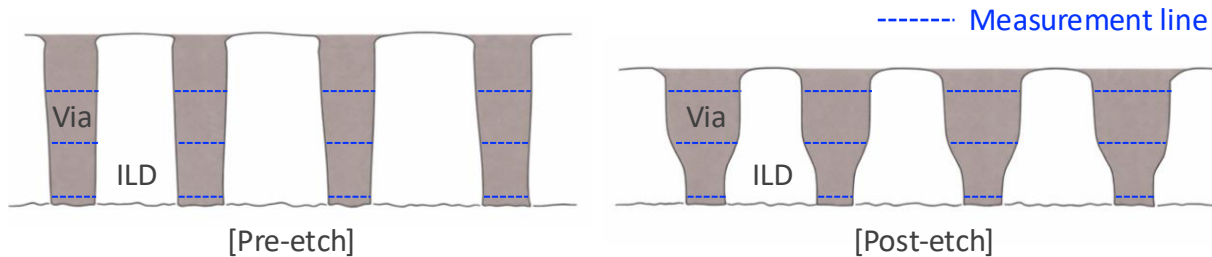


Reduced TEM analysis time by 97%, enabling data-driven process optimization

Background

▪ Via Etch Development

- Increase via metal volume using a reactive ion etching (RIE) tool
- Evaluate tool performance with TEM etch profile analysis



Motivation

▪ Time-intensive manual analysis

- ~6 minutes per image using ImageJ or Quartz PCI

Process condition evaluation requires:

- ☐ 3 via locations
- ☐ 2 cuts: X, Y
- ☐ 3 images per cut/location → **18 images total (~108 min)**

▪ Inconsistent measurement

- Results vary by person due to:

- ☐ Reference line placement
- ☐ Measurement line/ROI selection
- ☐ Pixel interpretation and click accuracy

▪ Throughput bottleneck

- DOE generates a large number of images:

One demo involves 20-25 conditions
→ Total analysis time: ~36-45 hours

Approach

- Develop a Python-based automated TEM profile analysis workflow to:
 - Automate measurement for **consistency and speed**
 - Provide **structured data** for comparison and trend analysis
 - Generate annotated images for **traceability and outlier detection**
 - Enable **custom measurement** rules on IP-controlled images

Outcome

▪ Reduced Analysis time

Manual measurement
~6 minutes per image
One condition (=18 images) → **~108 min**



Automated measurement
~30 seconds per image
One condition (=18 images) → **~3 min**

▪ Quantified etch profiles

