

# UVDI Technology Overview



**SILICON  
LIGHT  
MACHINES**

A **SCREEN** COMPANY

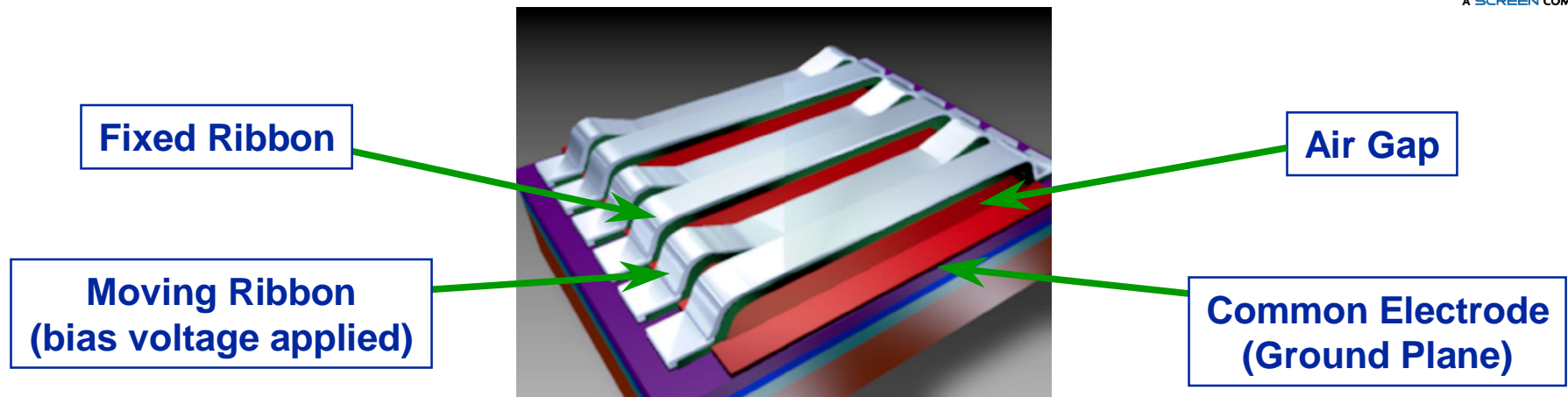
Ultra Violet Direct Imaging

Based on

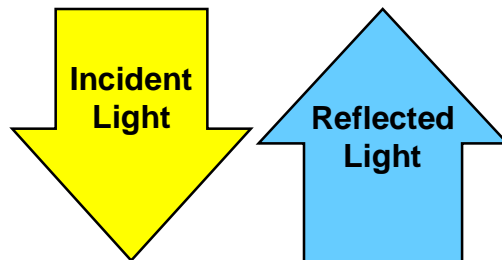
Integrated GLV Technology

# Grating Light Valve™ Technology

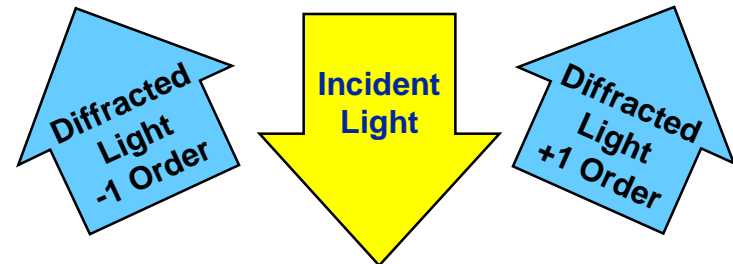
## Spatial Light Modulation Based on Diffraction



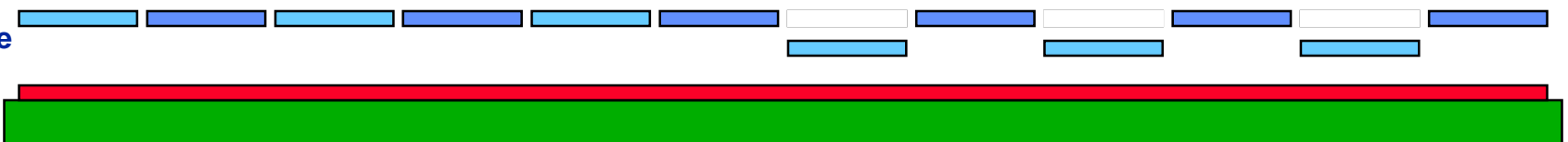
**Specular State Æ No Bias**



**Diffraction State Æ Bias Applied**



GLV Device  
Cross  
Section

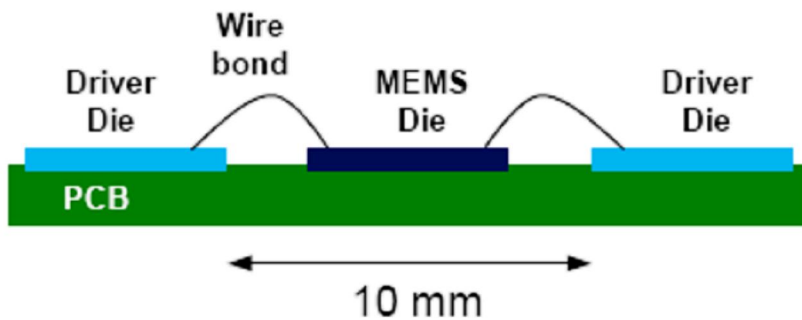


# Integrated MEMS – What is it?

- **Integration = CMOS + MEMS on the same chip**
- **MEMS devices must be interfaced to outside world. These interfaces can fall into 2 general categories:**
  - Multi-chip packaging solutions (multiple chips wire-bonded)
  - Monolithic integration solutions (single chip)
- **Motivation for integration:**
  - Performance (high density, low parasitics, e.g. iGLV)
  - Cost (reduced component count)
- **SLM is one of the few companies to successfully realize a fully integrated MEMS/CMOS device (iGLV)**
  - 2006: SLM integrated GLV with Cypress Via-link 2.7 process
  - 2009: SLM is integrating GLV with Freescale SmartMOS07

# Discrete & Integrated Solutions

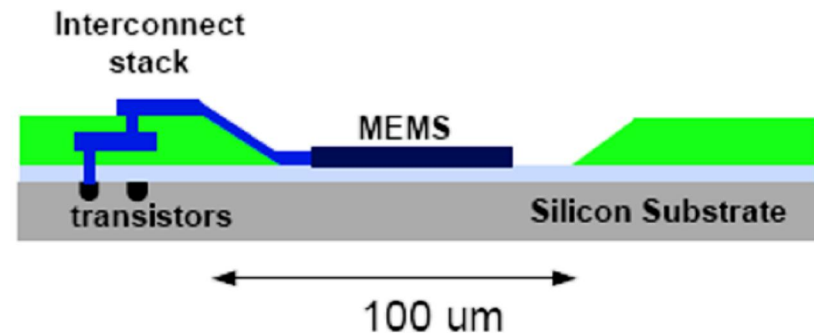
**Multi-chip Module**



- **Worked well for CtP application**

- 1088 channels
- 28 mm die length
- 25.5  $\mu\text{m}$  channel pitch

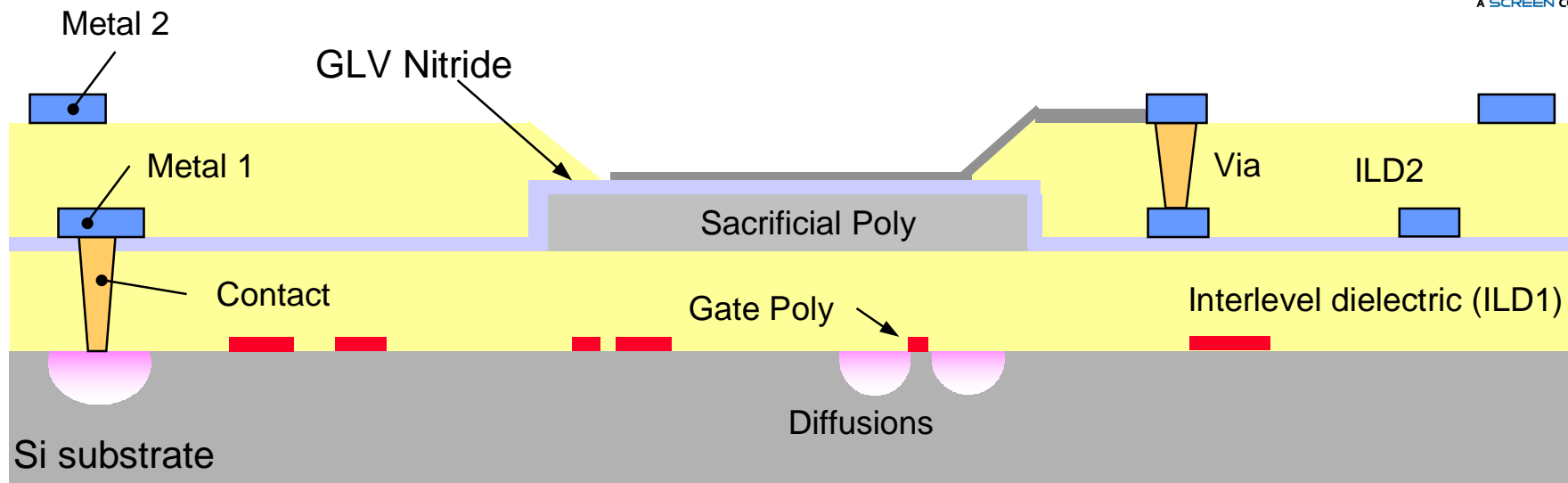
**Monolithic Integration**



- **Required because of UVDI channel count**

- 8192 channels
- 41 mm die length
- 5  $\mu\text{m}$  channel pitch

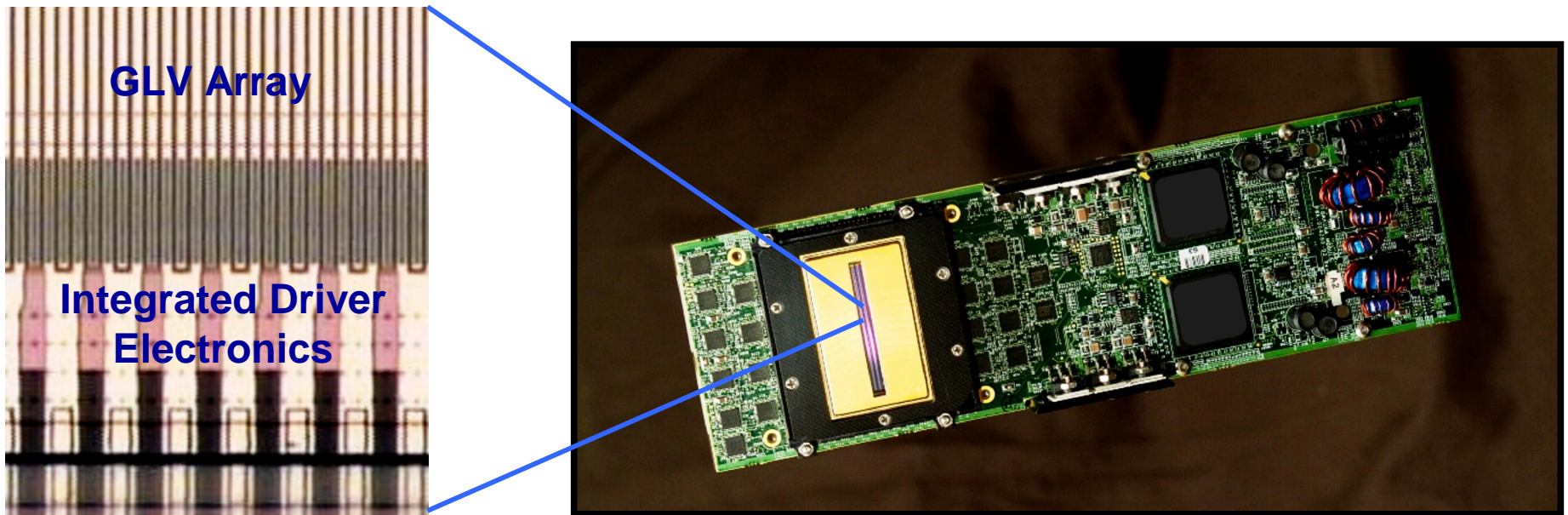
# Integrated Process Flow



- Transistor diffusions are first.
- Poly-Si gate lines followed by first insulating oxide & polish (CMP)
- Contacts are drilled & filled. Surface is polished again.
- GLV sacrificial layer is deposited & patterned
- LPCVD silicon nitride ribbon deposition.
- Metal1 deposited & patterned, more dielectric, vias, and Metal2.
- GLV re-exposed with high-selectivity etching & final interconnect
- Final MEMS ribbon patterning. GLV complete

# New 8K Integrated GLV Device

- GLV linear array has 8192 addressable elements
- 12-14 bit Grayscale (independent of frame rate)
- Designed for UV applications



# Direct Write Lithography Applications



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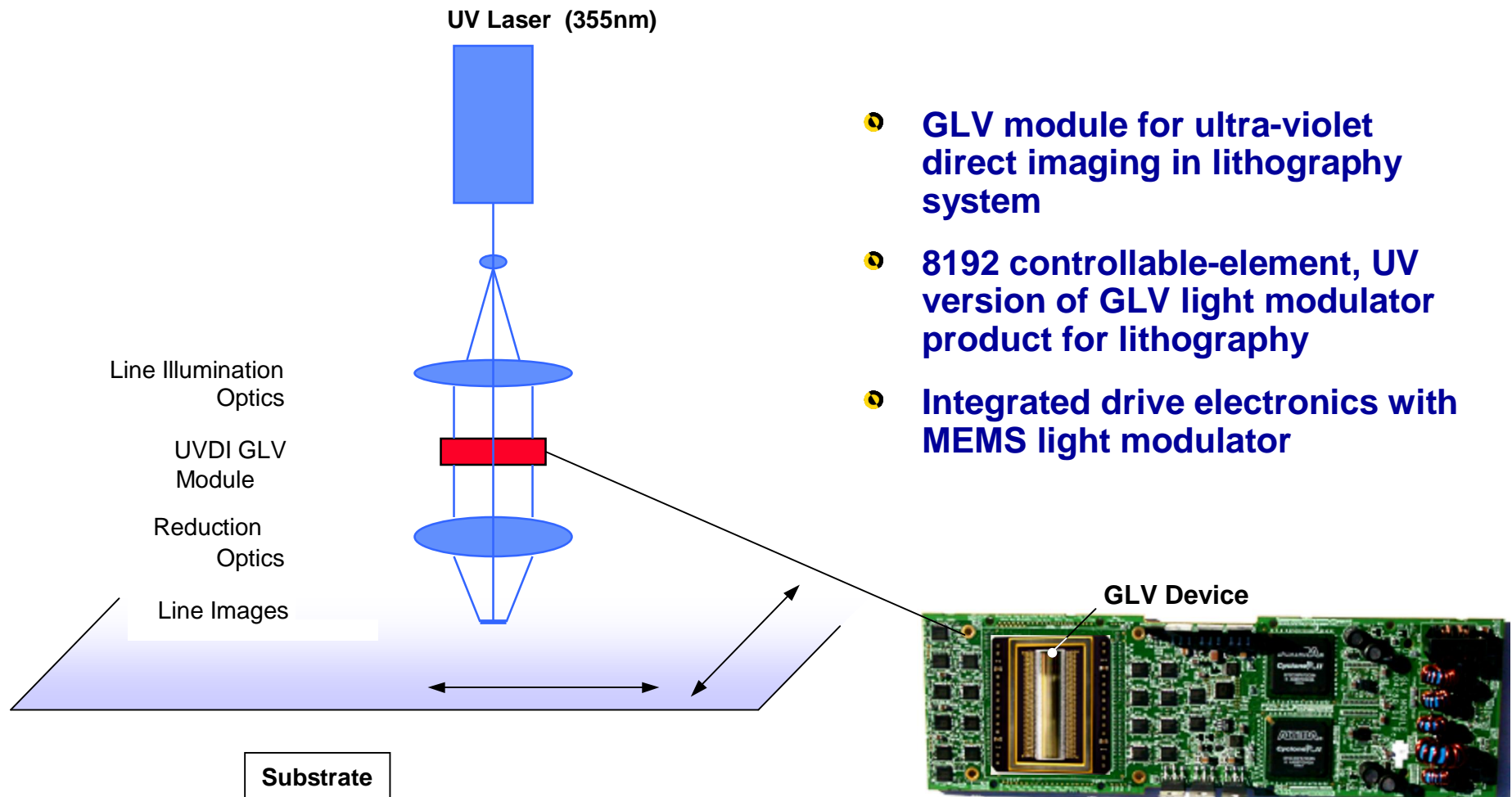
# GLV™ Direct Write Lithography



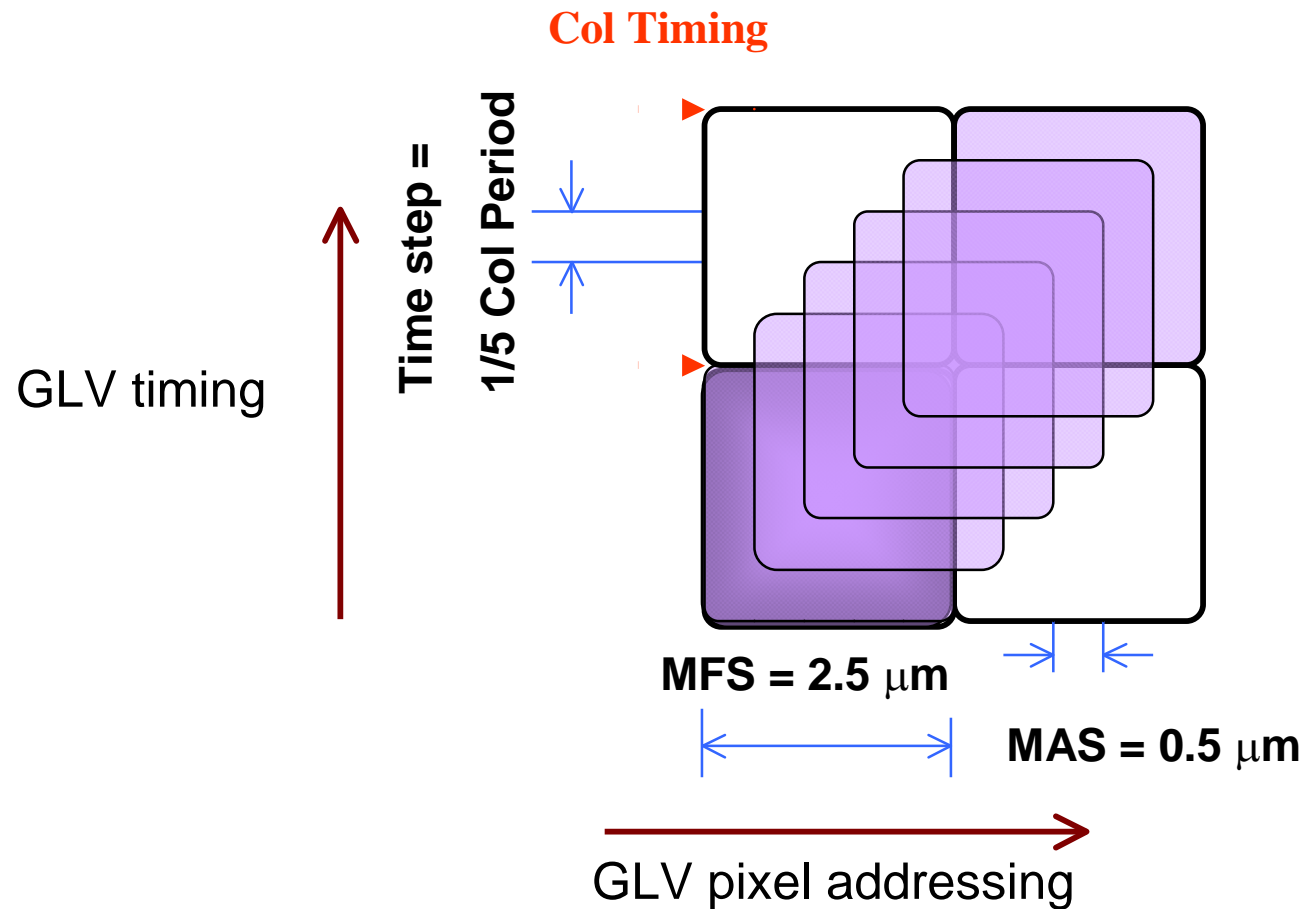
- **Developed new, high pixel count Ultra Violet Digital Imaging (UVDI) GLV module**
- **Customer system currently in Beta trials in production fab**
- **UVDI Module can be modified for visible (RGB) applications**



# Maskless Lithography using GLV



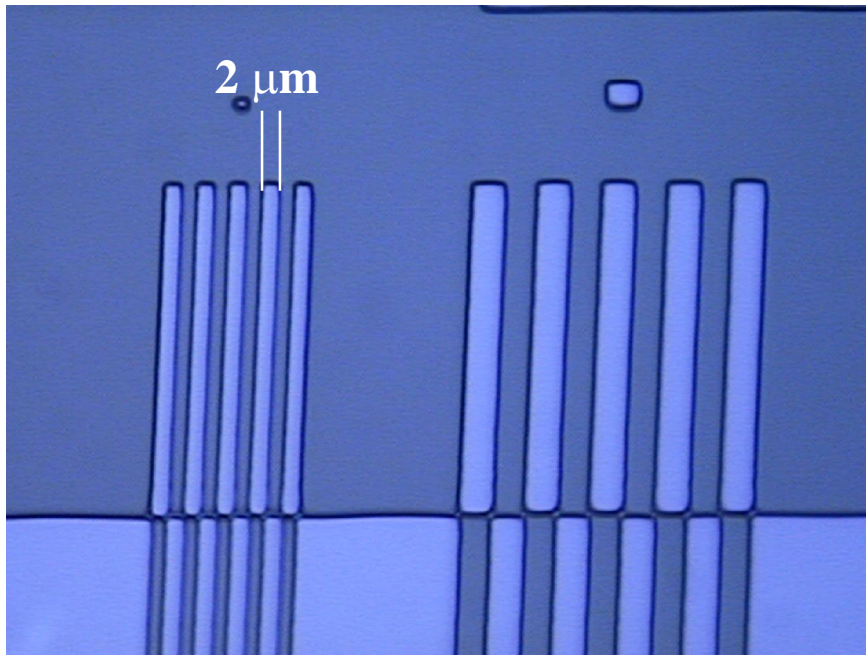
# Micro-address Technology



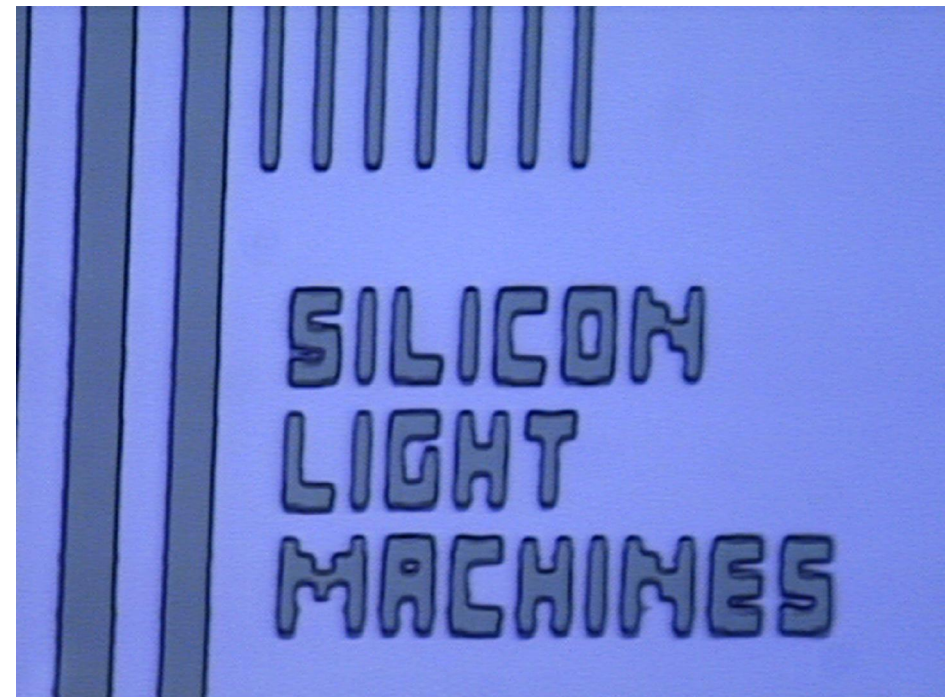
MFS: Minimum Feature Size

MAS: Minimum Address Size

# GLV Maskless Lithography



- 355nm exposure
- I-line resist
- 2 micron resolution



# Wafer Direct Imaging



- 300 mm wafer
- 2.5  $\mu\text{m}$  resolution

Provided by courtesy of  
**Dainippon Screen R&D Center**



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***Thank you!!***