

## Lecture 7 - PN Junction and MOS Electrostatics (IV)

### ELECTROSTATICS OF METAL-OXIDE-SEMICONDUCTOR STRUCTURE

September 29, 2005

#### Contents:

1. Introduction to MOS structure
2. Electrostatics of MOS at zero bias
3. Electrostatics of MOS under bias

#### Reading assignment:

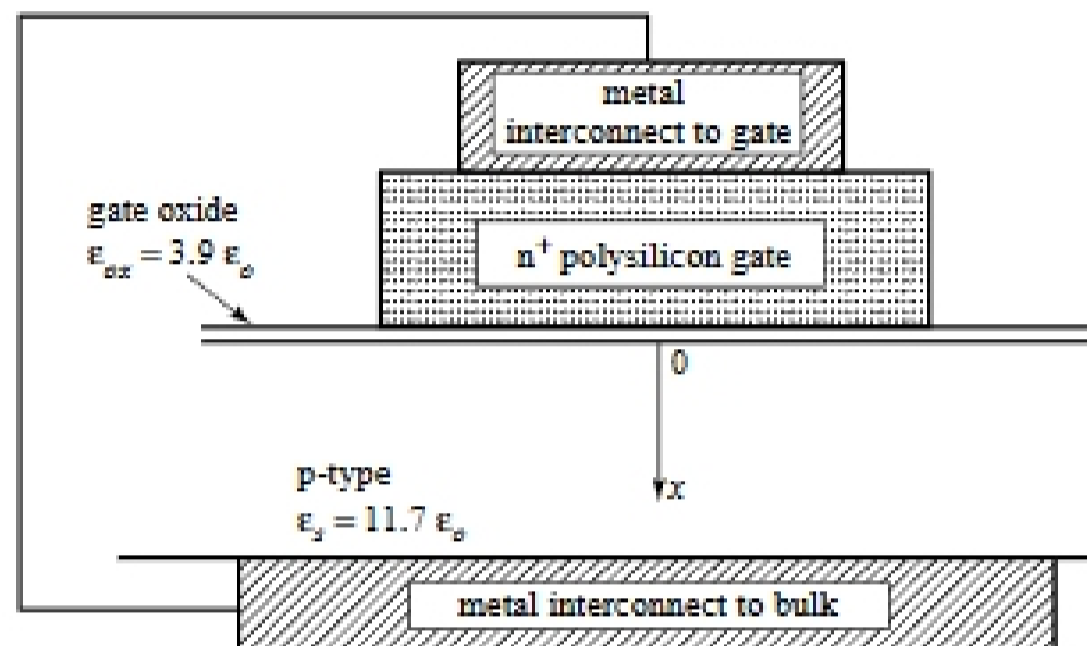
Howe and Sodini, Ch. 3, §§3.7-3.8

## Key questions

- What is the big deal about the metal-oxide-semiconductor structure?
- What do the electrostatics of the MOS structure look like at zero bias?
- How do the electrostatics of the MOS structure get modified if a voltage is applied across its terminals?

# 1. Introduction

Metal-Oxide-Semiconductor structure:



MOS at the heart of the electronics revolution:

- *Digital and analog functions:* Metal-Oxide-Semiconductor Field-Effect Transistor (**MOSFET**) is key element of Complementary Metal-Oxide-Semiconductor (**CMOS**) circuit family
- *Memory function:* Dynamic Random Access Memory (**DRAM**) and Flash Erasable Programmable Memory (**EPROM**)
- *Imaging:* Charge-Couple Device (CCD) camera, <sup>also</sup> CMOS imagers
- *Displays:* Active-Matrix Liquid-Crystal Displays
- ...