Lecture 7: Surface Micromachining I

- Announcements:
- HW#2 due Thursday, 2/21 at 9 a.m.
- Surface Micromachining Module 5 & Handouts online
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- Today:
- Senturia, Chpt. 3; Jaeger, Chpt. 2, 3, 6
- Lecture Topics:
  - Example MEMS fabrication processes
  - Photolithography
  - Etching
  - Oxidation
  - Film Deposition
  - Diffusion
  - Ion Implantation
- Reading: Senturia Chpt. 3, Jaeger Chpt. 11, Handouts: "Surface Micromachining for Microelectromechanical Systems", "Etch Rates for Micromachining—Part II"
- Lecture Topics:
  - Polysilicon surface micromachining
  - Stiction
  - Residual stress
  - Topography issues
  - Nickel metal surface micromachining
  - 3D "pop-up" MEMS
  - Foundry MEMS: the "MUMPS" process
  - The Sandia SUMMIT process
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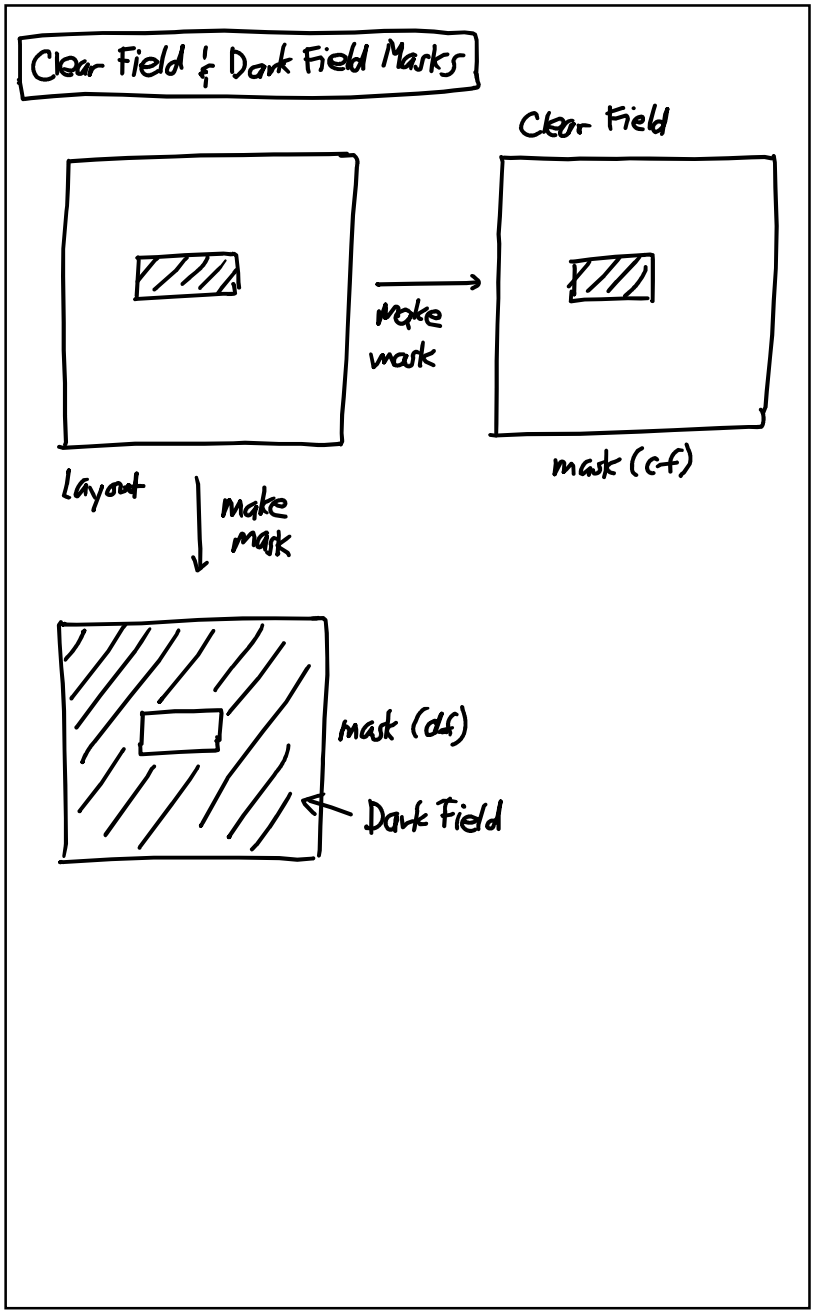
- Last Time: Diffusion section of Module 4



- Straight or Sloped Sidewalls:
- Often want sloped sidewalls in order to reduce the sharpness of corners
  - Easier to deposit over
  - Sharp corners concentrate stresses
  - High stress can weaken structures creating a reliabilty concern
  - High stress can dissipate energy, lowering Q
- When you want straight sidewalls (e.g., for lateral electrostatic drive), use a hard mask
  - PR can't last for thick structures
  - A hard mask suppresses angle transfer

Etching Sloped or Straight Sidewalls