Reading guide for TSBB21, lecture 4

Lecture 4a: Image sensors physics/electronics, part 1
(Alireza Saberkari)

This lecture deepens lecture 2: Image Sensing.
However, there will be no specific questions on this lecture unless covered in lecture 2: Image Sensing

Lecture 4b: Image sensors physics/electronics, part 2
(Johan Melander, SICK)

p1-p4: Just introduction

p5-p6: Also in Range1 lecture

p7:
SICK's
"Custom CMOS image sensor plus medium FPGA"
is faster than
"Standard 2D image sensor plus large FPGA"
The first one
locates the laser profile on the chip and
less data is needed to be transported.

p9:
CMOS Image Sensor = CIS
CIS usage: Mobile phone dominates, but is also used in automotive, survelliance, digital cameras, industrial and PC
Desire: high quality small pixels

p11:
CIS needs a specialized CMOS manufacturing process
Front-end-of-line = FEOL: Contains the silicon
Back-end-of-line = BEOL: Contains the Metal wiring and interconnects

p12:
You need a good photo sensitive device (photo diode) and you cannot route any wires on top of the pixel and and you need a glass lid on top of the package!

p14:
Keyterms: Cross-talk and Full Well Capacity (FWC)
("Well" is the potential well where electrons are collected)

p15:
Know what a microlens does.

p16-17:
Two pixel variants with 3T (3 transistors) and 4T (4 transistors) per pixel:
Active Pixel with a Photo Diode (PD, 3T)
Active Pixel with Pinned Photo Diode (PPD, 4T)

p18:
Know what the advantages of the Pinned Photo Diode (PPD) are.

p19:
Know what Back-Side Illumination (BSI) means.
"Disruptive technology" means a completely new innovative technology.

p20:
Know what Deep Trench Isolation (DTI) means.

p21:
Know what the Vertical Transfer Gate (VTG) is good for.

p22:
Know what 3D stacking is good for.

p23:
All previously mentioned techniques can be combined in the CIS!
Know: For an Industrial CMOS image sensor, the pixel size is typically 6-3 micrometer!