



AZ® ECI 3000 Photoresist

Universal i-Line/Crossover Photoresist Series

GENERAL INFORMATION

AZ® ECI 3000 photoresist series are a family of fast positive resists with high resolution capabilities (0.4 μm CDs in production in i-line) enabling wide process latitudes. The resist family is suited for i-line as well as broadband exposure covering g-, h- and i-line illumination wavelengths. It is designed to have superior implant and dry etch resistance. Further characterization highlights show strong wet etch adhesion and good thermal stability. AZ® ECI 3000 photoresist series are specifically tailored for universal application and excellent cost of ownership.

RECOMMENDED PROCESS

Softbake:	90°C, 60 sec (contact) - 90 sec (proximity)
Exposure:	i- & g-line stepper or broadband exposure
Post Exposure Bake (PEB):	110°C, 60 sec (contact) - 90 sec (proximity)
Development:	60 sec, puddle, AZ® 300 MIF Developer (non surfactated) or AZ® 926 MIF Developer (surfactated)

SUITABLE ANCILLARIES

AZ® Aquatar® top anti-reflective coating
AZ® BARLi® II bottom anti-reflective coating
AZ® EBR 70/30 edge bead remover
AZ® 400T stripper

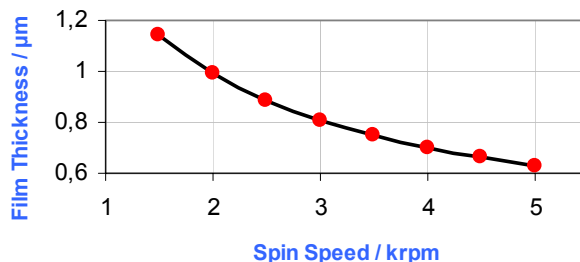
VISCOSITIES

AZ® ECI 3007 ~ 0.6 - 1.3 μm FT
AZ® ECI 3012 ~ 1.1 - 2.4 μm FT
AZ® ECI 3027 ~ 2.2 – 5 μm FT

AZ® ECI 3007 PHOTORESIST

SPIN CURVE

Softbake: 90°C, 60 sec, proximity
Wafer size: 6" (150 mm)
dynamic dispense



FILM THICKNESS

2000 rpm
0.99 µm

3000 rpm
0.81 µm

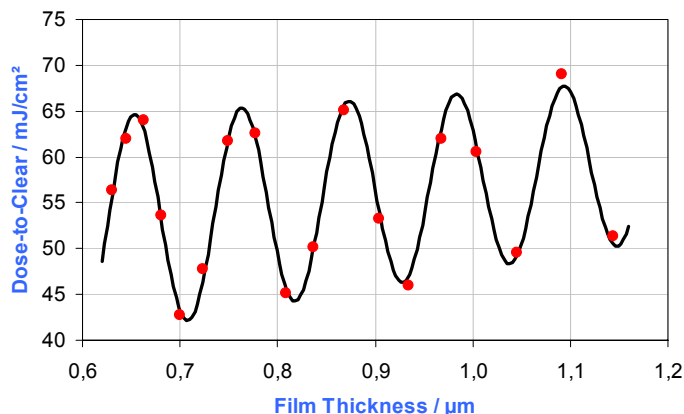
4000 rpm
0.70 µm

5000 rpm
0.63 µm

i-LINE THIN FILM INTERFERENCE

(on bare silicon)

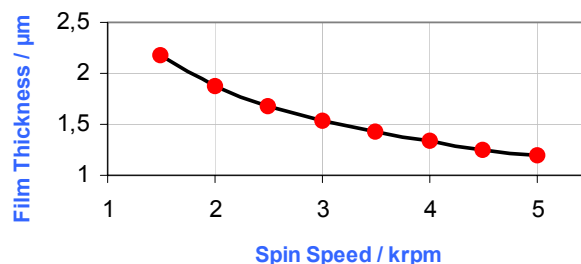
Softbake: 90°C, 60 sec, proximity
Exposure: Nikon NSR-1755i7B
i-line stepper
0.54 NA, 0.6 σ
PEB: 110°C, 60 sec, proximity
Development: 60 sec, puddle, 23°C
AZ® 726 MIF
Developer



AZ® ECI 3012 PHOTORESIST

SPIN CURVE

Softbake: 90°C, 90 sec, proximity
Wafer size: 6" (150 mm)
dynamic dispense



FILM THICKNESS

2000 rpm
1.88 µm
STD DEV 1.2 nm

3000 rpm
1.54 µm
0.8 nm

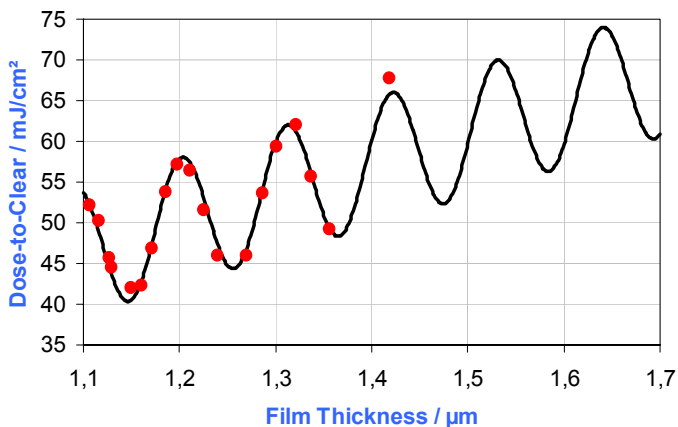
4000 rpm
1.33 µm
0.5 nm

5000 rpm
1.19 µm
1.1 nm

i-LINE THIN FILM INTERFERENCE

(on bare silicon)

Softbake: 90°C, 90 sec, proximity
Exposure: Nikon NSR-1755i7B
i-line stepper
0.54 NA, 0.6 σ
PEB: 110°C, 90 sec, proximity
Development: 60 sec, puddle, 23°C
AZ® 300 MIF
Developer

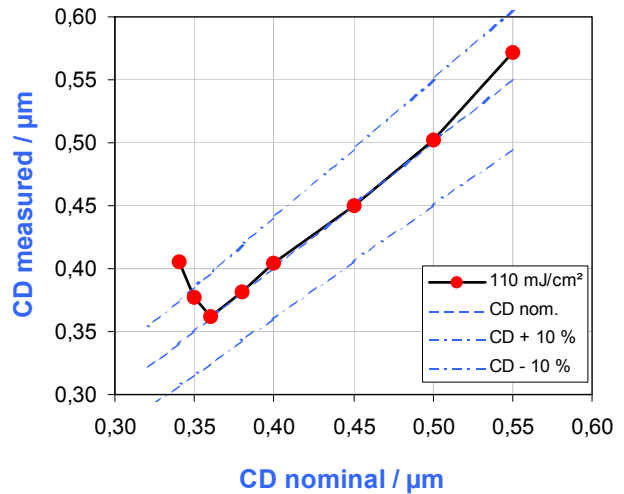


AZ® ECI 3012 PHOTORESIST

LINEARITY

(dense lines on bare silicon)

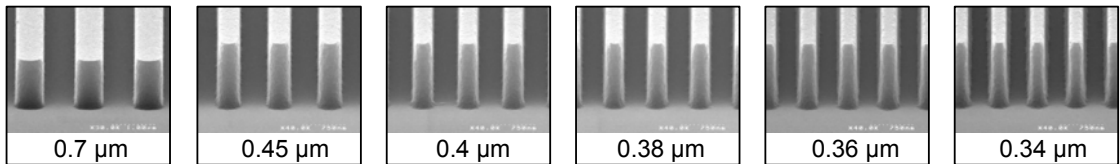
Softbake: 90°C, 90 sec, proximity
Film Thickness: 1.2 µm, Emax
Exposure: Nikon NSR-1755i7B
i-line stepper
0.54 NA, 0.6 σ
PEB: 110°C, 90 sec, proximity
Development: 60 sec, puddle, 23°C
AZ® 300 MIF
Developer
Measurement: Hitachi S-8840 CD SEM



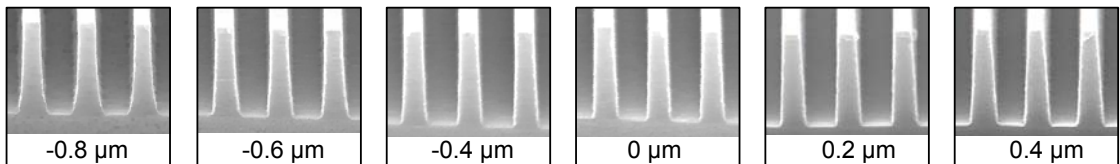
PROCESS on bare silicon substrate

Softbake: 90°C, 90 sec, proximity // 1.2 µm film thickness // Exposure: Nikon NSR-1755i7B i-line stepper, 0.54 NA, 0.6 σ // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

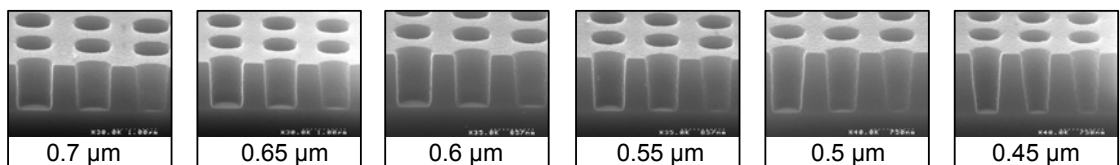
LINEARITY dense lines, 110 mJ/cm²



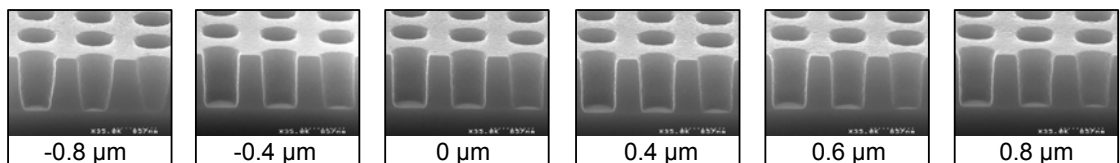
FOCUS LATITUDE 0.4 µm dense lines, 110 mJ/cm²



LINEARITY dense contact holes, 136 mJ/cm²



FOCUS LATITUDE 0.6 µm dense contact holes, 136 mJ/cm²



AZ® ECI 3027 PHOTORESIST

LINEARITY

(dense lines on bare silicon)

Softbake: 100°C, 60 sec, proximity

Film Thickness: 2.5 μm

Exposure: Nikon NSR-1755i7B

i-line stepper

0.54 NA, 0.6 σ

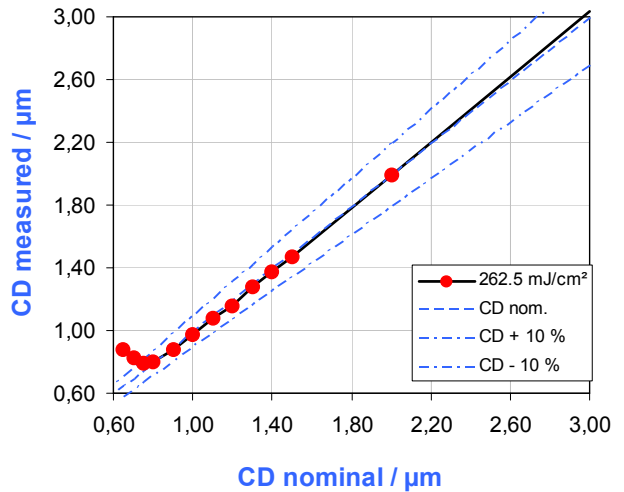
PEB: 120°C, 60 sec, proximity

Development: 60 sec, puddle, 23°C

AZ® 726 MIF

Developer

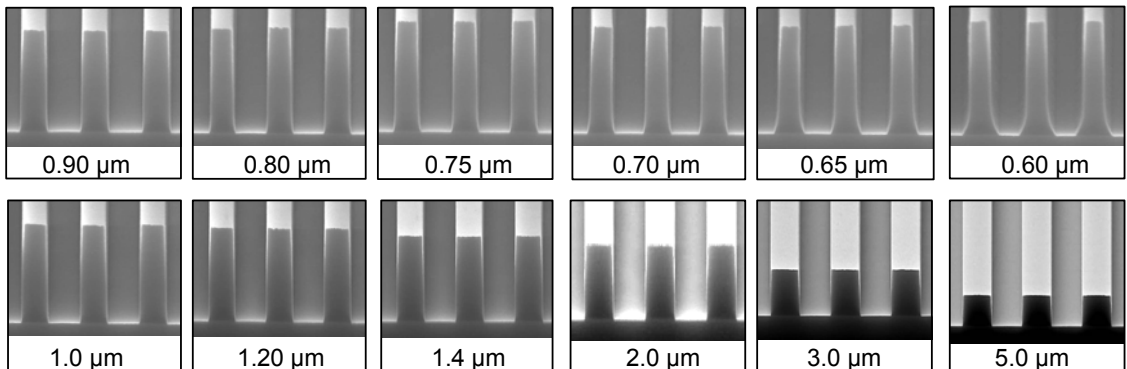
Measurement: Hitachi S-8840 CD SEM



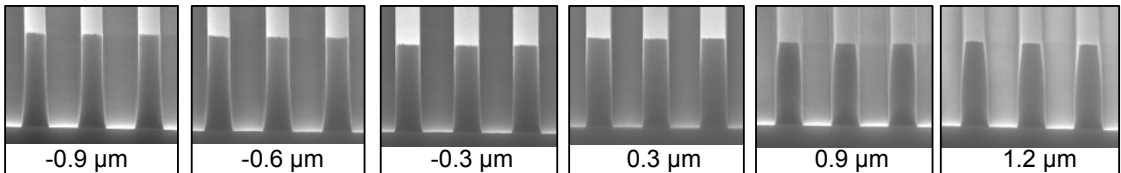
PROCESS on bare silicon substrate

Softbake: 100°C, 60 sec, proximity // 2.5 μm film thickness // Exposure: Nikon NSR-1755i7B i-line stepper, 0.54 NA, 0.6 σ // PEB: 120°C, 60 sec, proximity // Development: 60 sec, puddle, AZ® 726 MIF Developer @ 23°C // CD 1.3 μm dense lines process window summary at best point: 270 mJ/cm², 1.3 μm DOF, 32.4% exposure latitude

LINEARITY dense lines, 262.5 mJ/cm²

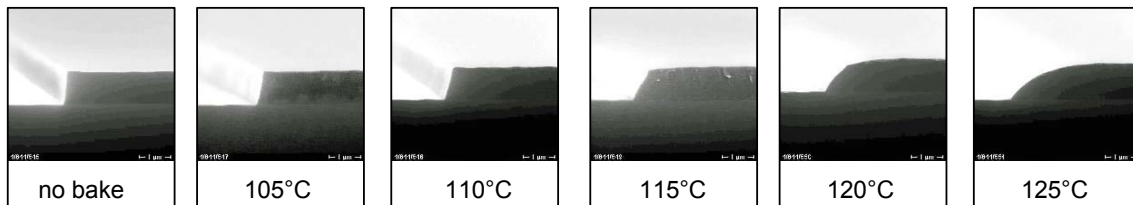


FOCUS LATITUDE 1.3 μm dense lines, 262.5 mJ/cm²



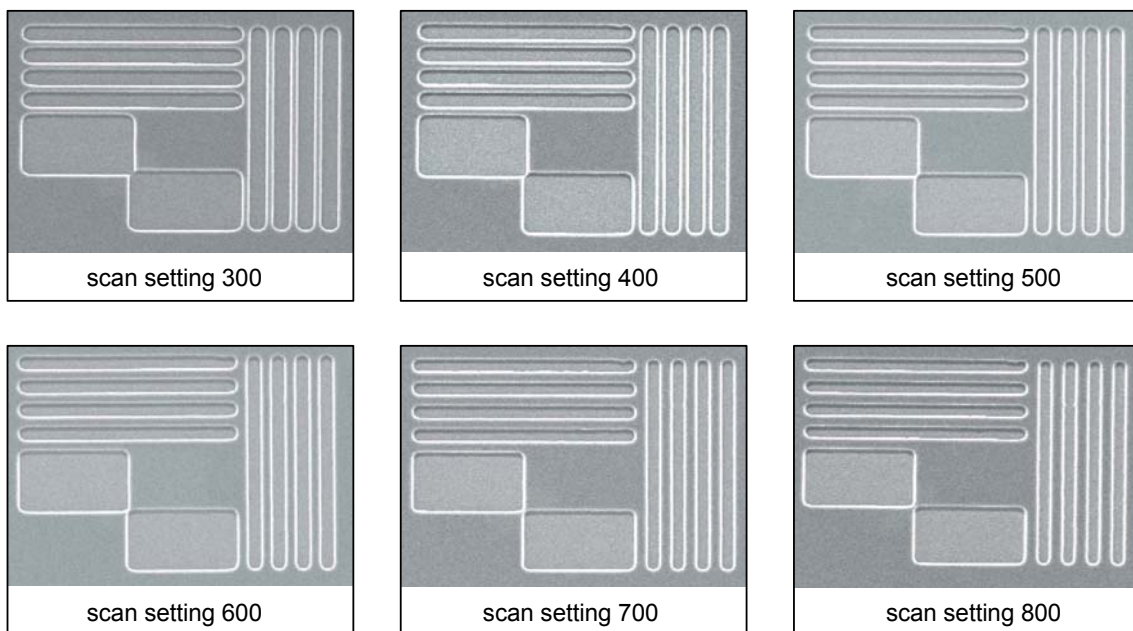
AZ® ECI 3012 PHOTORESIST

THERMAL STABILITY 100 μm edge, 1.2 μm film thickness, contact hardbake 60 sec at temperature
Softbake: 90°C, 90 sec, proximity // Exposure: Nikon NSR-1755i7B i-line stepper, 0.54 NA, 0.6 σ // PEB:
110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C



BROADBAND EXPOSURE LATITUDE 3 μm lines, 1.2 μm film thickness

Softbake: 90°C, 60 sec, contact // Exposure: Perkin Elmer 340 Series Projection Mask Aligner, Aperture: 1, Slit Width: 1 mm // PEB: 110°C, 60 sec contact // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

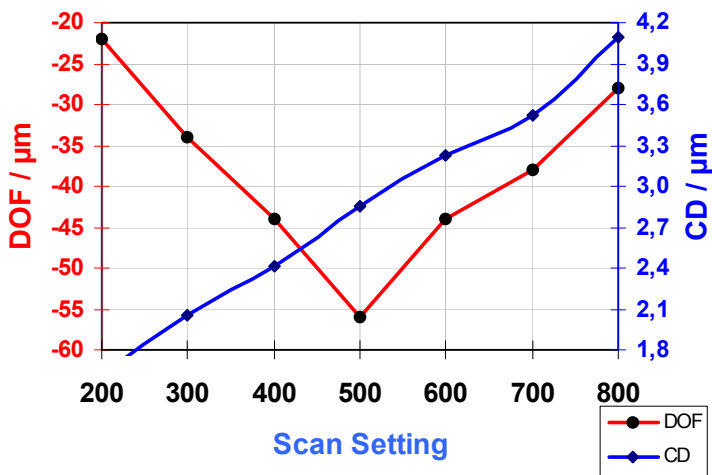


DOF / EXPOSURE LATITUDE

3 μm lines

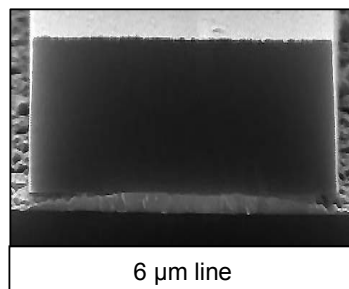
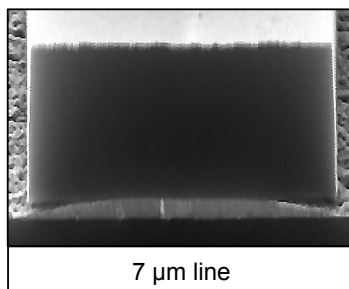
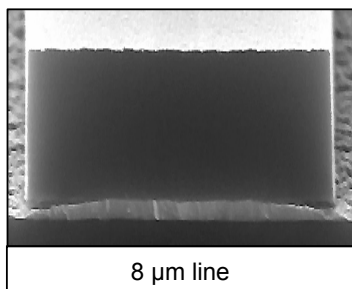
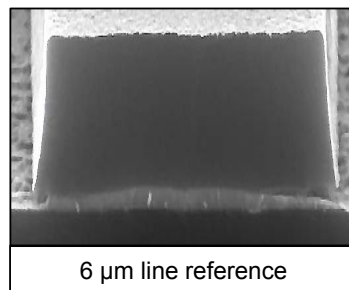
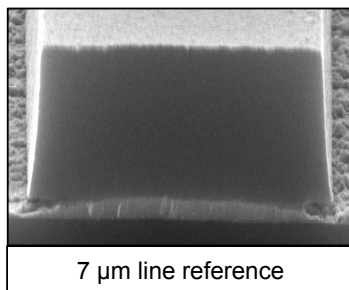
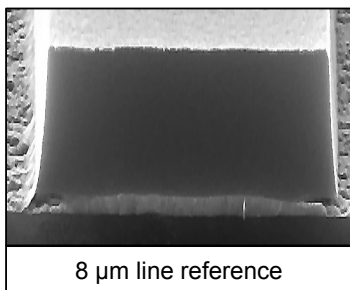
(Perkin Elmer 340 Series)

Substrate: Silicon
Softbake: 90°C, 60 sec, contact
Film Thickness: 1.2 μm
Exposure: Perkin Elmer 340
Aperture: 1
Slit Width: 1 mm
PEB: 110°C, 60 sec, contact
Development: 60 sec, puddle, 23°C
AZ® 300 MIF Developer



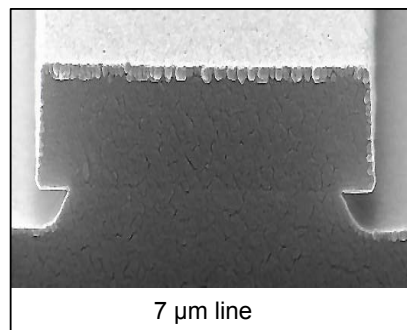
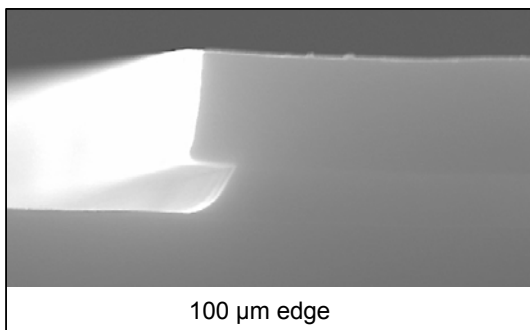
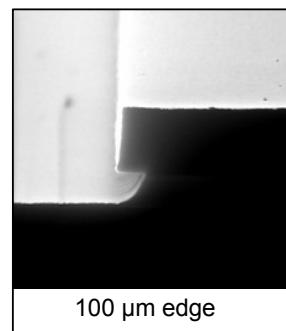
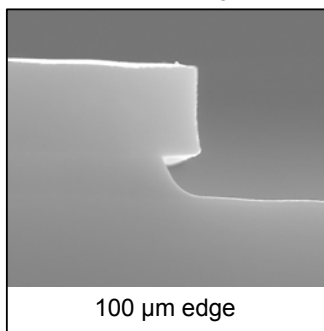
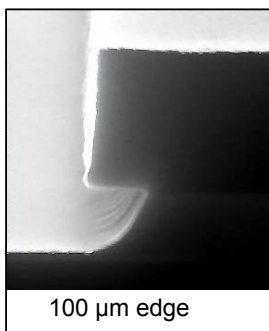
ADHESION ON ITO

Softbake: 90°C, 90 sec, proximity // 1.7 μm film thickness // Exposure: Nikon NSR-1755i7B i-line stepper, 0.54 NA, 0.6 σ // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C // ITO etching: etch time (70 sec) immersion in FeCl_3/HCl at 45°C, ITO thickness: 200 nm



ADHESION ON THERMAL OXIDE

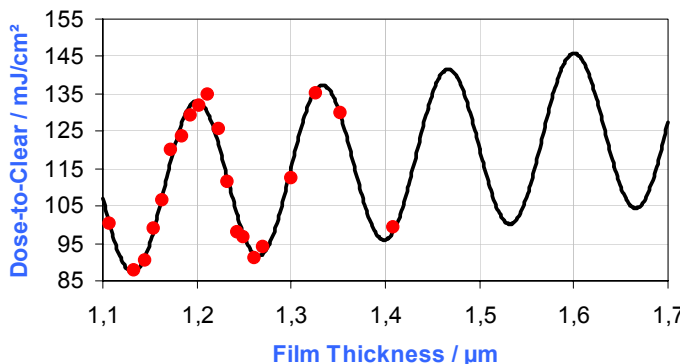
Thermal oxide thickness: 690 nm // Primer HMDS, vacuum 30 min // Resist thickness: 1.33 μm on 2" wafer // Softbake: 90°C, 60 sec, contact // Exposure: Suss MA 56 // PEB: 110°C, 60 sec, contact // Development: 60 sec, immersion, AZ® 300 MIF Developer @ 23°C // Oxide etch solution: Merck AF 87.5-12.5 @ 22°C // oxide etch time: 6 min // Remaining oxide thickness after etch: 75 nm



g-LINE THIN FILM INTERFERENCE

(on bare silicon)

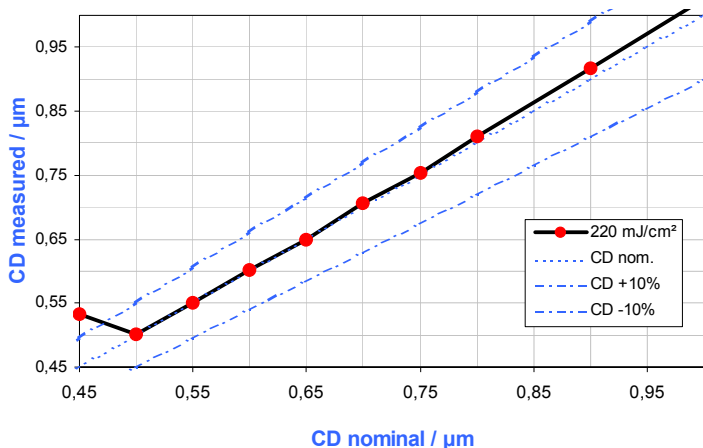
Softbake: 90°C, 90 sec, proximity
 Exposure: Nikon NSR-1505G7E
 g-line stepper
 0.54 NA, 0.5 σ
 PEB: 110°C, 90 sec, proximity
 Development: 60 sec, puddle, 23°C
 AZ® 300 MIF
 Developer



LINEARITY

(dense lines on bare silicon)

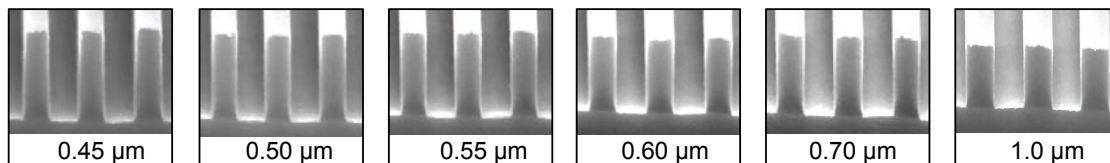
Softbake: 90°C, 90 sec, proximity
 Film Thickness: 1.2 μm, Emax
 Exposure: Nikon NSR- 1505G7E
 g-line stepper
 0.54 NA, 0.5 σ
 PEB: 110°C, 90 sec, proximity
 Development: 60 sec, puddle, 23°C
 AZ® 300 MIF
 Developer
 Measurement: Hitachi S-8840 CD SEM



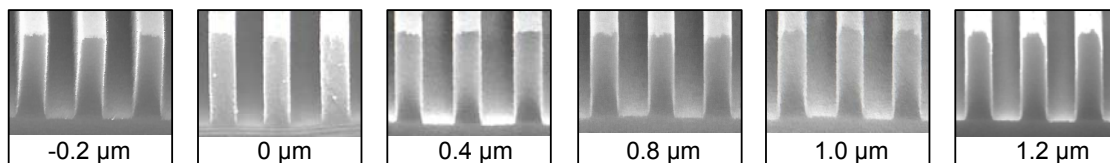
PROCESS on bare silicon substrate

Softbake: 90°C, 90 sec, proximity // 1.2 μm film thickness // Exposure: Nikon NSR-1505G7E g-line stepper, 0.54 NA, 0.5 σ // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

LINEARITY dense lines, 220 mJ/cm²



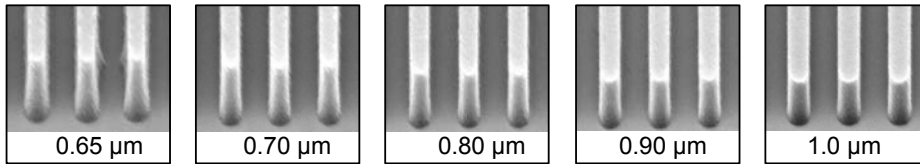
FOCUS LATITUDE 0.5 μm dense lines, 220 mJ/cm²



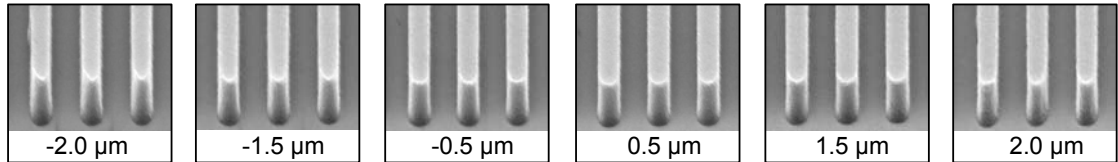
ULTRATECH 1500 PERFORMANCE on bare silicon substrate

Softbake: 90°C, 90 sec, proximity // 1.2 μm film thickness // Exposure: Ultratech 1500 1X stepper // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

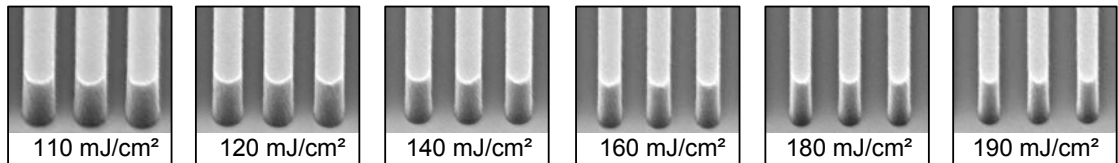
LINEARITY dense lines, 180 mJ/cm²



FOCUS LATITUDE 1.0 μm dense lines, 180 mJ/cm²



EXPOSURE LATITUDE 1.0 μm dense lines



CAUCHY COEFFICIENTS

Unbleached

A	B	C
1.6018	0.0098963 μm^2	0.00068636 μm^4
1.6018	9.8963 x 10 ⁵ Å ²	6.8636 x 10 ¹² Å ⁴

Bleached

1.5952	0.0084508 μm^2	0.0006556 μm^4
1.5952	8.4508 x 10 ⁵ Å ²	6.556 x 10 ¹² Å ⁴

REFRACTIVE INDEX

Unbleached

	365 nm	405 nm	435 nm	633 nm
n	1.7014	1.6803	1.6826	1.6308
k	0.0202	0.0244	0.0166	0

Bleached

n	1.6913	1.6670	1.6530	1.6204
k	0.0017	0.0010	0	0.0001

DILL PARAMETERS

i-line

A	B	C
0.64 μm^{-1}	0.075 μm^{-1}	0.0159 cm ² /mJ
0.76 μm^{-1}	0.035 μm^{-1}	0.0244 cm ² /mJ
0.45 μm^{-1}	0.036 μm^{-1}	0.0152 cm ² /mJ

h-line

g-line

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