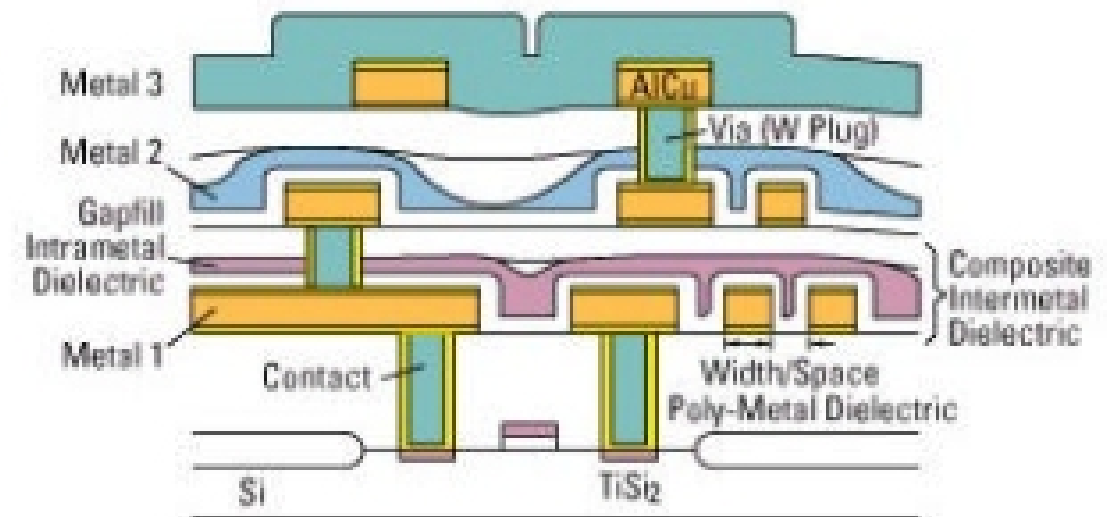


Lecture 2, February 19, 2001

EECS 105 Microelectronics Devices and Circuits, Spring 2001

Andrew R. Neureuther

Topics:
Value Added by Circuits



**Reading: (review of EE
40), HS 1, 8.2.2, 9.1**

How Does a Digital Camera Work?

- Physics (semiconductor junction)
 - » **Photons => charge => voltage**
- Analog Circuits
 - » **Amplify, gray level conversion**
- Digital Circuits
 - » **Encode, store, move, play**
- Analog Circuits
 - » **Display drivers**

Model for Photo Detector

- Film sensitivity $\sim 3 \times 10^4$ photons
 $\Delta Q_S = 3 \times 10^4$ electrons
- Junction capacitance $C_J \sim 30$ fF
- $\Delta V_S = \Delta Q / C_J = 3 \times 10^4 \times 1.6 \times 10^{-19} / 3 \times 10^{-14}$
 $\Delta V_S = 160$ mV
- Series resistance $R_S = 200$ Ohms

$$\begin{aligned} V_{\text{SOURCE}} &= V_{\text{BIAS}} + \Delta V_S \\ &= V_{\text{BIAS}} + \Delta Q / C_J \end{aligned}$$

