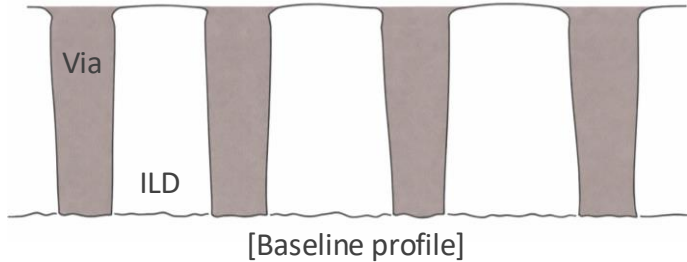


Increased Via Metal Volume While Maintaining Leakage Margin without Arcing

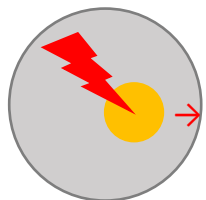
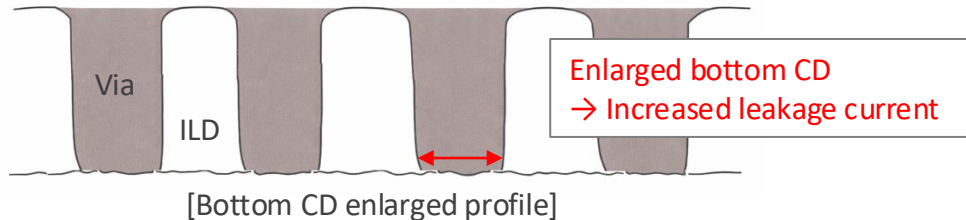
Objectives

- Via etch process development
 - Increase via metal volume while maintaining leakage margin



Challenges

- Bottom CD enlargement
 - Ion and radical bombardment at the via bottom causes **bottom CD enlargement**, resulting in **increased leakage current**
- Arcing during processing
 - Significant **plasma-induced arcing** causes **localized surface damage**

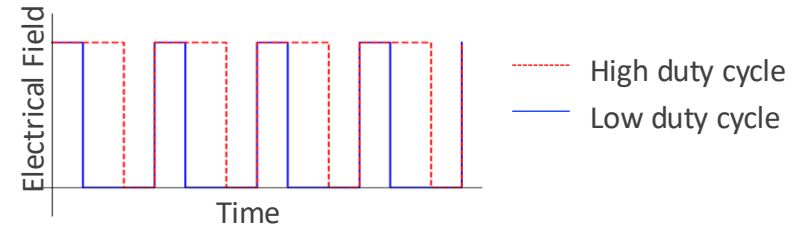


→ Charge accumulation leading to localized electric field and arcing

[Arcing on wafer]

Approach

- Gas chemistry design
 - Optimize multi-step etch gas chemistries to improve via profile while **preserving bottom CD**
- Ion beam angle control
 - Control ion beam angle to **suppress bottom CD enlargement**
- Duty cycle control
 - Adjust duty cycle to enable plasma relaxation during off periods, **mitigating charge buildup** with a controlled etch-rate trade-off



Outcome

- Target via profile achievement
 - Maintained bottom CD while increasing upper CD
- Plasma process stability
 - Eliminated plasma arcing during processing

