Institute of Microelectronics of Barcelona IMB-CNM CSIC

The **IMB-CNM** is the largest institute in Spain dedicated to the research and development of Micro and Nano Technologies and Microsystems and with unique capabilities in silicon technology. It belongs to CSIC since its foundation in 1985 and is distinguished as a María de Maeztu Unit of Excellence.

IMB-CNM aims to contribute to the advancement of knowledge and to the economic and social development of society, as well as to the training of researchers and engineers and to the advice to public and private entities.

The research activities of IMB-CNM are dedicated to Micro/Nano Integrated Systems: miniaturized electronic systems which include sensing and/or actuating capabilities in addition to electronic information processing, power management and external interfaces.

The IMB-CNM is located on the Autonomous University of Barcelona (UAB) Campus and contains the largest clean room facilities in Spain with full capability to process its own CMOS technologies and laboratories.

Project Type: TFG

Project Title: Development of a specific software for the processing, analysis and visualization of power devices characterization data

Research Group: Power Devices and Systems (PDS)

Project Description:

- The Power Devices Electrical Characterization Laboratory at IMB CNM (CSIC) has developed a platform for automated on-wafer characterization of power semiconductor devices (MOSFETs, IGBTs, diodes, etc.). The existing software controls probe stations and Source Measure Units (SMUs) via GPIB protocol to perform automated wafer-level measurements, generating datasets of current versus voltage (I–V) characteristics. Currently, the analysis and visualization module that processes the acquired I-V curves and extracts device parameters (such as threshold and breakdown voltage, leakage current, etc.) is missing. The goal of this TFG is to implement a robust software module to:
  - Process structured measurement data.
  - Extract key electrical parameters: VTH, VBR, RDS_ON, ILK, etc.
  - Apply configurable pass/fail and binning criteria.
  - Generate interactive wafer maps and visual reports (histograms, heatmaps).
- This work will provide a complete software tool for device characterization and yield analysis, enabling faster feedback on device semiconductor manufacturing and research processes. The student will acquire knowledge on semiconductor physics, scientific instrumentation as well as data analysis, data processing, programming, and graphical representation of experimental results. He or she will work in the framework of a very active and multidisciplinary research group. https://power.imb-cnm.csic.es/.

Work Plan:

Methodology:

- Data acquisition study: Identify and document current data structure, format and metadata (wafer ID, die coordinates, measurement recipes).
- Parameter extraction algorithms: Implement robust algorithms for VTH, VBR, RDS_ON, ILK, etc., including error estimation and outlier detection.

- Binning function: Design flexible pass/fail and multi-bin classification based on device specifications.
- Visualization tools: Develop wafer maps, dashboards, and reports with color-coded results.
- Integration: Package the solution as a Python library or standalone app, ensuring compatibility with the existing measurement data given from the actual software.
- Documentation and validation: Provide test datasets, notebooks, and user documentation.

Work Plan (20–24 weeks)

- Weeks 1–3: Requirements gathering, dataset exploration, and software architecture design.
- Weeks 4–8: Development of parameter extraction functions and validation with sample data.
- Weeks 9–12: Development of configurable pass/fail and binning rules, report generation.
- Weeks 13–16: Implementation of the app gui, wafer mapping visualization and basic dashboards.
- Weeks 17–20: Software validation, optimization, and unit testing.
- Weeks 21–24: Documentation, advanced GUI development, case studies with real wafers, and preparation of the final report.

Student Requirements

- Experience in scientific programming (python preferred) and data analysis.
- Basic knowledge of power electronics and semiconductor devices.
- Interest in instrumentation, data processing and visualization techniques.

Candidate desired studies:

- ✓ BSc in Physics
- ✓ BSc in Electronic Telecommunications Engineering
- ✓ BSc in Biomedical Engineering

Application Process:

Before applying, please **check with your TFG/TFM program supervisor,** as he/she may already be coordinating with us to assign the project.

If there is no such coordination**, complete this form and send your CV and a motivation letter** to **Talent@imb-cnm.csic.es**, with the **subject: "TFG/TFM at IMB-CNM"**

Your CV will be forwarded to the Researcher leading the project who will contact you directly if interested.

Check our website for more information about the IMB-CNM and our research activities

https://www.imb-cnm.csic.es/en

Take the next step in your research career with us!

*By applying, you accept our data protection policy.

**IMB-CNM (CSIC) adheres to the European Charter and Code of Conduct for Researchers, ensuring full alignment with their principles and requirements, including equal opportunity, transparency, merit and ability, caring for an open, fair, and excellence-based hiring processes.

IMB-CNM holds the HR Excellence in Research award, which acknowledges CSIC's commitment to continuous improvement in HR strategies for researchers.

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