Electric Current Induced Thermomechanical Fatigue Testing of Interconnects

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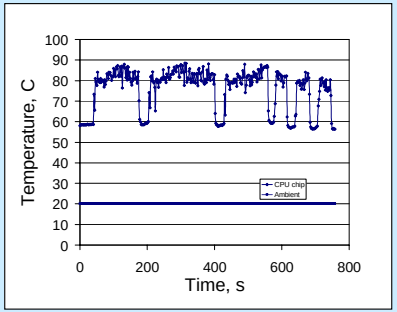
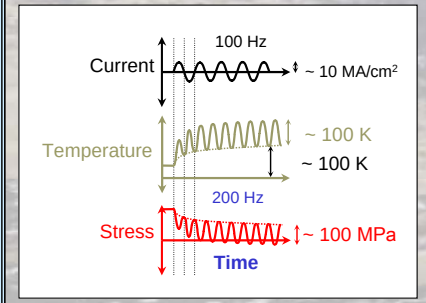
Reliability Challenge



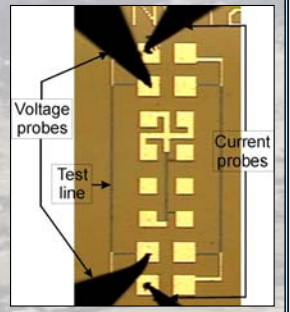
~ 27300 thermal cycles of up to 70 K over 5-yr product lifetime:

- **Power on-off**
- **Power saving modes**
- **Application modes**

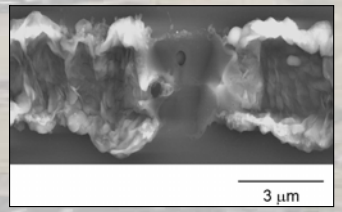
Measurement Principle



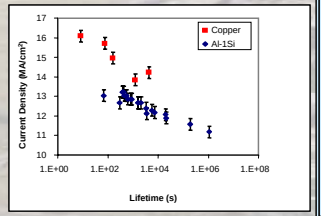
Test Structure



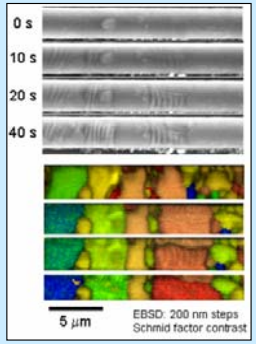
Failure Mode



Results

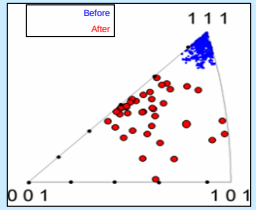


Analysis



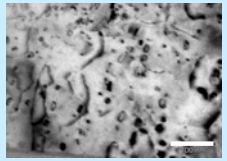
SEM – Topography changes, "cord" and "tweed", seen in mechanical fatigue tests

EBSD* – Lattice rotations in grains

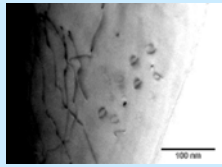


EBSD* – Lattice rotations resemble tensile behavior

*Electron back scatter diffraction



TEM – Prismatic dislocation loops from FIB'd section of AC-tested Al sample



Prismatic dislocation loops from fractured edge of MOSIS Al sample

Future work:

Electrical – Mechanical correlation

Approach:

Compare micro- nano-structural damage, failure mechanisms, property measurements in mechanical, electrical tests

By the way:

Are you signed up for the NIST nanoindentation round robin, on copper-on-silicon?

Send mail to:

read @ boulder.nist.gov

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