development of Specialized Force Sensor**
Authors:	*N. Nenov, E. Dimitrov, P. Piskulev*
Institute:	*University of Transport, Sofia, Bulgaria*

Title:	**Software for a Bidirectional Communication System for Neuromotor Disabled Patients**
Authors:	*L. Niţă, R.G. Bozomitu, V. Cehan, C. Rotariu, R.G. Lupu*
Institute:	*RomSoft, Iaşi, Romania*

Title:	**Pupil Centre Coordinates Detection Using the Circular Hough Transform Technique**
Authors:	*R.G. Bozomitu, A. Păsărică, V. Cehan, C. Rotariu, C. Barabaşa*
Institute:	*"Gheorghe Asachi" Technical University, Iasi, Romania*

Title:	**Improvement of NDIR Carbon Dioxide Sensor Accuracy**
Authors:	*M. Marinov, G. Nikolov, E. Gieva, B. Ganev*
Institute:	*Technical University of Sofia, Bulgaria*

Title:	**Flexible Inkjet Printed Sensor for Liquid Level Monitoring**
Authors:	*M. Kisic, N. Blaz, C. Zlebic, L. Zivanov, M. Damnjanovic*
Institute:	*University of Novi Sad, Serbia*

Title:	**Displacement Sensor Based on Interdigital Capacitor**
Authors:	*N. Blaž, M. Kisić, Č. Žlebič, G. Mišković, G. Radosavljević, L. Živanov*
Institute:	*University of Novi Sad, Serbia*

Title:	**Development of Optical Inclinometer in LTCC Technology**
Authors:	*J. Somer, M. Štekovič, F. Urban, I. Szendiuch*
Institute:	*Brno University of Technology, Czech Republic*

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Title:	**A Wireless Sensor Network for Remote Monitoring of Bioimpedance**
Authors:	*C. Rotariu, R.G. Bozomitu, V. Cehan, A. Pasarica, H. Costin*
Institute:	*"Grigore T. Popa" University of Medicine, Romania*

Title:	**A Flexible Resistive Read-Out Circuit Suitable to Multi-purpose ZnO Nanostructured Transducers for Robotic Applications**
Authors:	*A. Damilano, M. Crepaldi, H.M.A. Hayat, D. Demarchi*
Institute:	*Istituto Italiano di Tecnologia@PoliTo, Italy*

Title:	**A SPICE Model for Electroluminescent Foils**
Authors:	*C. Ionescu, F. Drăghici, D. Bonfert*
Institute:	*University "Politehnica" of Bucharest; Romania*

20:00 Dinner

Further information / contact persons:
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