

Power Devices and Systems Group

National Microelectronics Centre (CNM-CSIC)



The research activity of Power Devices and Systems Group deals with innovative and custom design, breakthrough technologies definition, advanced processing and characterisation of Si and Wide Band Gap devices, new technologies for power systems integration and thermal management. The tackled research topics range from basic physics (atomistic modelling, processing physical analysis...) to highly applied developments close to industrial products (high voltage IGBT, high temperature packages...). The group is a highly experienced team worldwide recognised with a large number of international collaborations and a well established network of industrial partners.

Key Research Fields & Competence Areas:

➤ Silicon Power Devices

New designs and concepts of high voltage IGBTs, low resistive LDMOS transistors for RF applications, super-junction LDMOS devices aimed at automotive applications, thin SOI Smart Power technology and advanced protecting devices like TVS (Transient Voltage Suppressors)

➤ Wide Band Gap Semiconductors

Modelling and Setting up of optimized technologies for Silicon Carbide semiconductor processing, design and implementation of novel power devices and high temperature sensors: power diodes up to 6.5kV, power JFETs & MOSFET, MEMS, gas sensors, graphene devices

➤ Power Systems Integration

New methods for the design, modelling, implementation and characterisation of power systems (IPMs, thermal management, electro-thermal characterisation, interconnection and packaging techniques). Reliability analysis of power devices and systems. Technological processes for functional integration and smart power ICs.

Institute Highlights:

The acquired skills and technologies are almost unique in the European academic scenario. This provides a privileged position to respond the needs of European industries as well as to collaborate with European laboratories

- Clean Room facilities with planar DMOS/IGBT and SiC devices technologies. Specific equipments for WBG semiconductor processing (Al, Mg, Si implantation, 1800°C RTA annealing, deep etching,..).
- Simulation, design and characterisation dedicated software (e. g., Synopsis, Ansys, Flotherm, etc.).
- Static and dynamic characterisation facilities for power devices (at high voltage, high temperature,...)
- Static and dynamic thermal characterisation facilities at device and system level: IR and LCD thermography, laser-based measurement techniques (e. g., IIR-LD), thermal conductivity and resistance measurements.

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