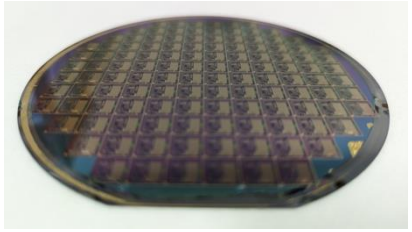
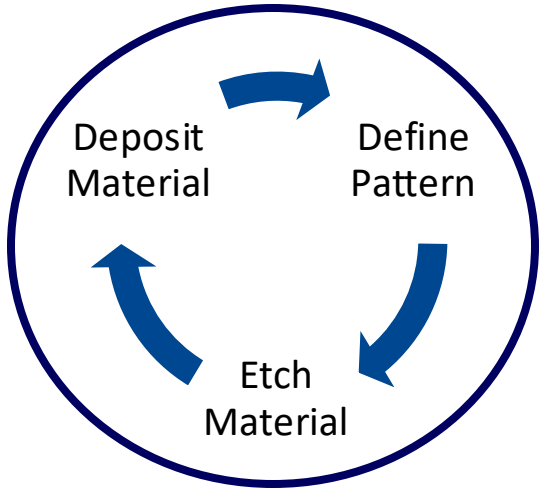
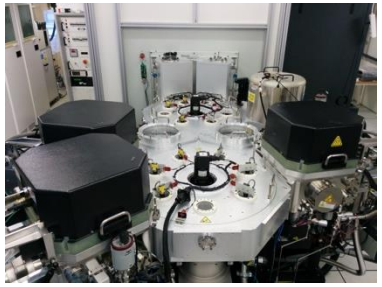
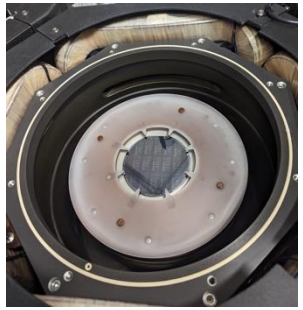
Electrum Laboratory

- 1300 m^2 cleanroom
- ISO 9001 certified / controlled processes and calibrated characterization tools
- Users: ~50 % academia and ~50% start-up/SME/RISE
- KTH + 20 other entites in 2024 (>100 individuals)







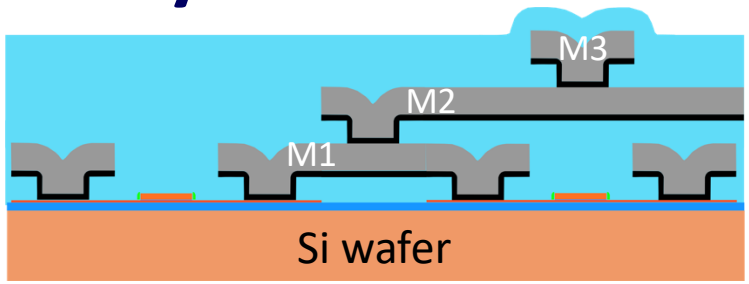


- **Silicon Technology**
- Silicon – Integated Circuits
- Silicon - Microsystems
- **Compound Semiconductors**
- SiC – High Voltage – High power, Harsh environment
- InP, GaAs, InGaAs… - opto-electronic, Infrared Imaging

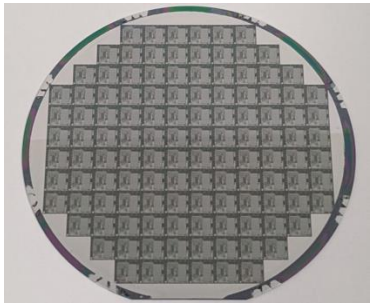
myfab www.myfab.se

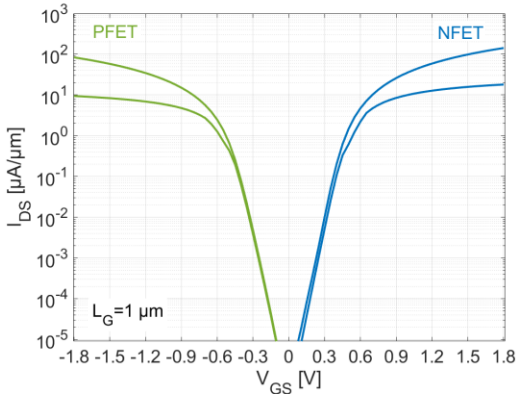
Cleanrooms in KTH, Uppsala, Lund and Chalmers

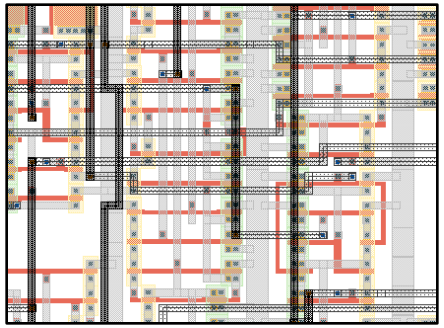
CMOS electronics in Electrum Laboratory

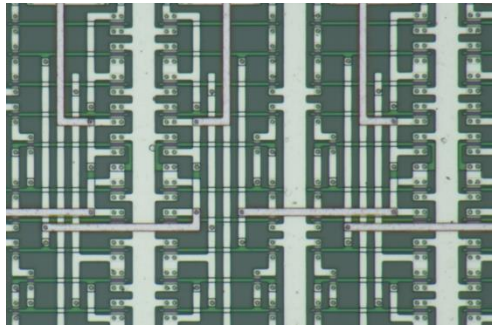


- 13 Patterning Masks
- > 40 individual process steps
- Turn around ~ 3 months
- Full Digital Design flow in Cadence
  - 10 track Cell library, P&R, timing
  - D Flip Flop is Height/Width 40/108 µm









Research field: Transparent Si electronics

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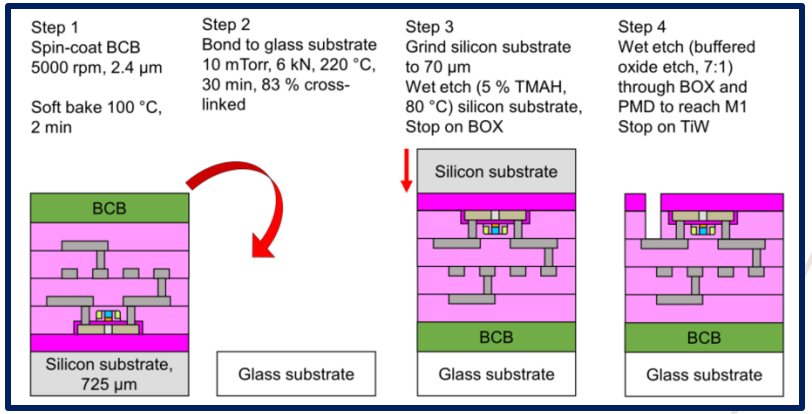
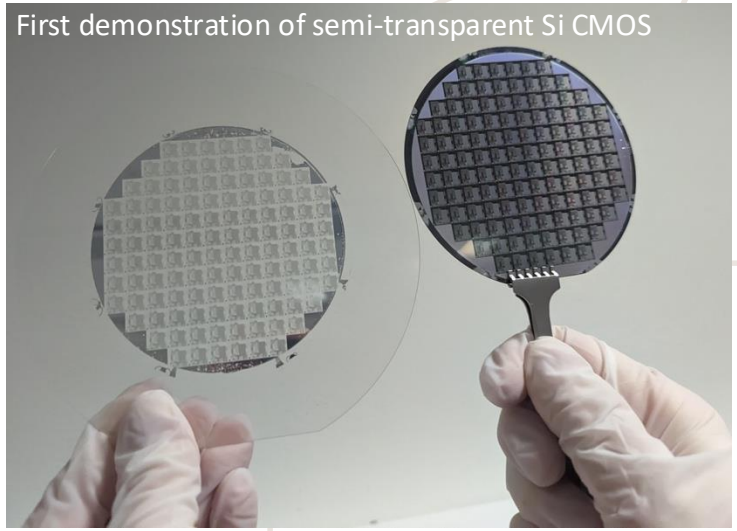
Prof. Frank Niklaus (MST)
Arne Quelmatz (MST)





High Voltage SiC Bipolar Transistors (>3.3 kV)

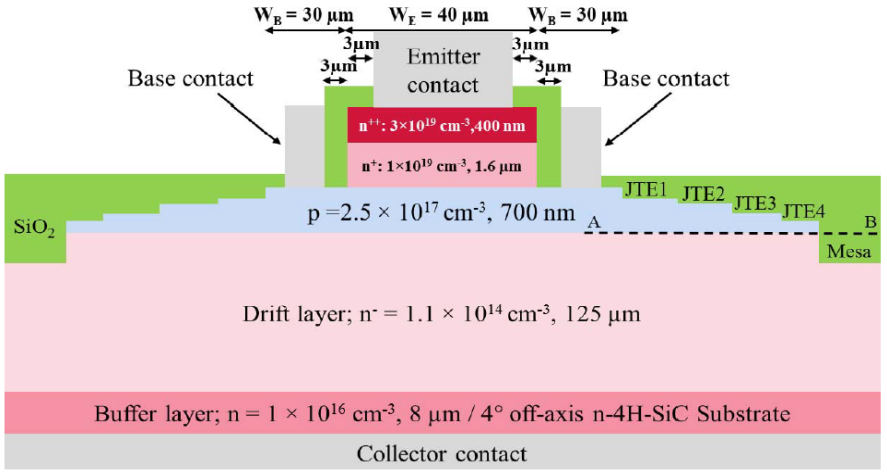


Fig. 1. Schematic cross-sectional view of the fabricated 4H-SiC BJT.

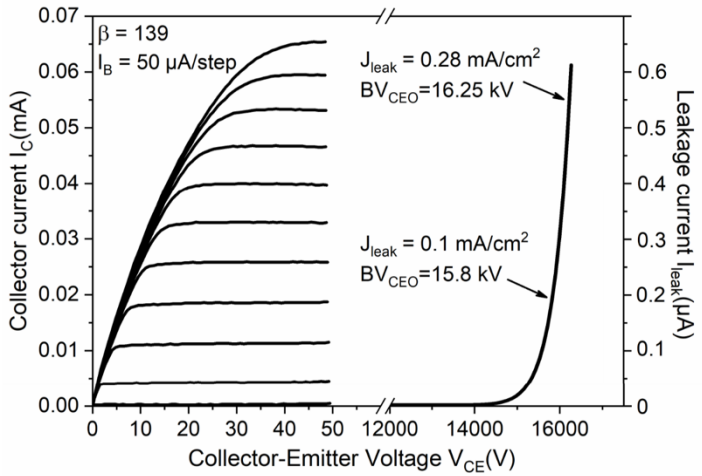


Fig. 2. Room temperature *I–V* characteristics of the fabricated 0.08 mm² (active area of 0.18 mm²) 4H-SiC BJTs with emitter width of 40 µm.

A. Salemi, H. Elahipanah, K. Jacobs, C. -M. Zetterling and M. Östling, "**15 kV-Class Implantation-Free 4H-SiC BJTs With Record High Current Gain**," in IEEE Electron Device Letters, vol. 39, no. 1, pp. 63-66, Jan. 2018, doi: 10.1109/LED.2017.2774139.

- EU Chips Act: Pilot line Advanced semiconductor devices based on Wide Bandgap materials (2025-2030) https://www.chips-ju.europa.eu/pilot-lines-detail/
- KTH's part is to:
  - Deliver devices based on the available SiC Bipolar Junction Transistor (BJT) technology that has been demonstrated to sustain up to 15 kV of collector-emitter voltage.
  - Initially offer BJT devices for 3-5 kV (TRL level 5) on 150 mm SiC wafers.
  - Research and develop Insulated Gate Bipolar Junction Transistors (IGBT) in 150 mm SiC wafers.
  - In-house available innovative, basal plane dislocation-free,1 150 mm SiC substrates from KISAB (https://kisabsemi.com/) and SiC epitaxy from Coherent (www.coherent.com).