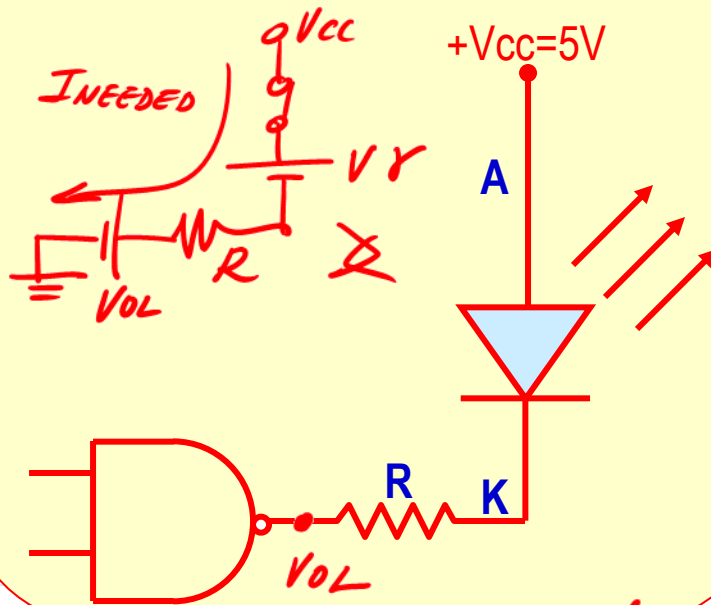


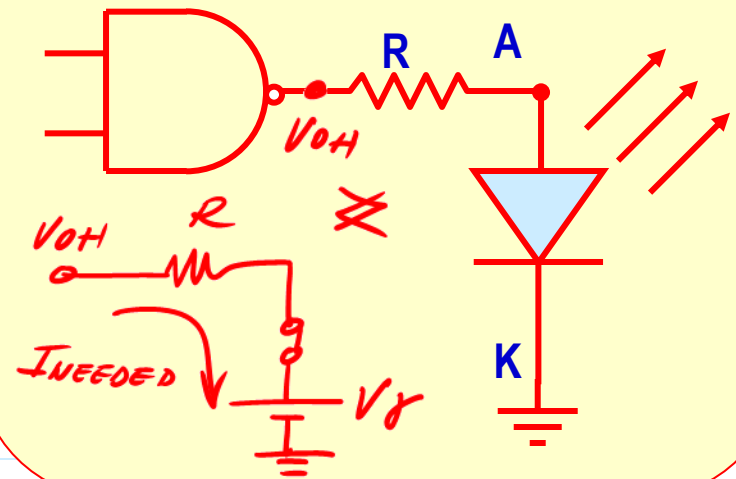
# 1.4 LED circuits

LED ON with output LOW

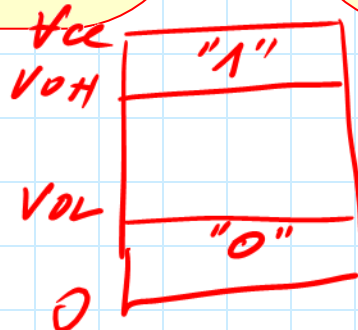


$$R = \frac{V_{CC} - V_{OL} - V_{\gamma}}{I_{NEEDED}}$$

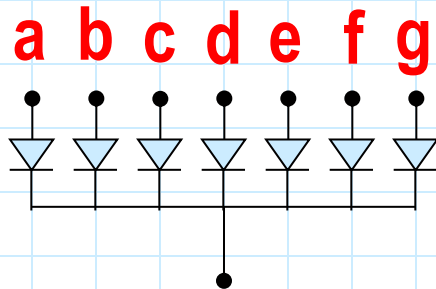
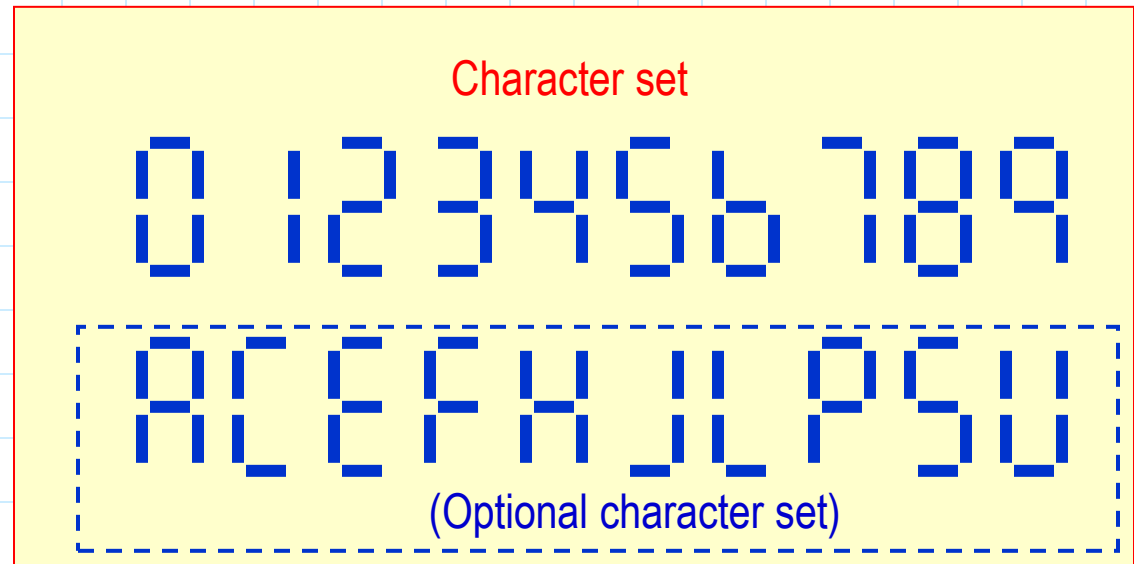
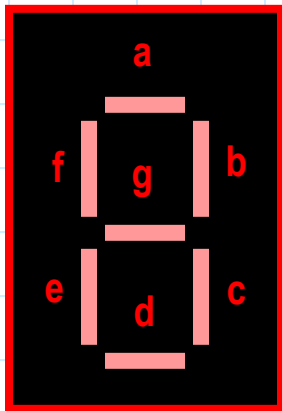
LED ON with output HIGH



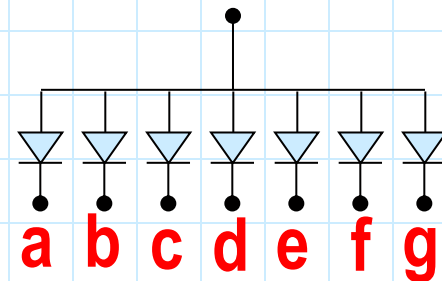
$$R = \frac{V_{OH} - V_{\gamma}}{I_{NEEDED}}$$



# 1.4. 7 segment display

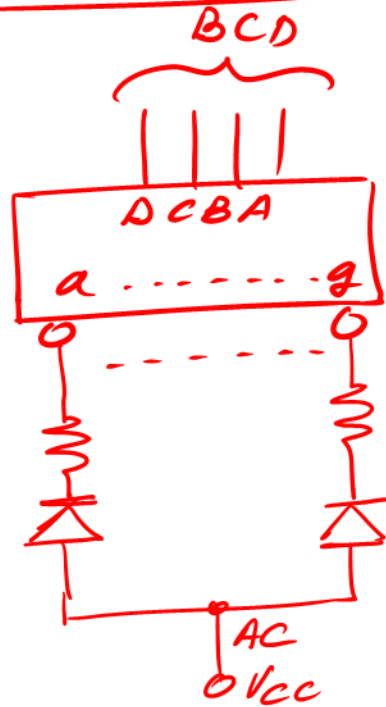


Common-cathode configuration

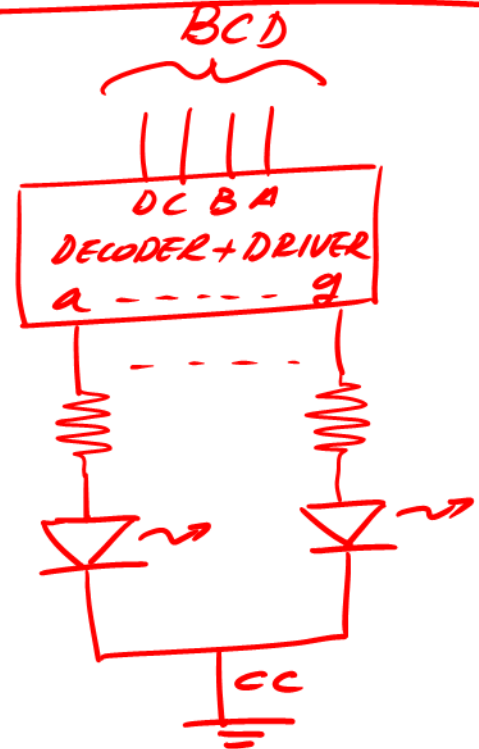


Common-anode configuration

## COMMON ANODE

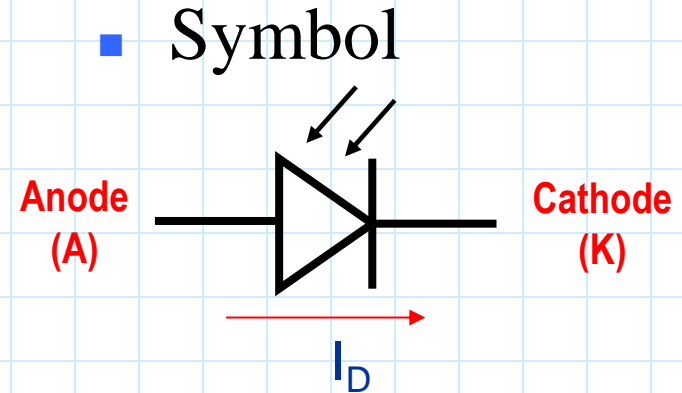


## COMMON CATHODE

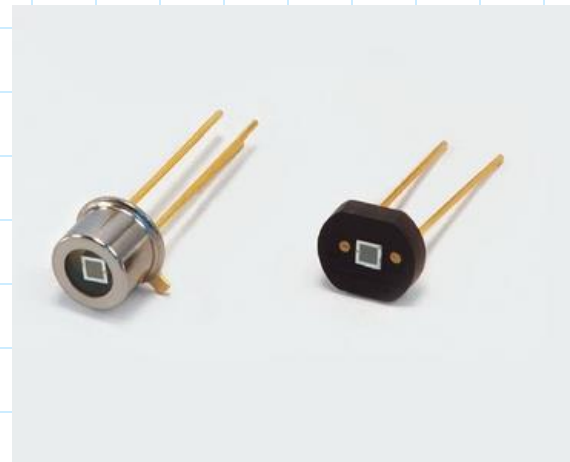


# 1.4 Photodiodes

- They work in the opposite way to LEDs
  - ◆ A reverse current is obtained from light
- The light must reach the diode junction
  - ◆ Part of the package is translucent

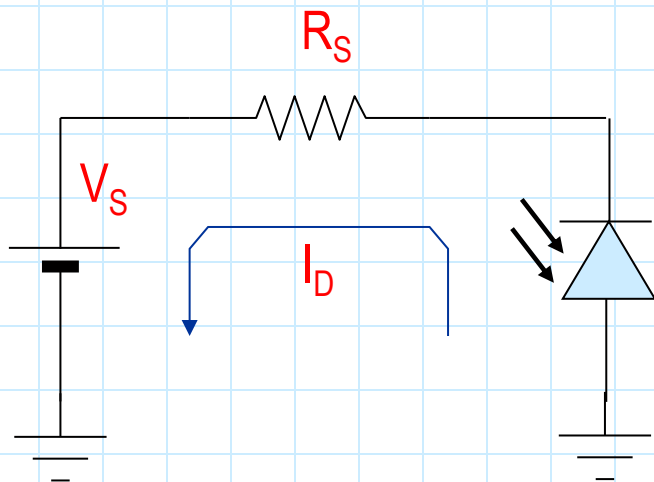


- Real photodiodes

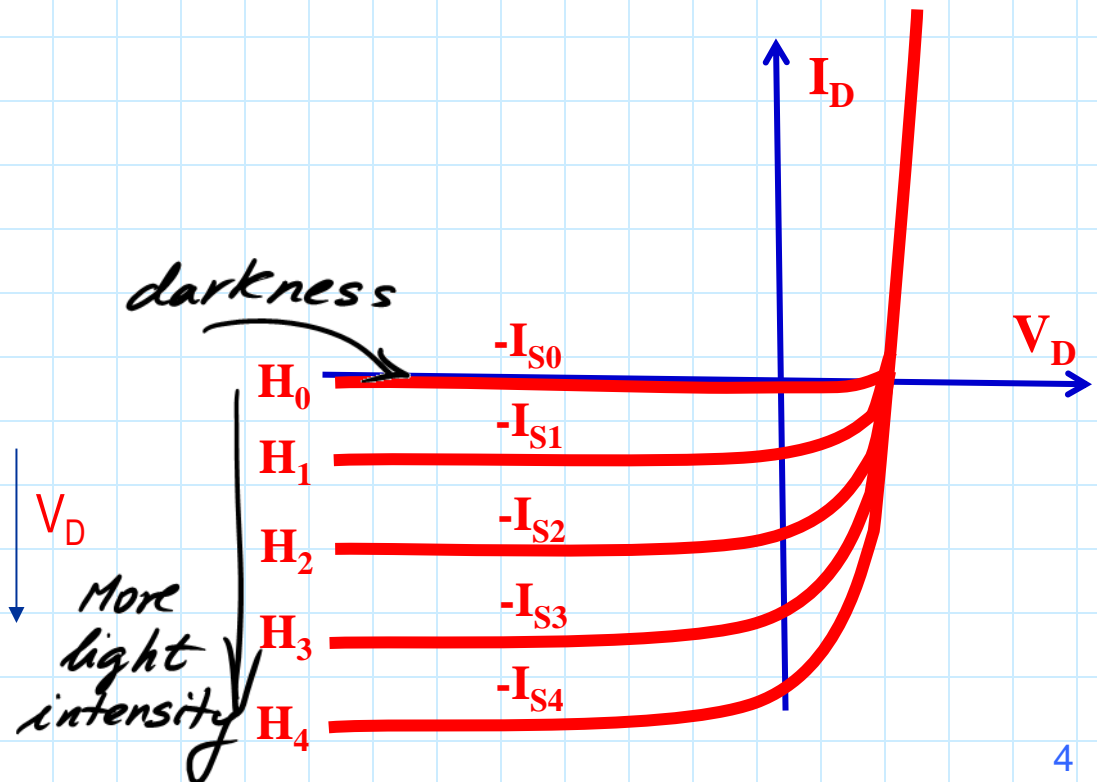


# 4. Photodiodes

- The photodiode must be in reverse bias mode
- Reverse current ( $I_D = -I_S$ ) is proportional to brightness of the received light .
  - ◆ H: Light brightness  
[fotons/s] [mW/cm<sup>2</sup>]
- Test circuit:



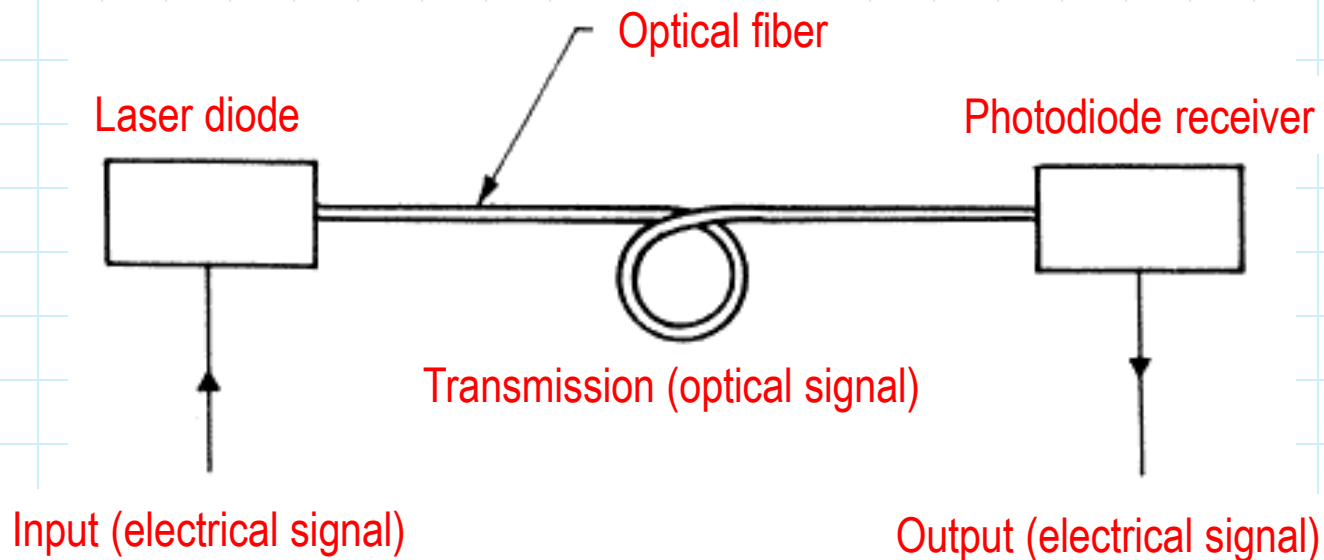
Characteristic curves



# 1.4 Applications of LEDs and photodiodes (I)

- Application to data transmission by optical fiber

*FTTH: Fiber To The Home*

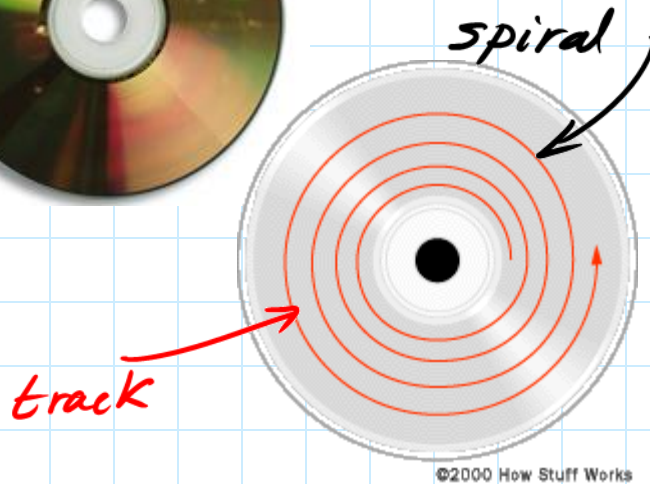


- No electromagnetic interference
- High speed (light)

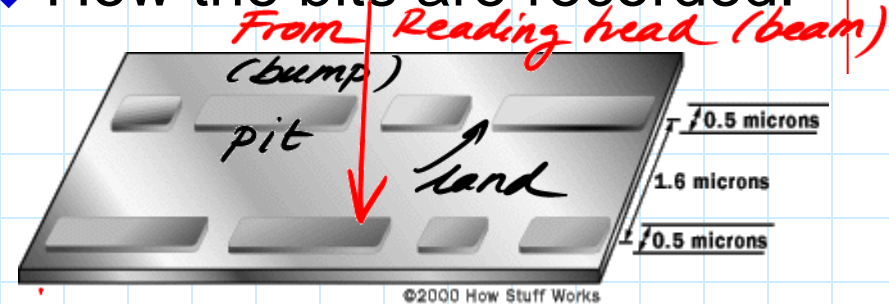
# 1.4 Applications of LEDs and photodiodes (II)

## • Reading CDs, DVDs and Blu-ray

### ◆ Information placement



### ◆ How the bits are recorded:

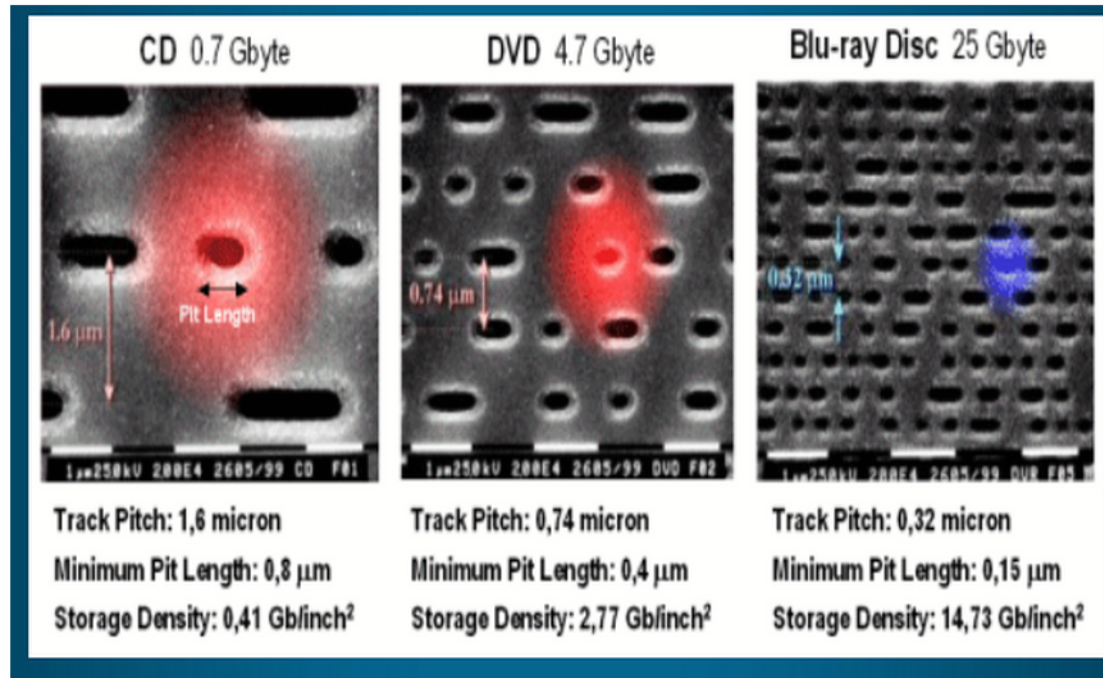


### ◆ "Pits": ("Bumps" on another side)

- 0.5  $\mu\text{m}$  wide
- 0.83  $\mu\text{m}$  long (mín.)
- 125 nm high
- In DVD & Blu-ray these values are lower (more density of information)

### ◆ "Lands"

# INFORMATION DENSITY / CAPACITY

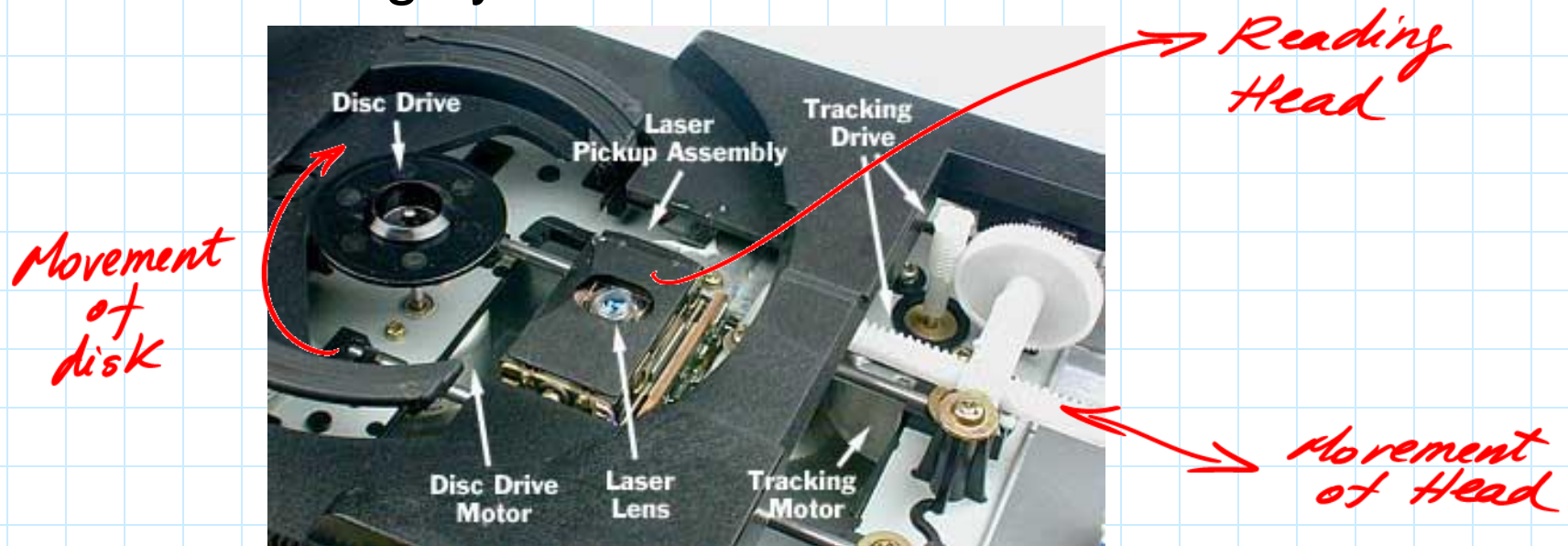




# 1.4 Applications of LEDs and photodiodes (II)

- Reading CDs, DVDs and Blu-ray

- ◆ Reading system:



- ◆ How the reading system work?

<http://static.howstuffworks.com/flash/cd-read.swf>