CAPT
Center for Advanced Power Technologies
National Tsing Hua University, TAIWAN

國立清華大學 電機系
先進電源科技中心

短 期 課 程

功率半導體元件與設計準則
Power Semiconductor Devices and Design Criteria

Dr. Leo Lorenz

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時間：2009年8月10-14日；每日18：30-21：30。
地點：新竹 國立清華大學 電機系 105 教室。

主辦單位：國立清華大學 先進電源科技中心
協辦單位：IEEE Taipei Section、IEEE EDS/PELS/IES Taipei Chapter、 中華民國電力電子協會、國立清華大學電機系/電子所

Leo Lorenz was born in Haibach, Germany, in 1946. He received the Dipl.-Ing. degree from the Technical University of Berlin, Berlin, Germany, in 1976 and the Dr.-Ing. degree from the University of Federal Defence, Munich, Germany, in 1984. From 1976 to 1980, he was with AEG, R&D –Center for Power Electronics, Berlin. In 1984, he joined Siemens Semiconductor Division which became Infineon Technologies AG, Munich, Germany, in 1999. Since then he has worked on power semiconductor and power ICs in different functions and responsibilities. He has published over 200 technical papers in these fields. In 2001, he became a Professor for system integration at the University of Ilmenau, Ilmenau, Germany. Dr. Lorenz is President of the ECPE (European Center of Power Electronics)

Part 0: Introduction

- Contents of Lecture
- Device Concepts (overview)
- Basic circuit topologies and reflections on device application
- Device Integration perspectives

Part I: Power Semiconductor Device Physics

- Semiconductor material
- Intrinsic conductivity
- Material doping
- Pn-structure

  - low carrier injection
  - high carrier injection

Part II: Power Semiconductors: **Power semiconductor concepts for Power MOSFET's, IGBT's, SiC**

- Semiconductor cell structure
- Electrical equivalent circuit topologies
- Electrical performance for Power MOSFET & IGBT's
- Integrated parasitic structures
- Static electrical behavior and data
- Dynamic behavior
- Short circuit capability
- Thermal characteristics and over temperature behavior

Part III: Devices limiting factors

- Short circuit destruction modes
- Avalanche characteristics
- Overload limitation (SOA)
- di/dt, dv/dt-Limitations and physical effects

Part IV: Driving and Protection of Power Semiconductors

- Basic circuit topologies for driving MOS-controlled devices
- Protection circuits and requirements
- Basics for driving high power devices
- Basic about thermal aspects