A versatile tool for many applications... today we're going to focus on probing...
Probing on FIB Cuts

Courtesy of Cathal McAuley, Xilinx Dublin
12 micromanipulators inside an FIB/SEM
Probing a 130 nm SRAM
Challenges with sub 22 nm

• Positioning accuracy
• Safe (soft) landing on contacts
• Reliable probe tips with tip radii < 20 nm
• Clean environment: chamber, sample, probe tips
• Low sensitivity to vibrations
• Damping of acoustic noise
• Drift compensation
• Circuit Edit: Operation at FIB angle
I40 mm Prober Shuttle PS8
Loadlock compatible
Clean cabling inside and outside the chamber
Low leakage (50 fA/V), low noise
Failure analysis overview

- Defect Localization
  - Nanoprobing
    - Circuit Edit
    - Lift-Out
    - TEM Inspection
Failure analysis overview

Defect Localization

Nanoprobing

Circuit Edit in combination with Nanoprobing

Lift-Out

TEM Inspection
EBIC principle
EBIC amplifier converts measured current to grey values

defect localization with EBIC
Defect localization with RCI (EBAC)
EBIC/EBAC on 22 nm
0.6 MHz
1e8V/A
Advanced Probing Tools
Using the mouse and ShuttleXpress input device, all tips are lowered and brought into position.

iProbe - land tips
All tips landed safely!
... switch focus to APT GUI...

Live Contact Tester
Drain p-MOS
Drain n-MOS
Source

Probing in 22 nm
Circuit Edit requires stability

Drain current is stable for 55 minutes
Tilt to 52 degrees
Key Factor for Probing during Circuit Edit
Four point probing at FIB tilt
Probing during Circuit Edit
Future work: add GIS to the mix for EBID/IBID
Thank you!