

Lecture 7

Spatial light modulator -- DMD

A brief history:

A digital micromirror device, or DMD, is an optical semiconductor that is the core of DLP projection technology

1987, Dr. Larry Hornbeck and Dr. William E. "Ed" Nelson of Texas Instruments (TI) develops the DMD.

1996, the first commercial DLP projector from InFocus hits the market.

2005, TI ships its 6 million unit in April.



A Few Facts About DMD MEMS Technology

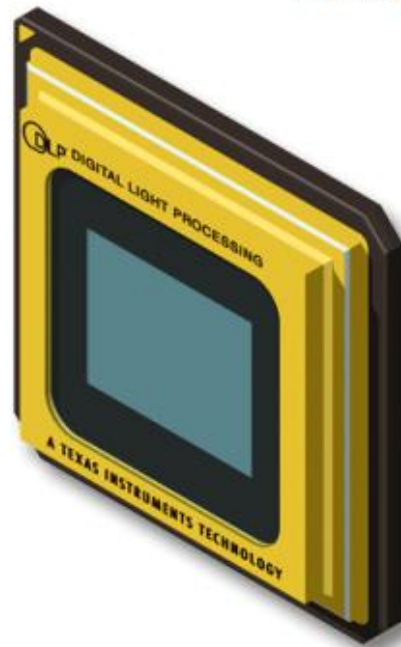
Number of mirrors
480,000 to >2,000,000

Mechanical motion
Makes discrete contacts or landings

Lifetime
>100,000 hrs

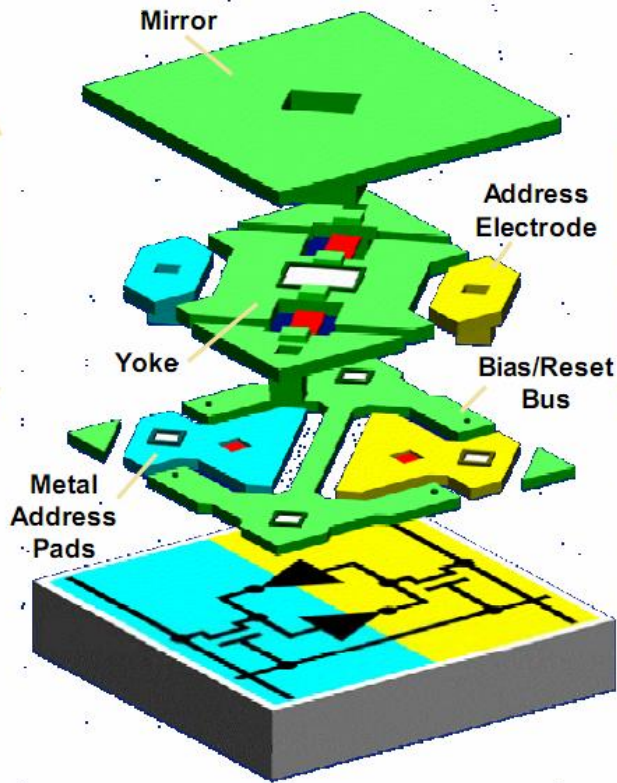
Address voltage
3.3-volt CMOS technology

Mechanical elements
Aluminum



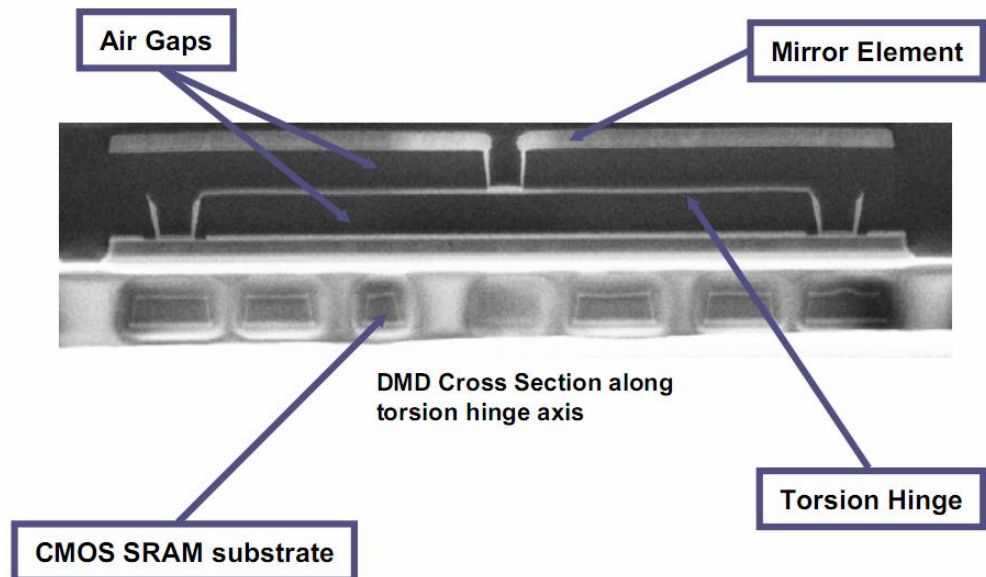
Package (Type A)
Optical, hermetic, welded lid

Process
Low temperature, sputter deposition,
plasma etch (standard SC processes)

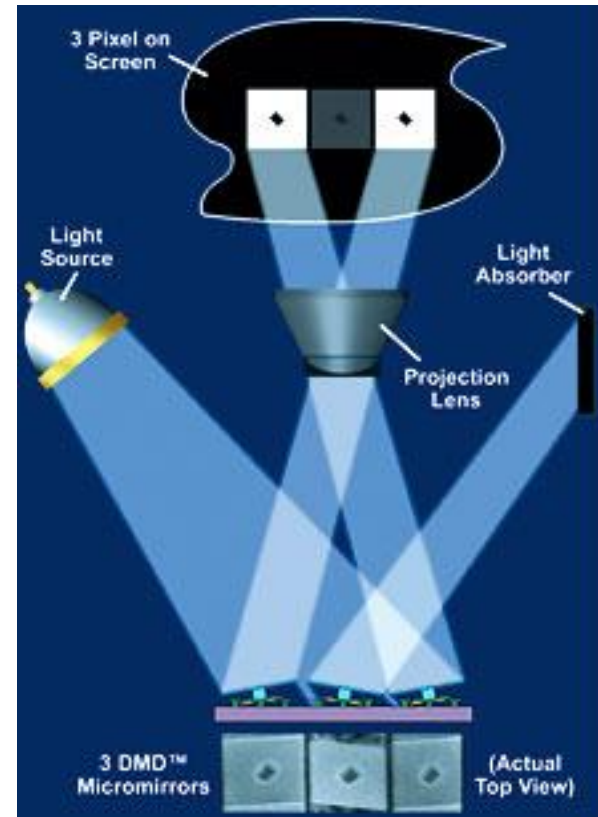
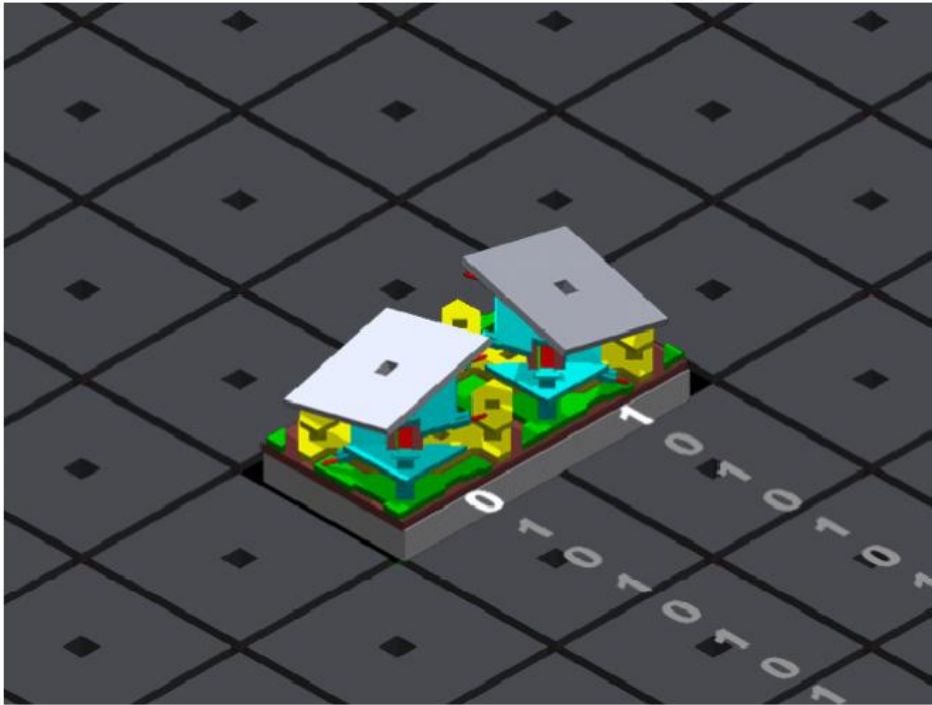


- ◆ Mirror: reflects light
- ◆ Control electrodes and yoke: switches ± 12 degrees in μs
- ◆ Precise digital control
- ◆ SC standard process metal interconnect for control electrodes

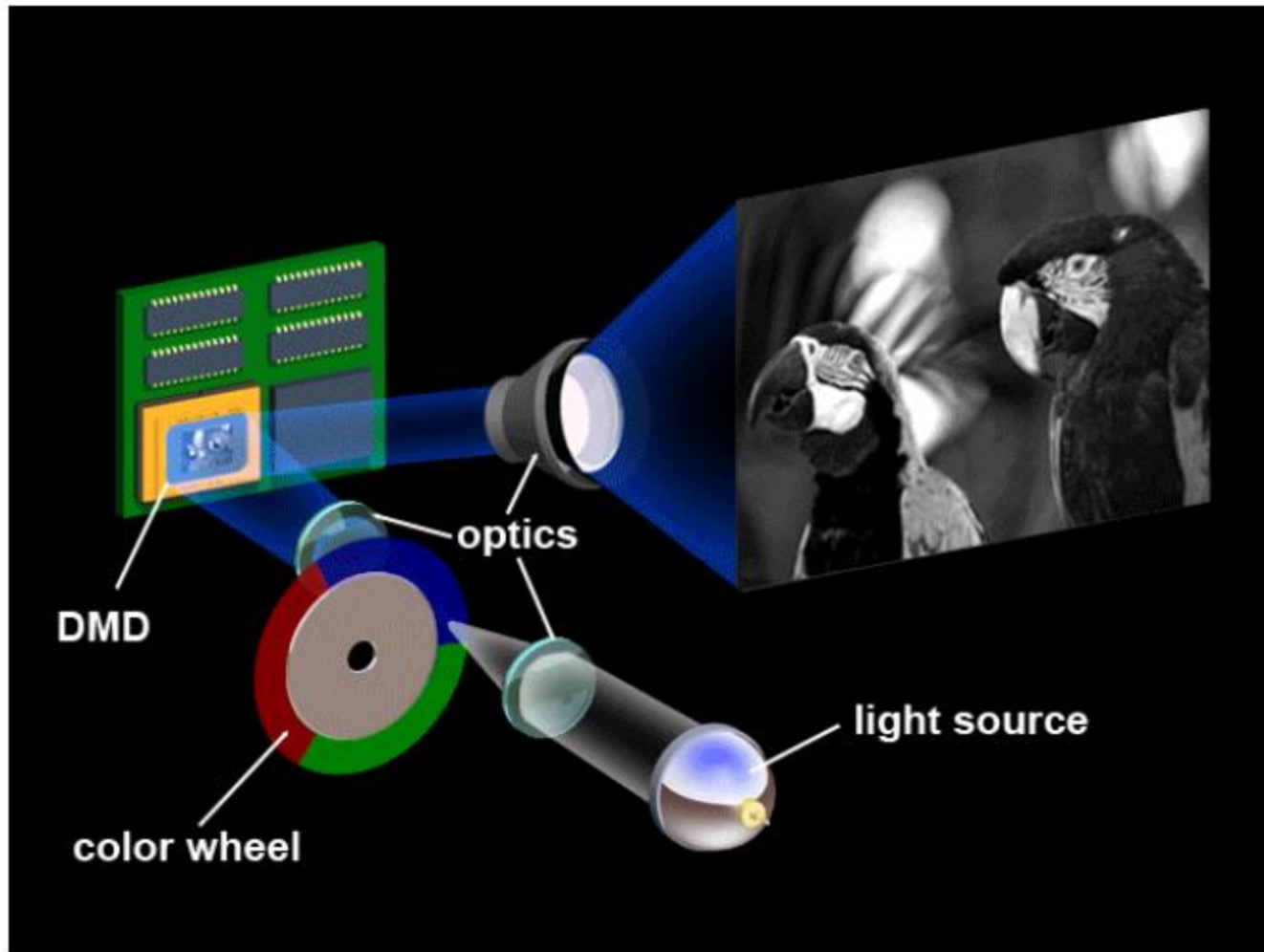
Cross Section of DMD element



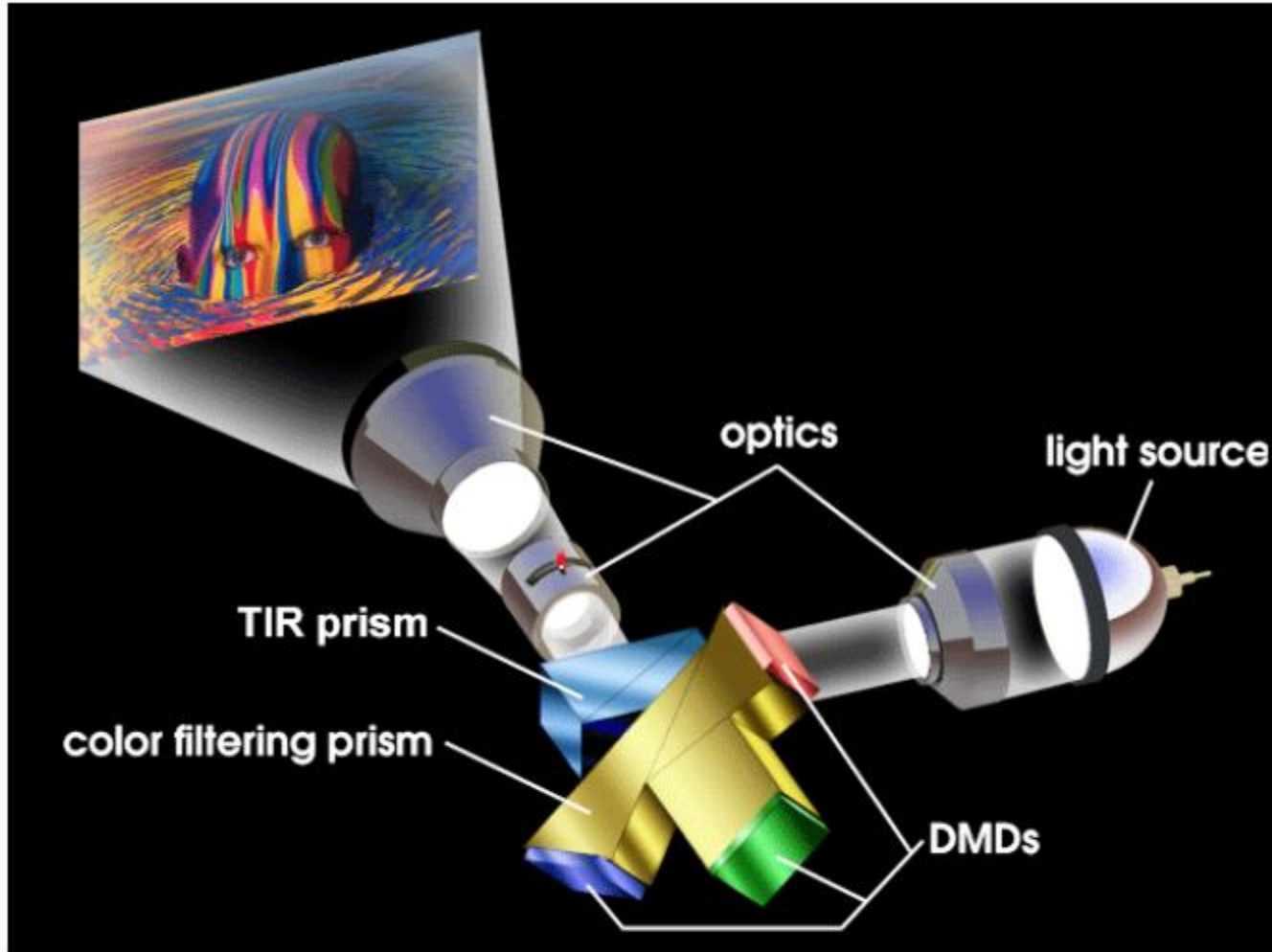
How it works



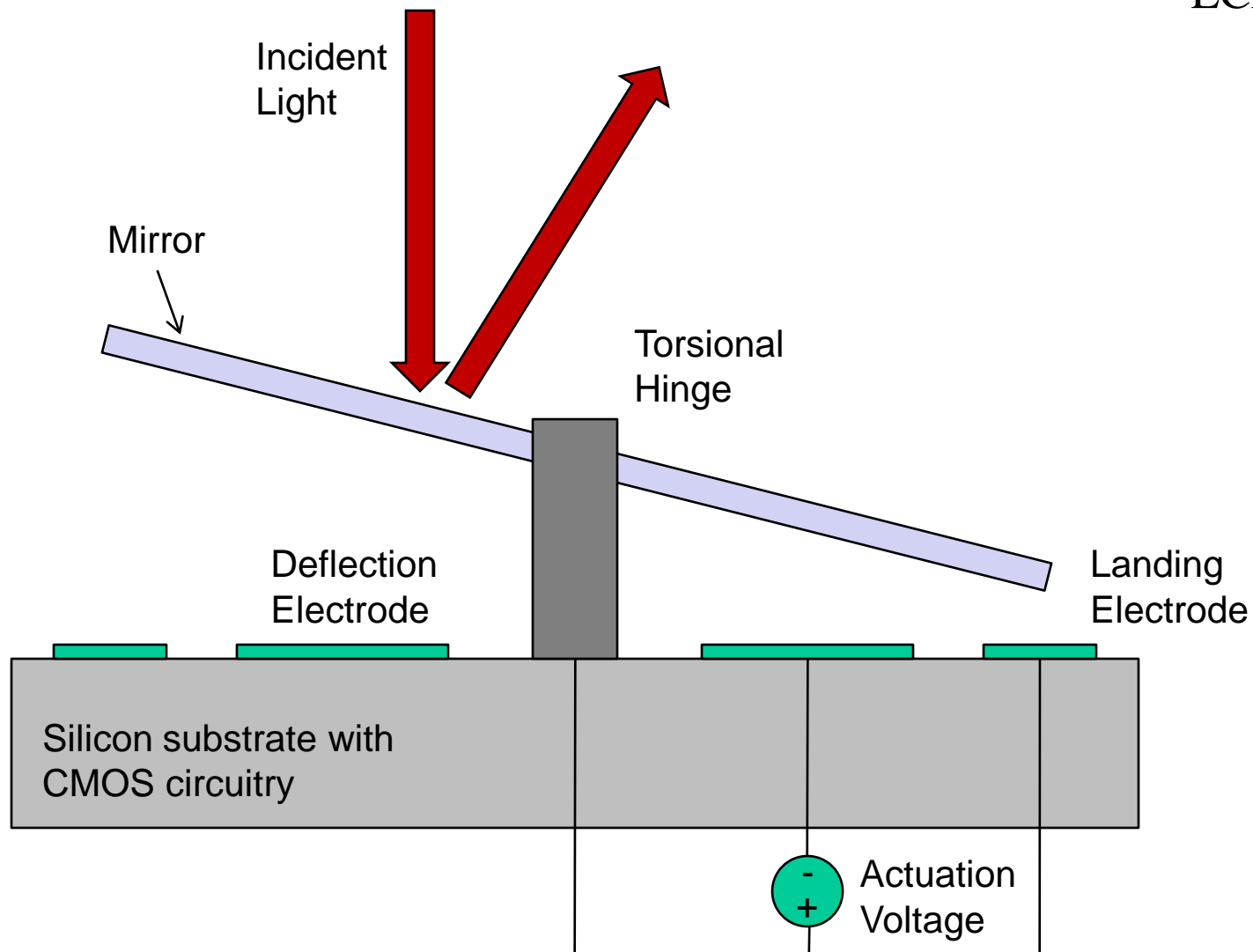
One chip solution – time multiplexing



Three chips solution



**DLP® technology for commercial, high-end home,
and digital cinema applications**



Conceptual illustration of the basic operation of a DMD. The tip of the torsional plate is allowed to land on an equipotential “landing electrode” to prevent sticking. Actual mirror designs have evolved considerable over time and are more complex.