IHP Open PDK

SOC SURVEY

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IHP Open Source PDK – What is it? Who did it?

- Process design kit (PDK) contains a set of files used for model fabrication process for ICs.
- IHP is (I)nsitute for (H)igh (P)erformance Microelectronics for high-frequency circuits.
  - Non-university research establishment institutionally funded by the German federal and state governments and a member of the Leibniz Association.
- Repo contains necessary files and data to design ICs using IHP's SG13G2 technology.
  - Uses 130nm BiCMOS process.
  - Provides Transistor capabable of operating at frequencies up to 350 GHz, and a maximum oscillation frequency of 450 GHz.
  - Specifically designed for Analog, Mixed-Signal and RF designs.

IHP Open Source PDK – Why does it exist?

- Created to provide Open Source access for chip design education and to provide low-barrier access to high-frequency (sub-THz) technology.
- Support of Open Source design flow development with Free Area in MPW Runs (chip designs for non-economic activities, such as university education, research projects).

Repository Contents

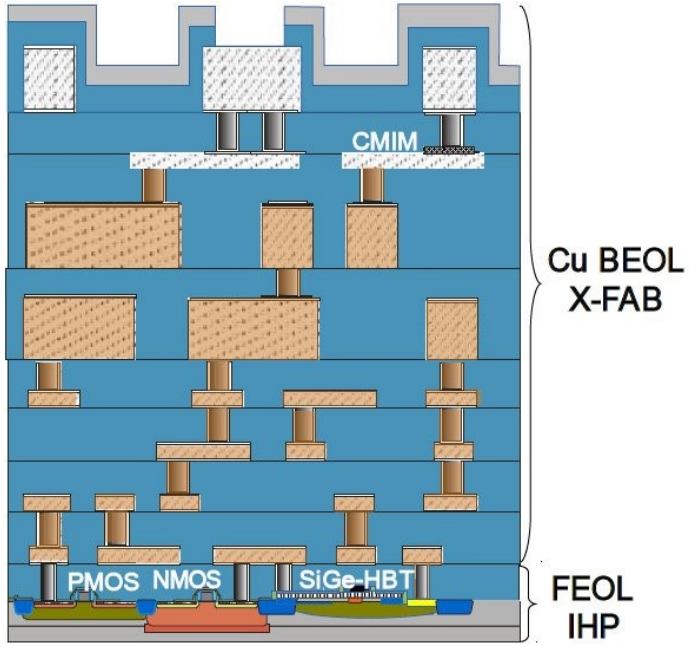
- Contains set of files to be used with Open EDA tools to implement mainly open designs.
  - Tools supported: ngspice, Xyce, xschem, QUCS-S, Klayout, Magic, Pygmid, OpenEMS, OpenROAD, OpenROAD-flow-scripts, LibreLane.
- Provides reference libraries for physical devices to facilitate hardware creation from RTL description.
- It is still on an early access state.
  - Tools used & languages: not listed; documentation is very sparse.
  - Installation instructions contain large number of prerequisite and support packages that need to be installed.
- Licensed under Apache-2.0.
- Lines of code: ~128k, mostly HTML (30.5k, documentation), XML (26k), Python (22k), Scheme (14k) and TCL (13k).
  - Contains also a high number of library and definition files not included in number.

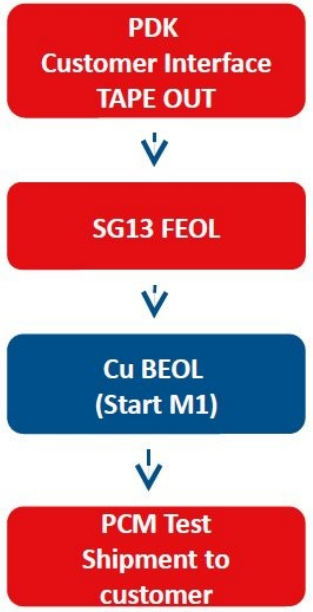
How easy is it to get started?

- "Hello world" isn't really a thing here – this is a Process Development Kit - requires additional tools to be useful.
- Documentation is lacking at certain points, but provides enough information to understand how the PDK is installed and what the PDK contains.

SG13G3Cu

- "Technology offers IHP´s highest performance HBT's with up to 470 GHz transit frequencies and up to 650 GHz maximum oscillation frequencies. The process offers a 8-layer Cu-BEOL from X-FAB containing 4 thin Cu layers, 2 thick 3µm Cu layers, a thin Al layer with 2 fF/µm MIM capacitor and a 2.8 µm Aluminum top layer. This technology offers CMOS devices with 130 nm gate length and 1.2 V core voltage and high voltage CMOS devices with 3.3 V core voltage."





Action IHP

Action XFab

References

- GitHub - IHP-GmbH/IHP-Open-PDK: https://github.com/IHP-GmbH/IHP-Open-PDK
- IHP-Open-PDK documentation: https://ihp-open-pdk-docs.readthedocs.io/en/latest/index.html
- IHP : Leibniz Institute for High Performance Microelectronics: https://www.ihp-microelectronics.com/
- SiGe BiCMOS: https://www.ihp-microelectronics.com/services/research-and-prototyping-service/mpw-prototyping-service/sigec-bicmos-technologies