# UVDI Technology Overview

SILICON LIGHT MACHINES

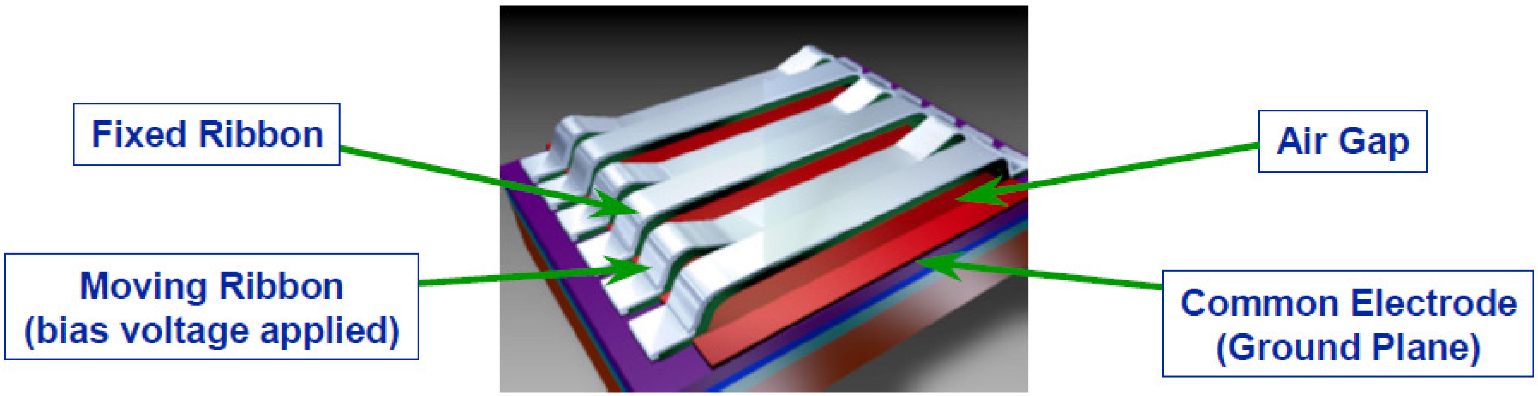
A SCREEN COMPANY

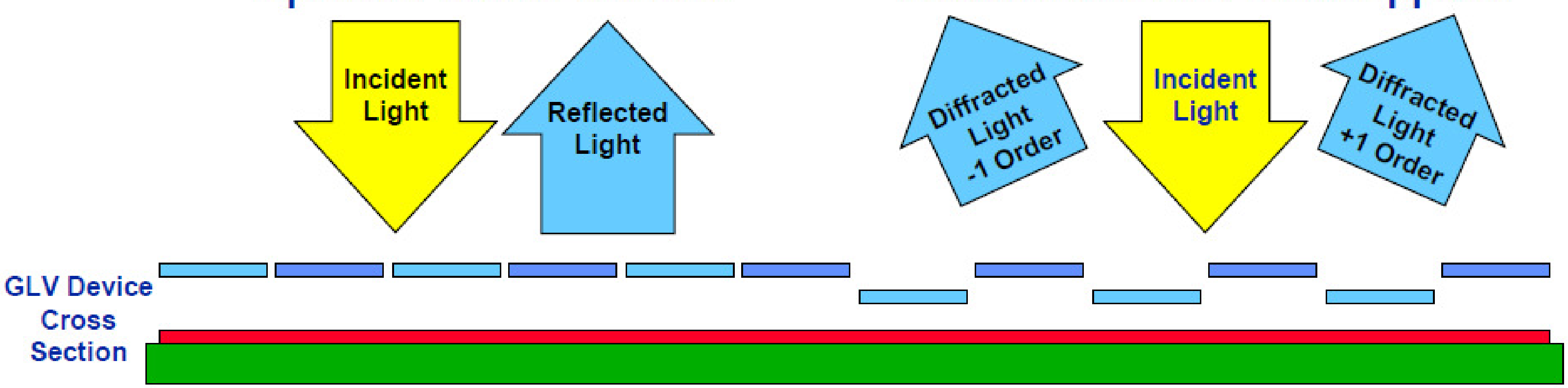
**UltraViolet Direct Imaging**

**based on**

**Integrated GLV Technology**

# Grating Light Valve™ Technology
## Spatial Light Modulation based on Diffraction



# Integrated MEMS – What is it?

- **“Integration” = CMOS + MEMS on the same chip**
- **MEMS devices must interface to outside world.  These interfaces can fall into two 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 and Integrated Solutions

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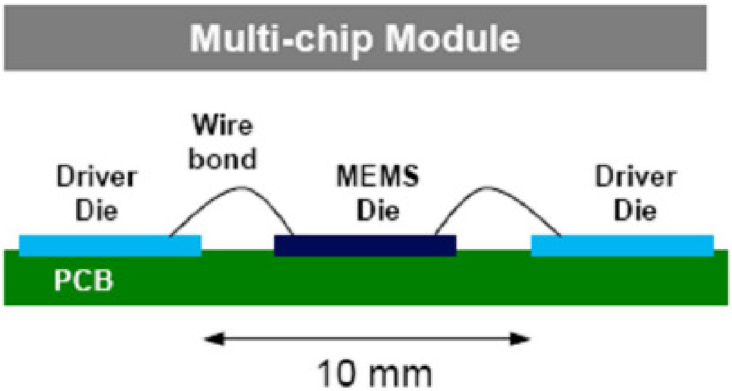
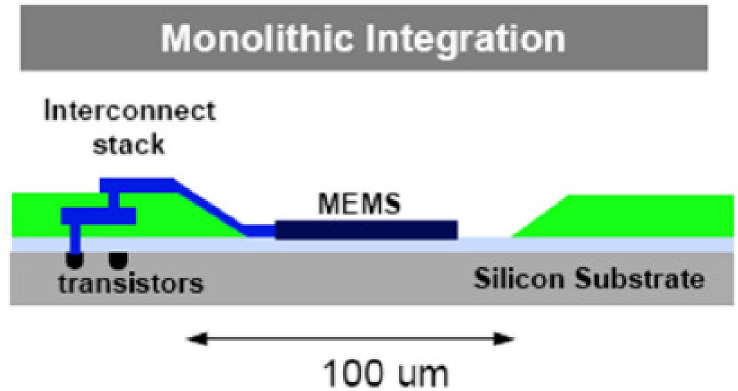
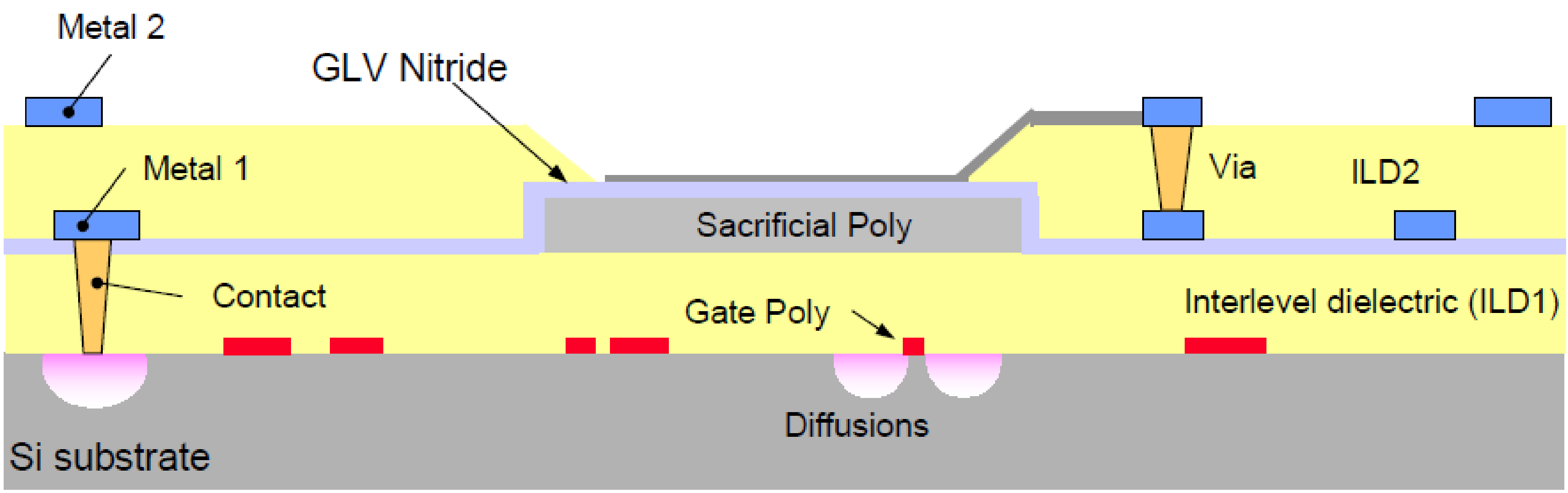



- **Worked well for CtP application**
  - 1088 channels
  - 28 mm die length
  - 25.5 um channel pitch

- **Required because of UVDI channel count**
  - 8192 channels
  - 41 mm die length
  - 5 um channel pitch

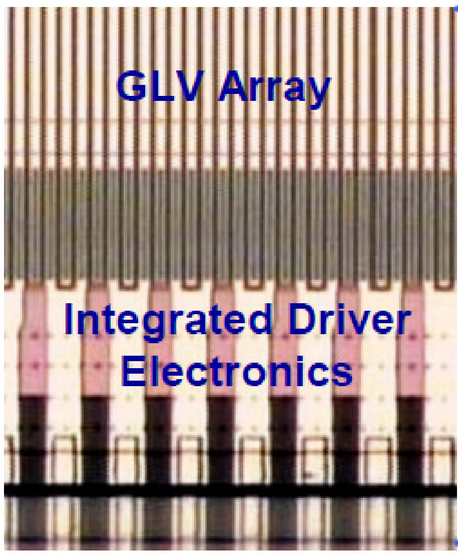
# Integrated Process Flow

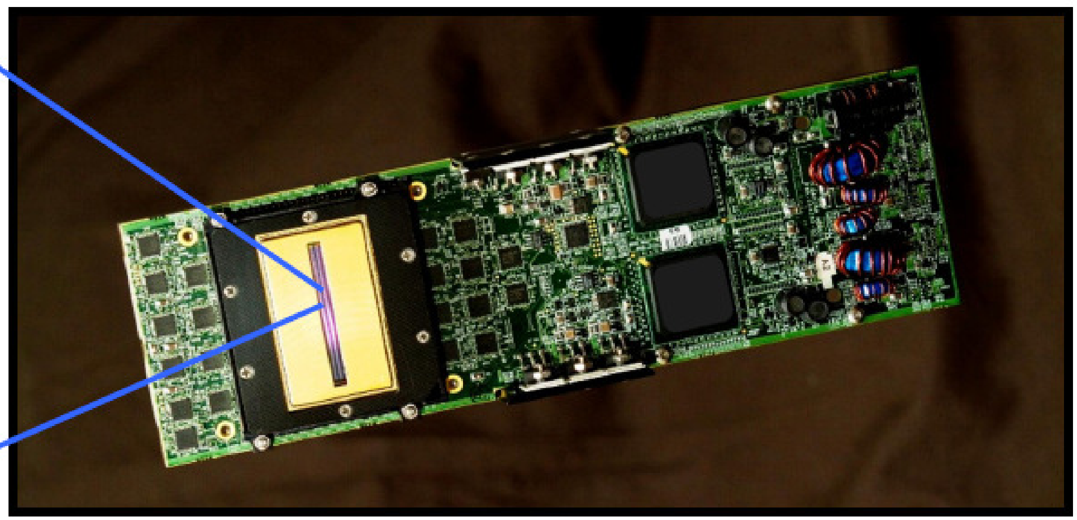



- Transistor diffusions are first.
- Poly-Si gate lines followed by first insulating oxide & polish (CMP)
- Contacts are drilled & filled. Surface is polished again.
- GLV sacrificial layer is deposited & patterned
- LPCVD silicon nitride ribbon deposition.
- Metal1 deposited & patterned, more dielectric, 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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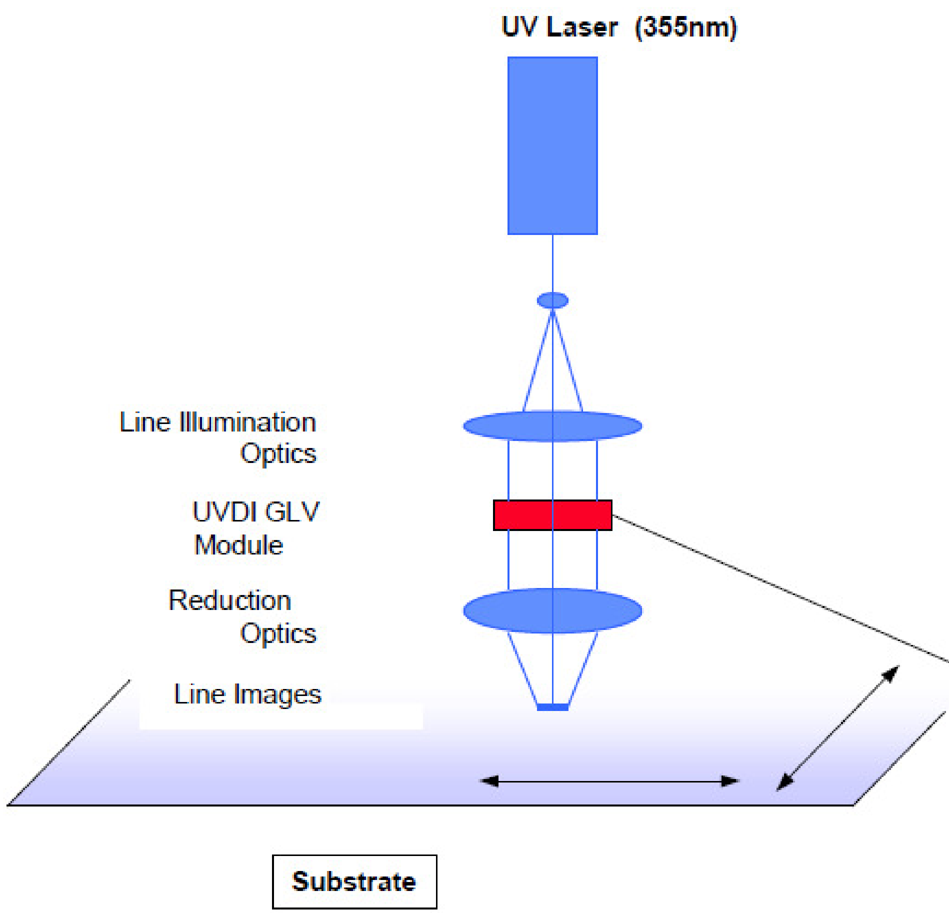
# GLV™ Direct-Write Lithography

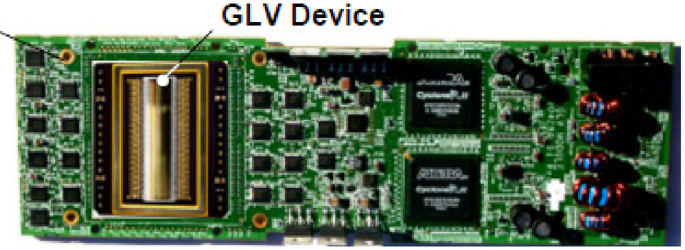
- Developed new, high pixel count Ultra Violet Digital Imaging (UVDI) GLV module
- Customer system currently in Beta trials in production fab
- UVDI module can be modified for visible (RGB) applications

# Maskless Lithography Using GLV

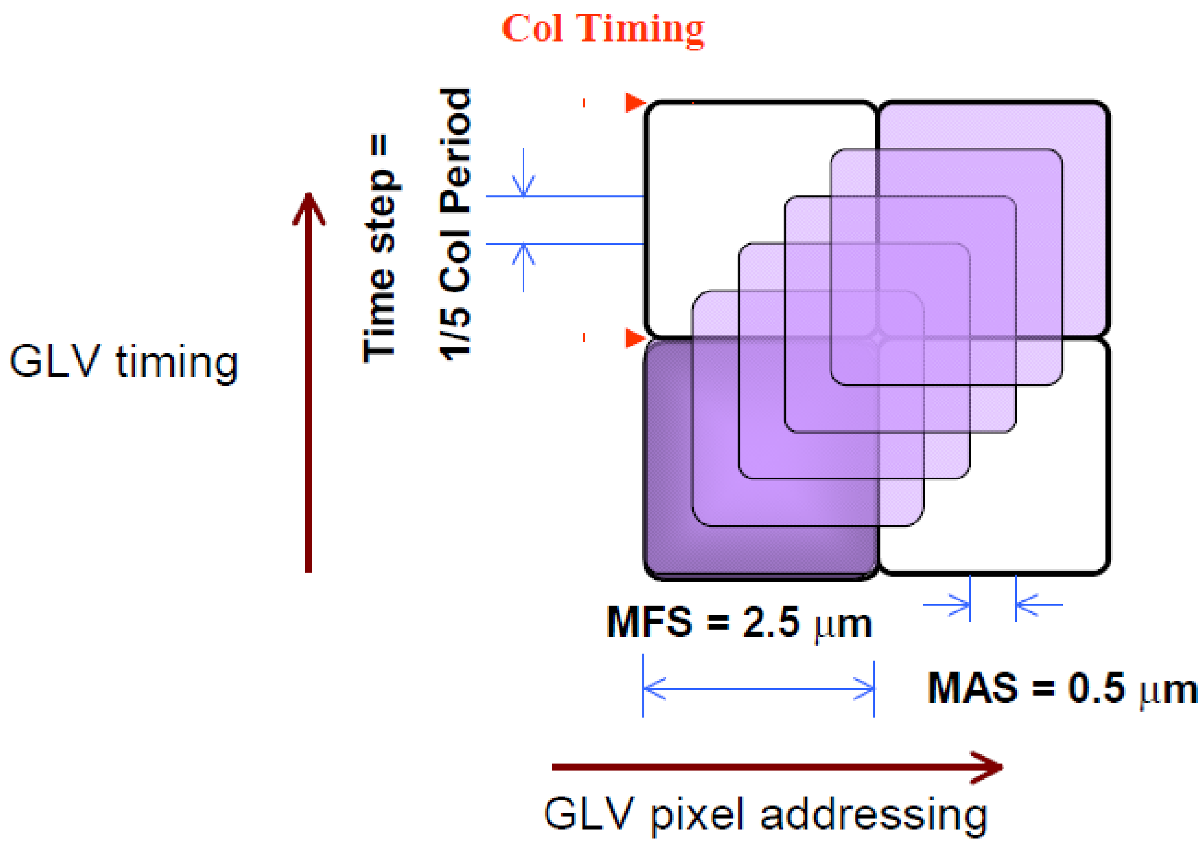



- GLV module for ultra-violet direct imaging in lithography system
- 8192 controllable-element, UV version of GLV light modulator product for lithography
- Integrated drive electronics with MEMS light modulator

GLV Device



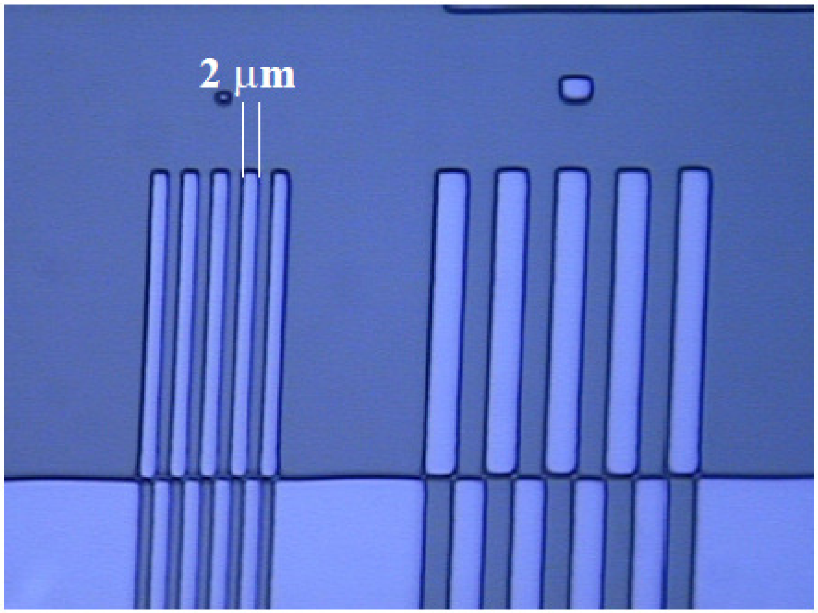
# Micro-address Technology



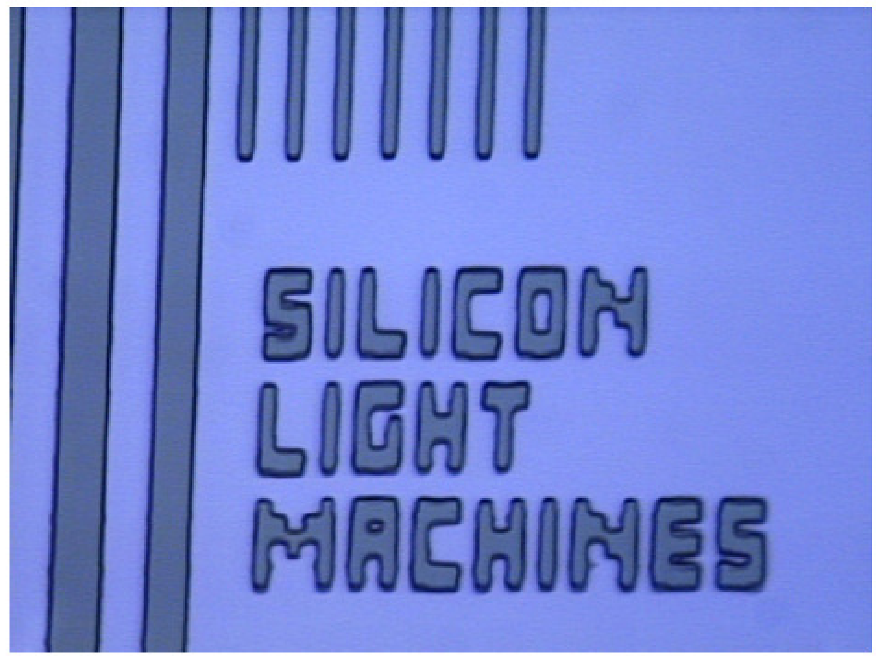

MFS:Minimum Feature Size

MAS:Minimum Address Size

# GLV Maskless Lithography




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



# Wafer Direct Imaging


- 300 mm wafer
- 2.5 um resolution

Sample wafer courtesy of Dainippon Screen R&D Center