MO EXPOSURE OPTICS®
The New Illumination System for all SUSS Mask Aligners

SÜSS MicroTec AG, www.suss.com
SUSS MicroOptics SA, www.suss.ch, info@suss.ch
„Shadow Printing“ Lithography

+ Mask illumination using collimated UV light
+ Resolution ⇔ proximity gap
Lamp readjustment required
Uniformity change over lamp lifetime
Daily uniformity test required
Variation of illumination light over mask (angular spectrum)

"Fly's Eye"

Forgot to control light uniformity this morning.
KEY COMPONENTS: MICROLENS OPTICAL INTEGRATORS

Light Source

Microlens Optical Integrator

Flat-Top Illumination
MO EXPOSURE OPTICS®
SELF CALIBRATING MASK ALIGNER ILLUMINATION

NO  Lamp readjustment required
NO  Uniformity change over lamp lifetime
NO  Daily uniformity test required
NO  Variation of illumination light over mask (angular spectrum)
+ 2x Microlens Optical Integrators in the Mask Aligner illumination system
+ Light homogenization in both Fourier planes
+ Self-calibrating light source
+ Illumination filter plate (IFP)
MO EXPOSURE OPTICS®: QUICK INSTALLATION

Microlens Optical Integrators

Quick Installation in Mask Aligner
Conventional Mask Aligner in Production
- Daily light measurement (9 or 12 points uniformity)
  - 5 min x 365 day ~ 30 hours per year
- 12x lamp exchange per year
  - 30 min x 10 ~ 6 hours per year
  - 36 hours less productive time & labor costs per year

MO Exposure Optics®
- No uniformity measurements, no lamp alignment!
- Improved uniformity, telecentric illumination
- CD uniformity improvement = Yield!
- Process stability assurance = Yield!
- Convenience!
+ Excellent light uniformity
+ No lamp misalignment
+ No uniformity change due to degradation of lamp electrode during lifetime cycle

Deviation from mean value in [%] for Ø200mm in MA200 Compact
TELECENTRIC MASK ILLUMINATION

Conventional vs. MO Exposure Optics®

Angular spectrum illumination light

Near-field light distribution behind photomask

Uniform angular distribution over the entire mask plane
MA200 Compact
MOE (200mm production line in semiconductor fab)

- 3μm lines
- 30μm proximity gap
- i-line illumination (MO Exposure Optics)
- Resist IX335, 1.5μm thick
- 0.17μm variation (3 Sigma)
INDUSTRY EXAMPLE: REDUCTION OF PROXIMITY ARTIFACTS BY SMO

Proximity artifacts in redistribution lanes: Deformations in lane edges.

Fillet reduces erosion

Simulation LayoutLAB software

Source Mask Optimization (SMO)

Proximity artifact: Deformation (protrusion) due to diffraction effects (simulation in LayoutLAB)

- Simulation enables significant process improvements
- Customer purchased five MA200 Compact Mask Aligners equipped with MO Exposure Optics®

Corrected: 30µm Exp Gap, SB 90°C, 300sec, 650mJ in MA200 Compact with MO Exposure Optics

MO Exposure Optics®

- SUSS MicroTec confidential -
CONTACT OR PROXIMITY LITHOGRAPHY?

Changeover from HR-Optics to LGO-Optics in less than 5 minutes!

IFP-HR „High Resolution“

IFP-LGO „Large Gap“
MO EXPOSURE OPTICS®

+ Self calibrating light source - no periodic uniformity measurement required
+ Easy lamp change without lamp adjustment
+ Improved uniformity, telecentric illumination
+ Very convenient – higher yield!

+ One optics set for both Contact and Proximity Lithography
+ Advanced Mask Aligner Lithography (AMALITH)
ARE YOU STILL USING THE **CONVENTIONAL** MASK ALIGNER ILLUMINATION SYSTEM?

WE WOULD LIKE TO VISIT YOU TO SHOW YOU OUR NEW **SELF CALIBRATING** MO EXPOSURE OPTICS®!

"We love our MO Exposure Optics. It's so convenient!"
AVAILABLE FOR ALL SUSS MASK ALIGNERS

- MA6, MA8
- MA/BA8 Gen3
- MA200Compact, MA100e, MA150e
- MJB4
- LithoPack 300
- MA300 Gen2
Thank you!

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