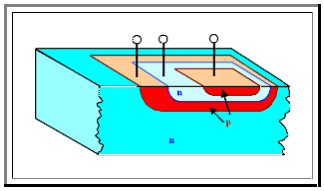
Exercise 5.1-6

Quick Questions to

5.1 Basic Considerations for Process Integration

Basic Considerations for Process Integration

- Draw a cross section of an integrated **pnp**-bipolar transistor! Denote in the drawing all doping types and the purpose of the layers!
- Compare an integrated bipolar transistor made with or without an epitaxial layer. Describe advantages and problems of either approach.
- Give a plot of the doping atom concentration as a function of depth for the kind of transistor shown. Describe qualitatively but with rough numbers as far as possible



  - Indicate the **pn** junctions in your drawing. Discuss their depth and distance in terms of process stability.
  - Describe how the doping could be administered.
  - Discuss possible problems encountered, in particular if the substrate doping is rather high.
- What function has a "buried layer" in bipolar technology?
- Draw a cross section of two integrated **p-MOSFET** transistor! Denote in the drawing the materials and the purpose of the decisive layers! Include typical lateral and vertical dimensions! Give key requirements for the dielectrics!
- Give a schematic drawing of a two-level metallization; make a list of the essential process steps and enumerate the materials used in each step.
- What exactly is a field oxide needed for?
- What is the difference between **MOS** and **CMOS**? Compare a **MOS** and **CMOS** inverter for this.
- Draw a schematic cross-section of two complementary **CMOS** transistors next to each other. Indicate the major difference to **MOS**.