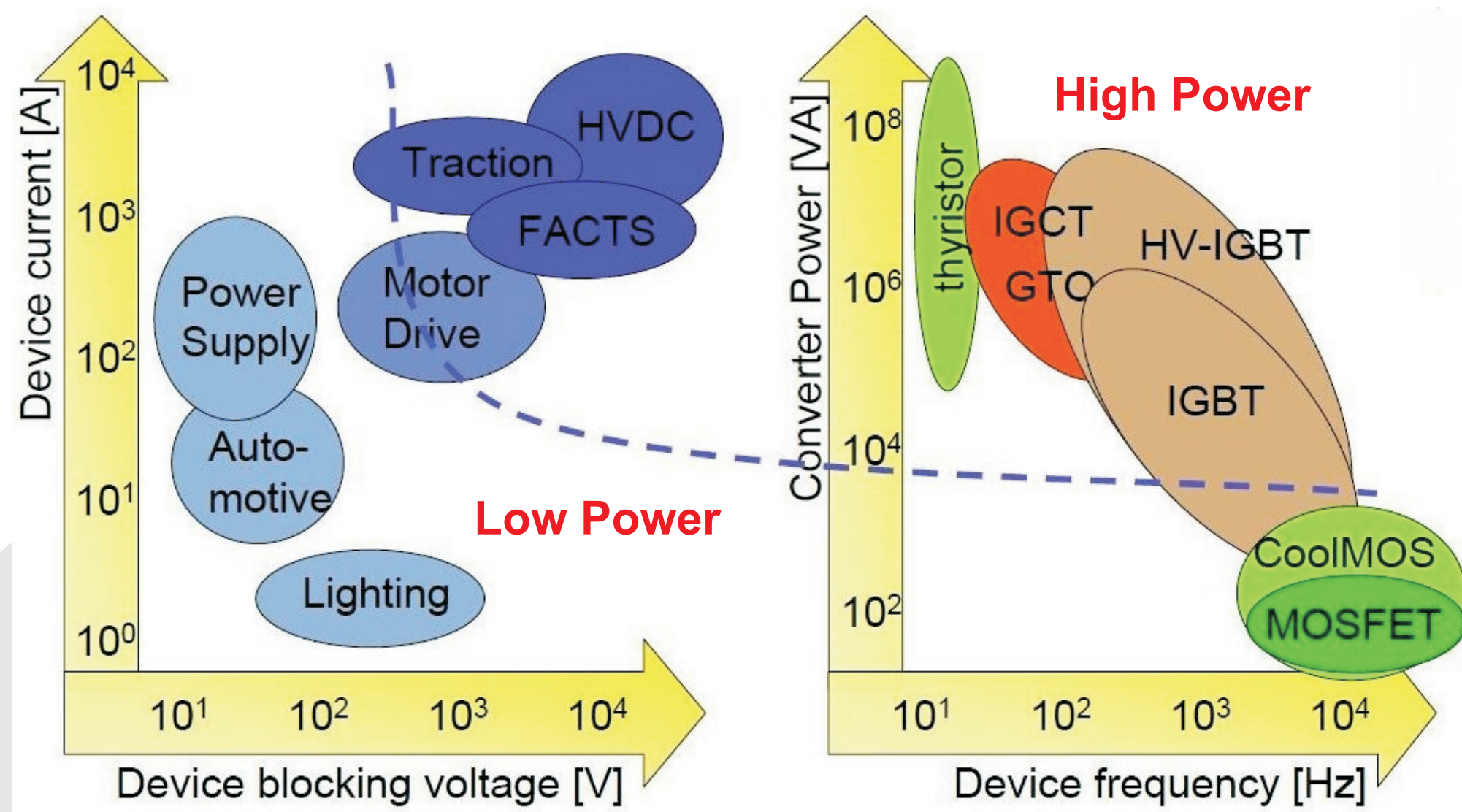


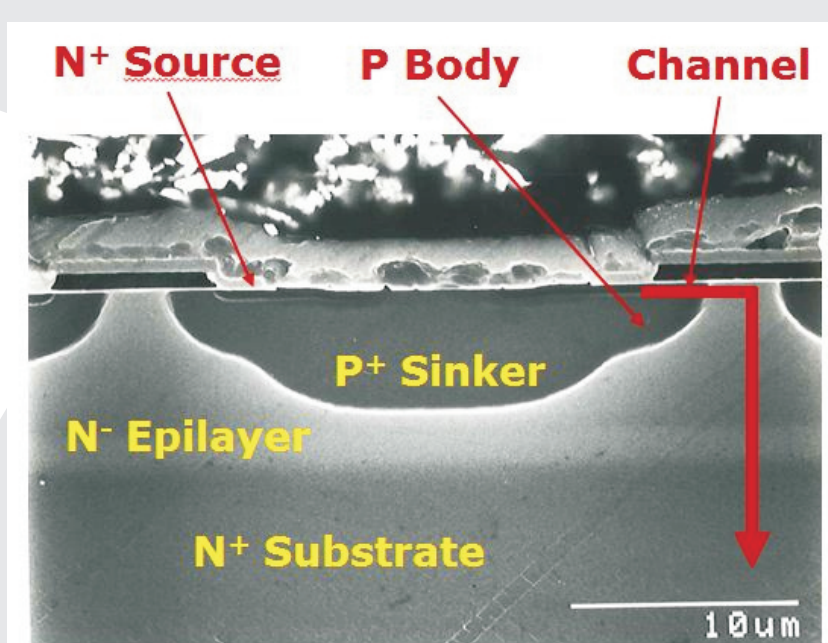
POWERDEVICES&SYSTEMS

SILICONPOWERDEVICES

Design of new power structures for high efficiency converters and smart grids, with voltage capability from 600 to 6500 V. Reliability of power devices in radiation environments and use of diode based structures for high energy physics detectors



Application fields of Silicon power devices

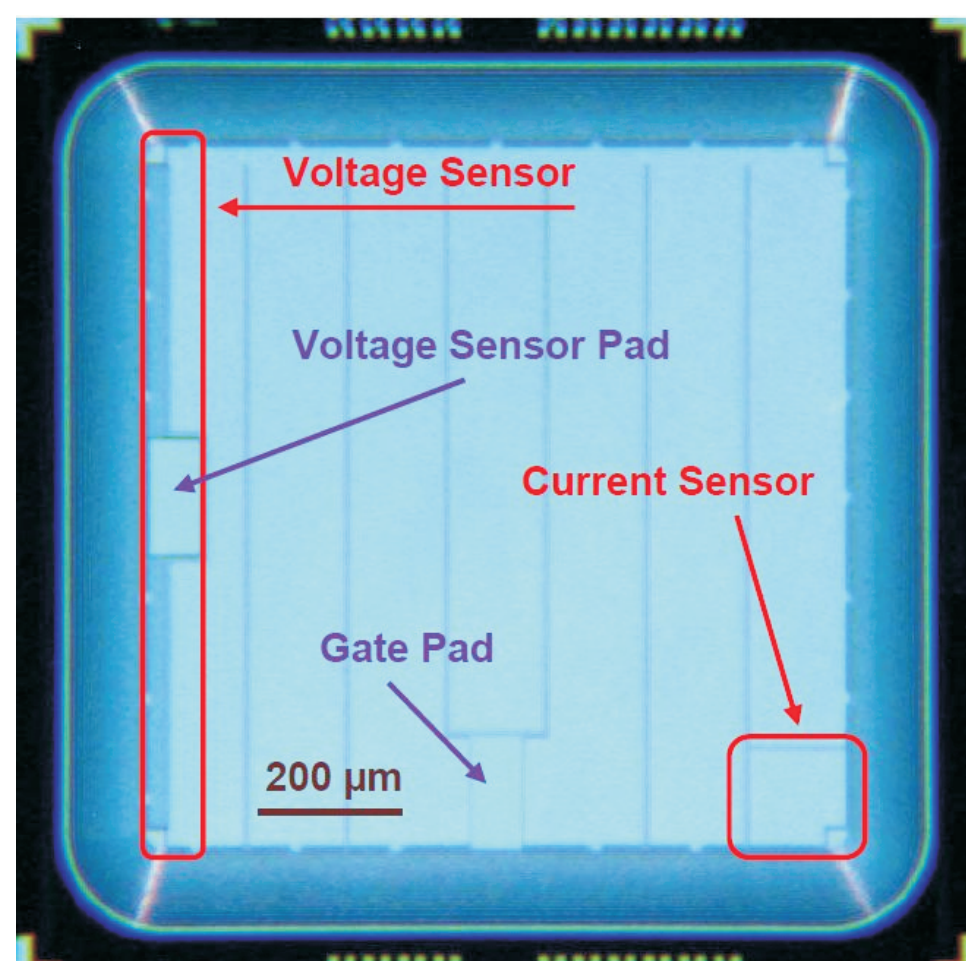


Process Technologies

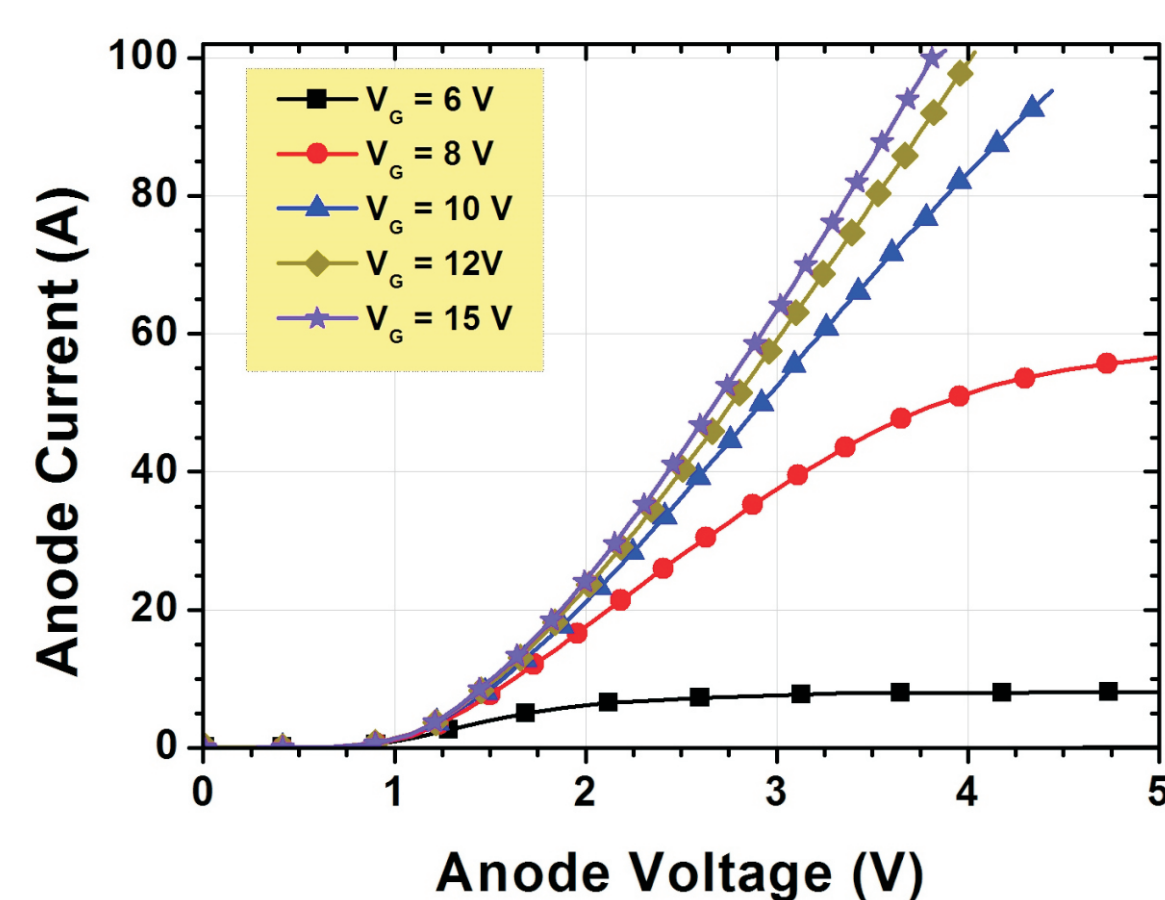
Set-up of process technologies in the IMB-CNM Clean Room for the fabrication of MOSFET and Bipolar based Silicon power devices. Standard double diffusion VDMOS/IGBT technology.

3300 V - 50 A IGBT with Anode Voltage Sensor

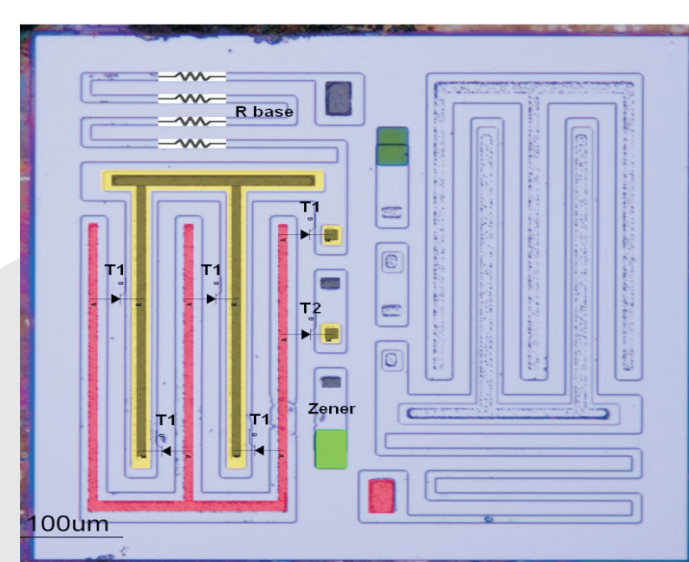
Large area IGBT ($> 1 \text{ cm}^2$) with anode voltage sensor monolithically integrated in the active area and auxiliary cathode pad for current sensing. Short-circuit protection in traction power modules.



3300 V - 50 A IGBT with anode voltage and current sensors



Current capability for different gate bias

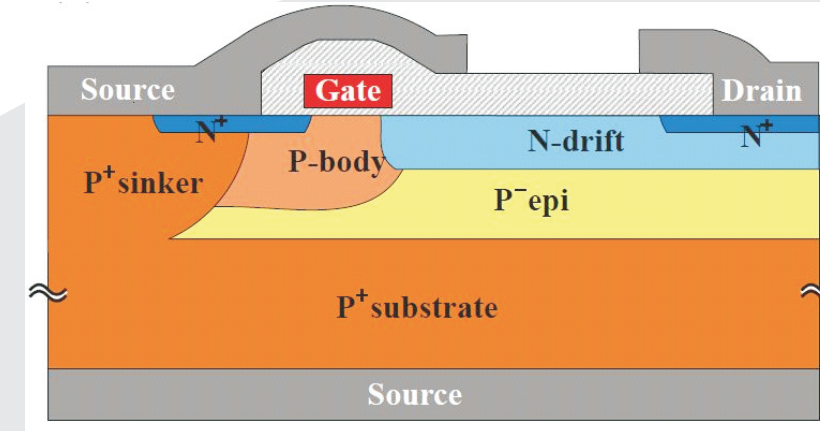
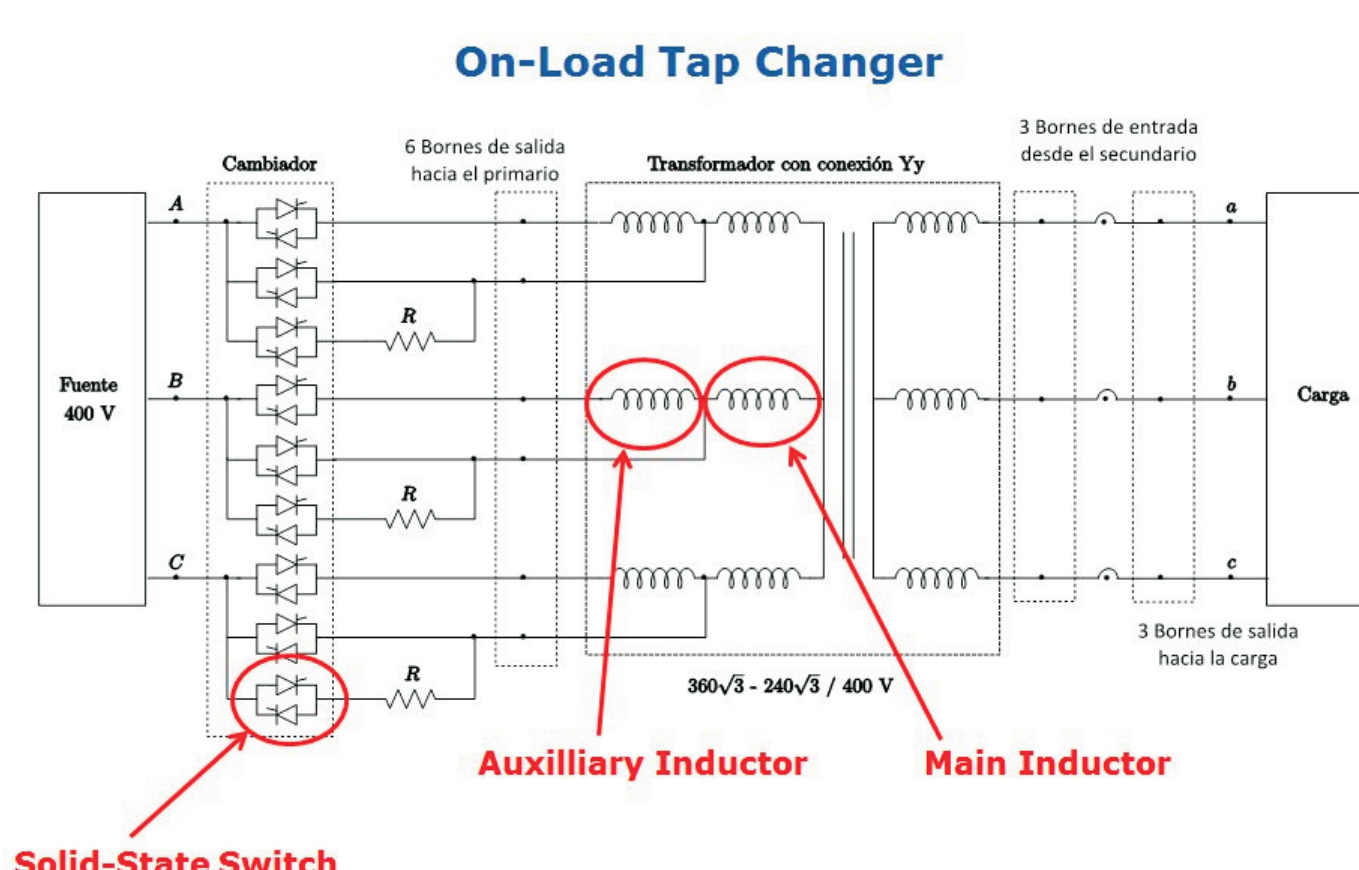


Custom Devices

Design and fabrication of application oriented power devices. Technology transfer and small series.

2500 V EST for Smart Grids

50 A MOS-Thyristor (EST) as solid state switch for on-load tap changers with remote voltage control.

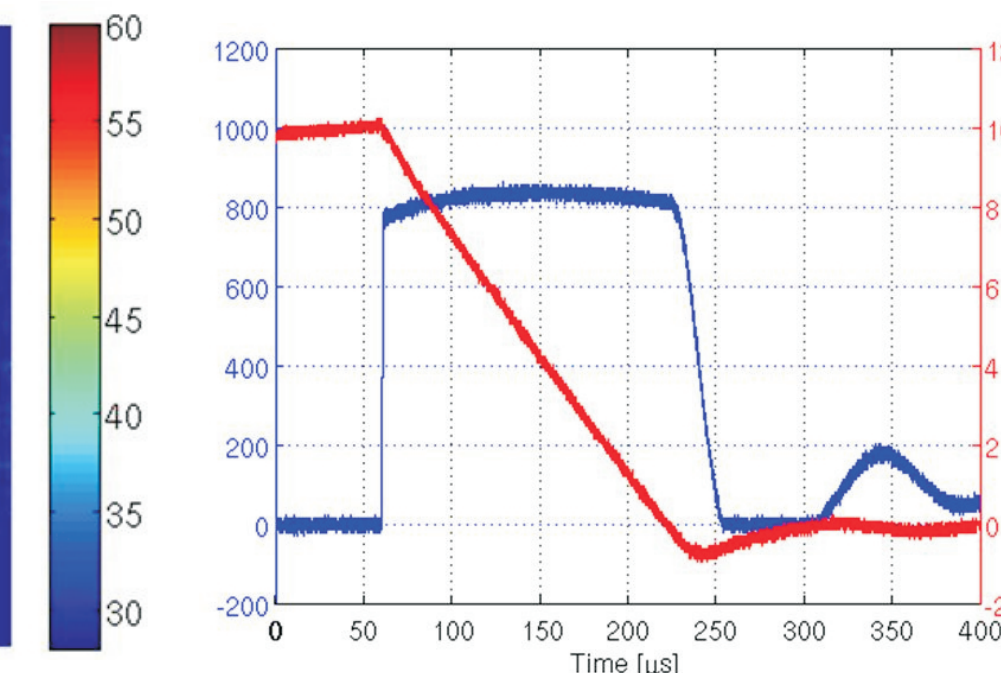
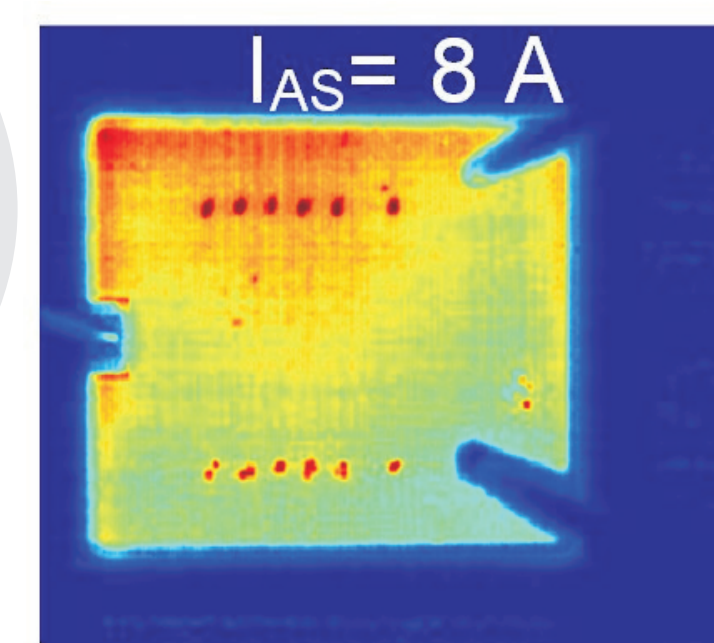


Device Design

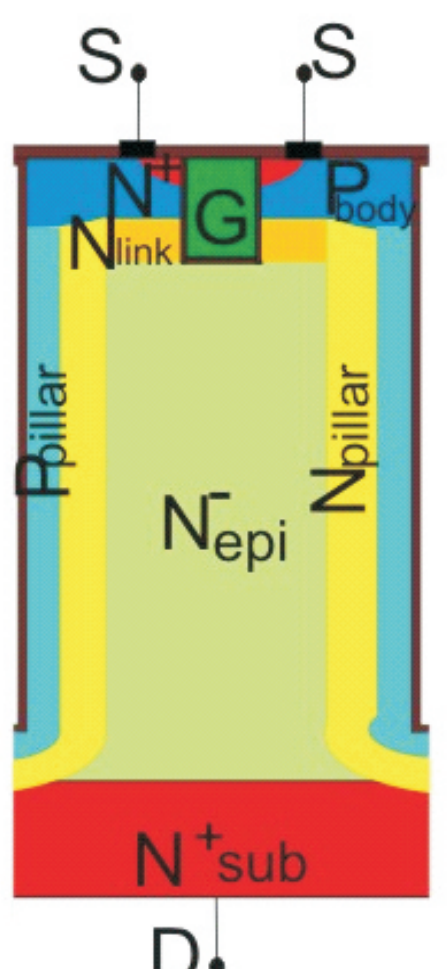
Design and optimisation of new lateral and vertical power semiconductor devices on Bulk Silicon and Silicon-on-Insulator substrates. Electrical and technological TCAD simulation.

Super Junction Power MOSFETs (600 V)

Avalanche ruggedness optimisation of a new generation of 600 V SJ power MOSFETs based on deep trench technology. Technical solutions for high energy capability under UIS stress.



Uniform current distribution at 800 V during an 8 A UIS test

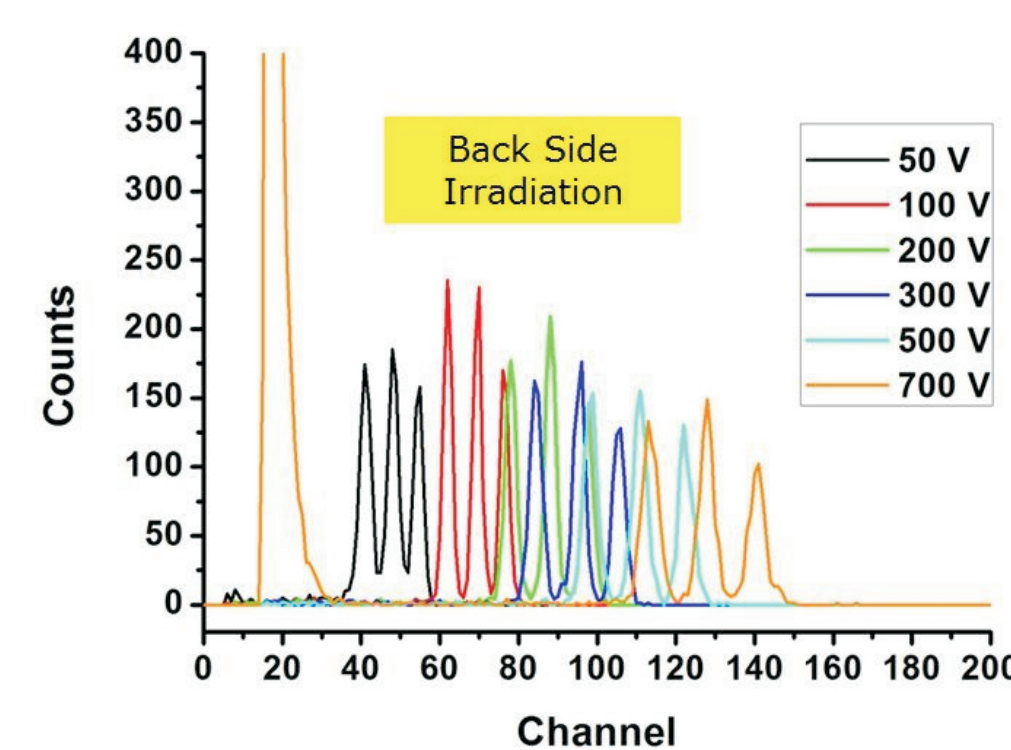


Radiation Effects on Power Devices

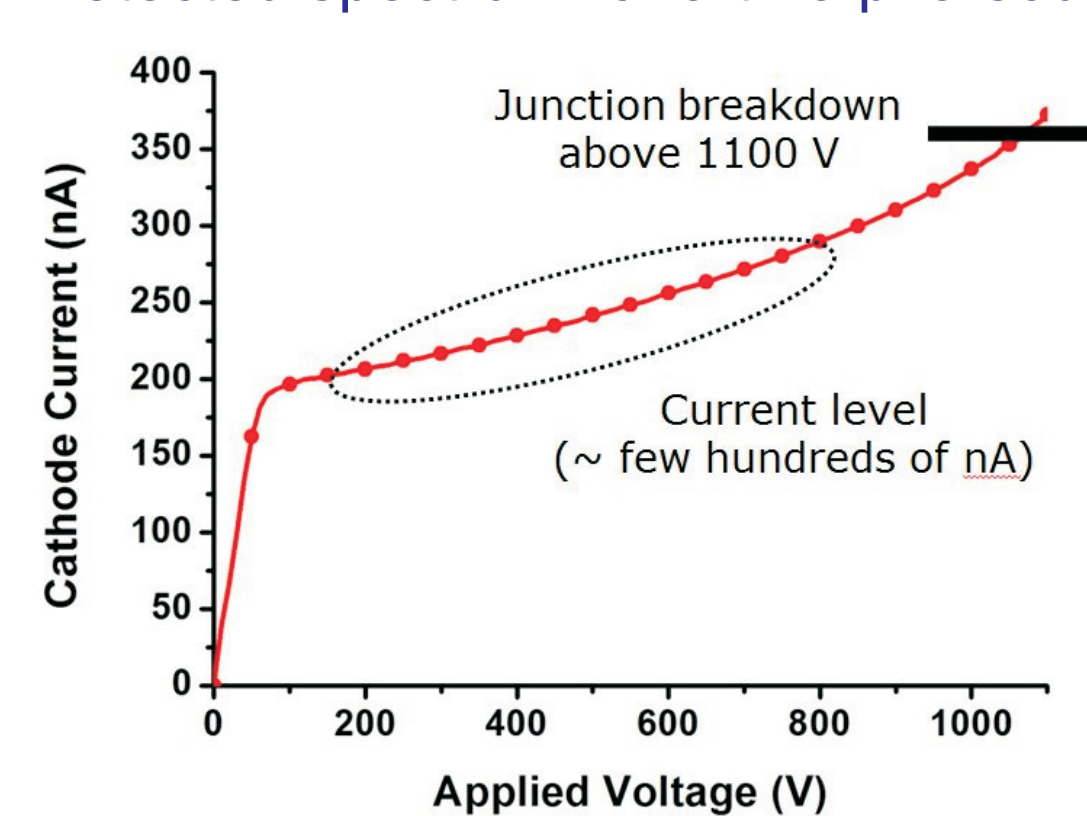
Reliability and damage analysis of power devices used in harsh environments. Design and optimisation of avalanche detectors for high energy physics applications.

Low Gain Avalanche Detectors (LGAD)

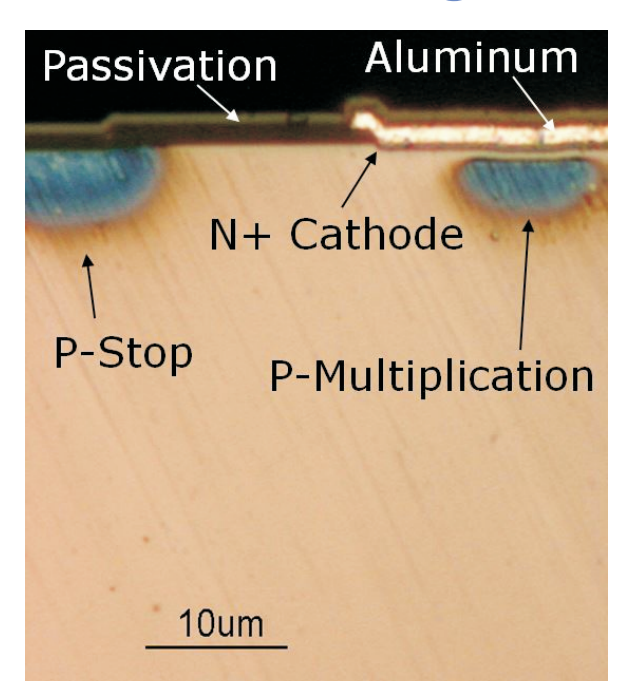
Controlled avalanche process to Improve performance and stability of PiN diodes against radiation, achieving a high signal to noise ratio. Fabricated 1100 V LGAD devices with leakage current less than 500 nA. Detection area of 25 mm^2 with a gain in the range of 10.



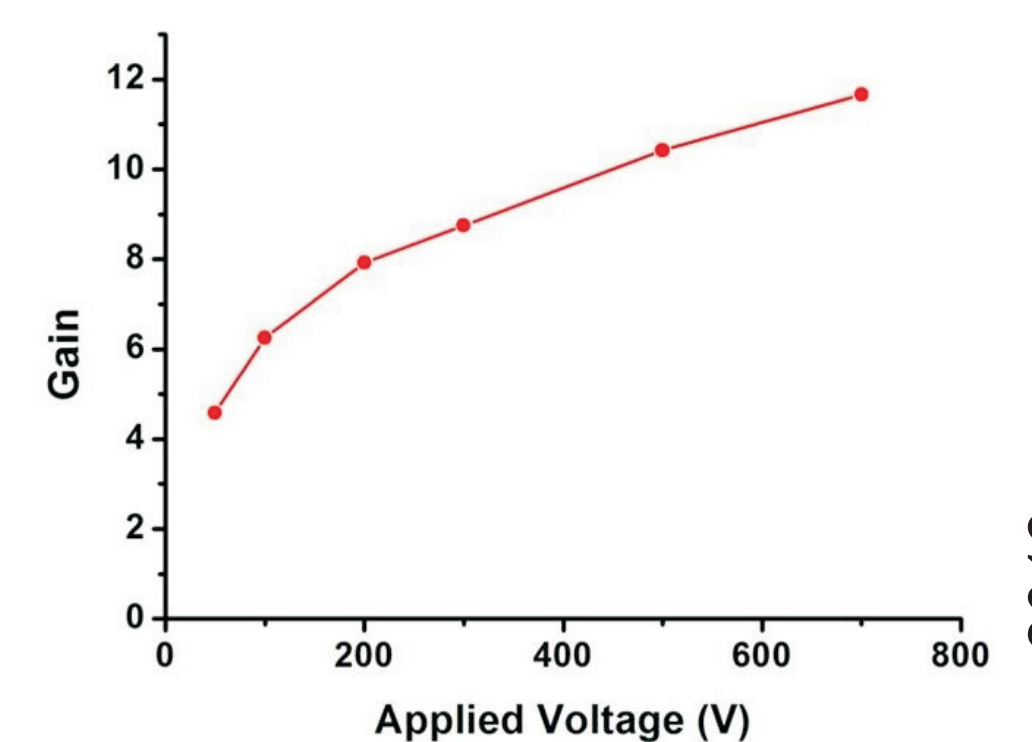
Detected spectrum for a tri-alpha source



Reverse I-V characteristics



Cross-section of a detector with gain



Gain versus applied voltage