

Technical datasheet

AZ[®] ECI 3000 Series

Positive Tone Cross-Over Photoresist

APPLICATION

General purpose, high throughput, positive tone cross-over (i-line/g-line) photoresists for plasma/RIE and wet etching applications.

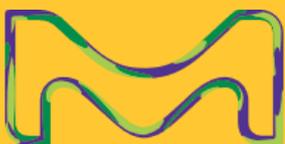
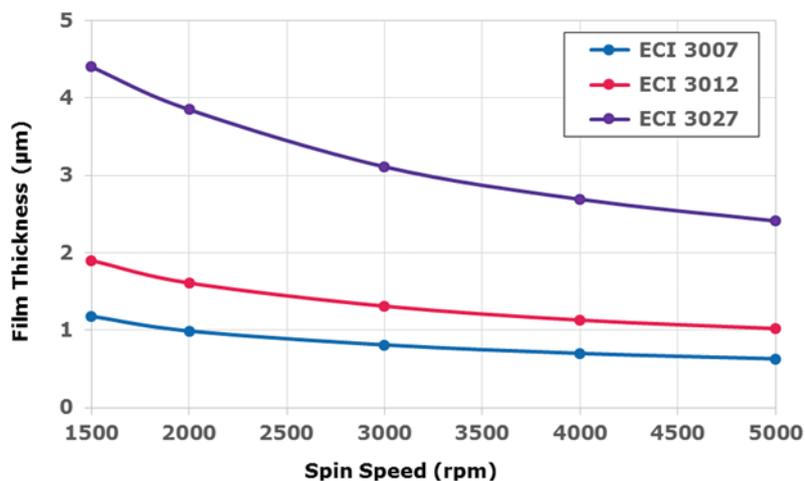
- Low cost process
- MIF developer recommended
- Spin coated thickness from 0.7 to 5.0 μ m
- Production resolution to 0.4 μ m

TYPICAL PROCESS

- Soft Bake: 90° to 110°C*/ 60s
- Expose: 310-450nm sensitive
- Post Expose Bake: 110°C/60-90s
- Develop: 60s Puddle or immersion Developer type: MIF

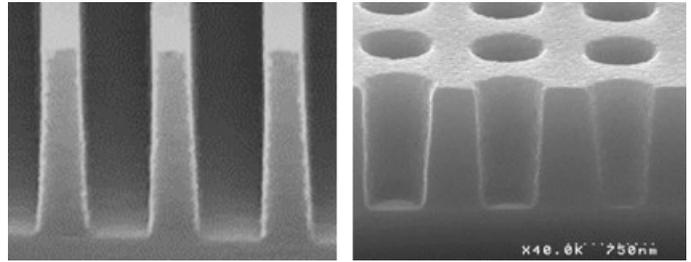
* Use higher soft bake temp. for best adhesion to metals

SPIN CURVES (150mm Wafers)



OPTICAL CONSTANTS*

Cauchy A	1.6018
Cauchy B (μm^2)	0.009896
Cauchy C (μm^4)	0.000686
n @ 633nm	1.6308
k @ 633nm	0



AZ ECI 3012 Photoresist
0.4 μm lines and 0.5 μm holes
1.20 μm thick film
0.54NA i-line exposure
AZ 300 MIF Develop (60S)

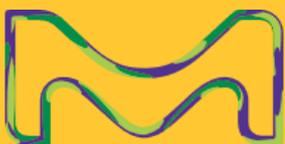
* Unexposed photoresist film

COMPANION PRODUCTS

THINNING/EDGE BEAD REMOVAL
AZ[®] EBR Solvent or AZ EBR 70/30

DEVELOPERS
AZ 300MIF, 626MIF, 726MIF, AZ 926MIF

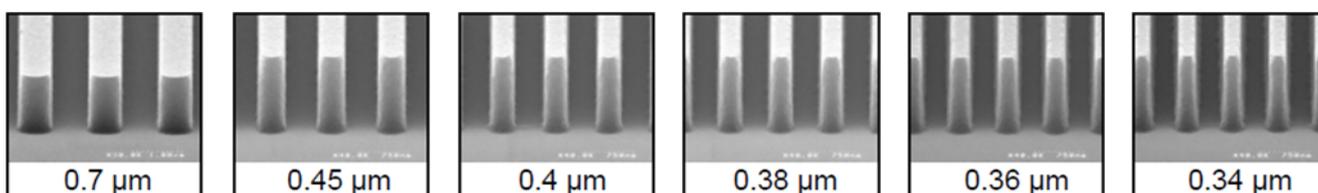
REMOVERS
AZ 100 Remover



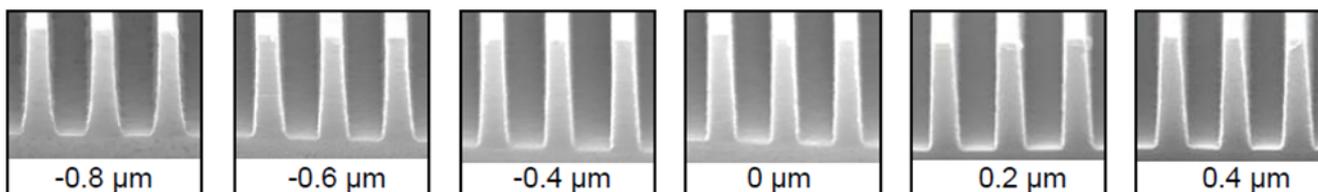
REFERENCE PROCESS (Dense lines and holes in AZ ECI 3012 Photoresist)

Process Step	Parameters
Coat	1.20µm thick AZ ECI 3012 on bare Si
Soft Bake	90°C, 90 seconds, proximity hotplate
Exposure	i-line @ 110-136mJ/cm ² nominal (0.54NA, 0.6 s) Nikon Stepper
Post Expose Bake	110°C, 60 seconds, direct contact hotplate
Develop	AZ 300MIF, 60s single puddle @ 23°C

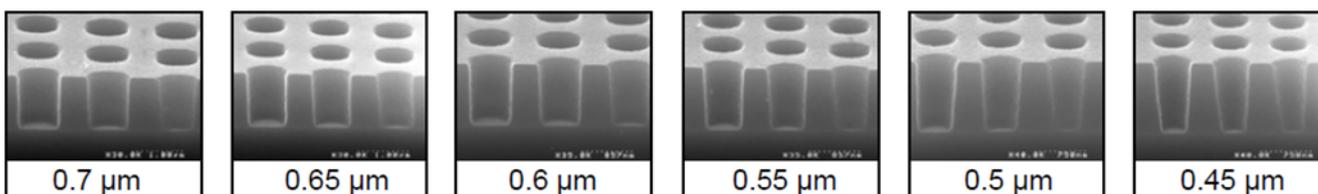
Dense Line Linearity @ 110 mJ/cm²



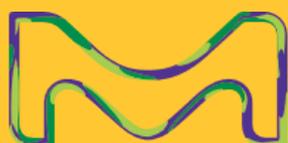
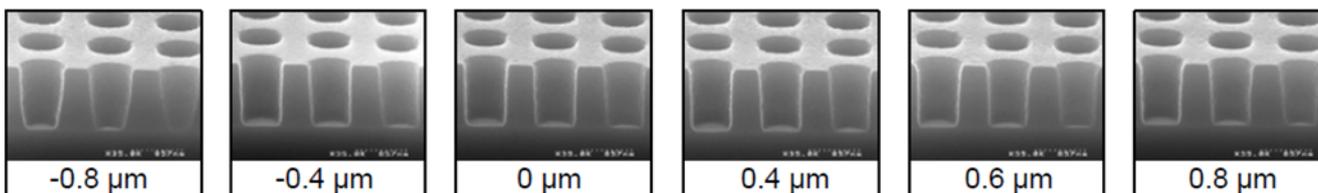
Dense Line Focus Latitude: 0.40µm Lines @ 110 mJ/cm²



Dense Hole Linearity @ 136mJ/cm²



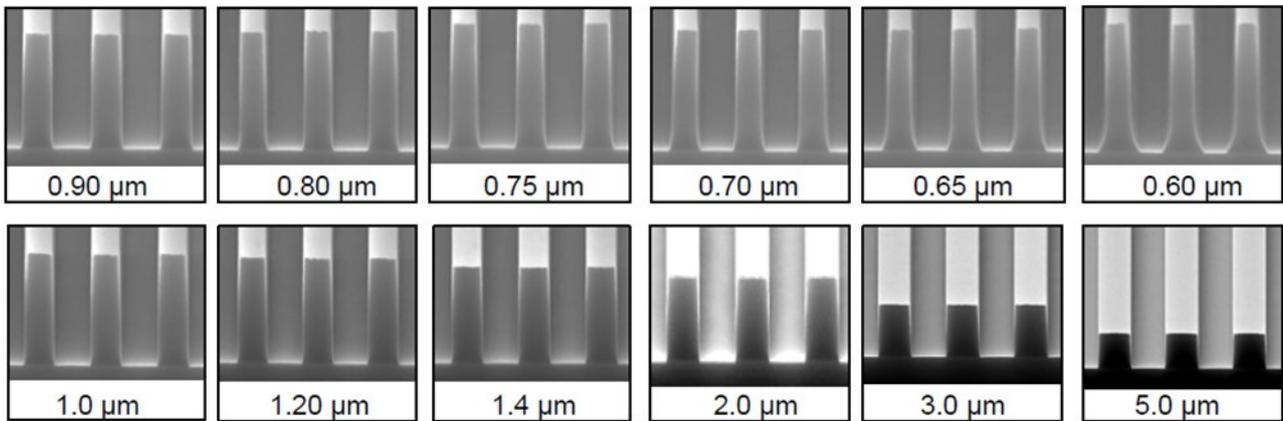
Dense Hole Focus Latitude: 0.60µm Holes @ 136 mJ/cm²



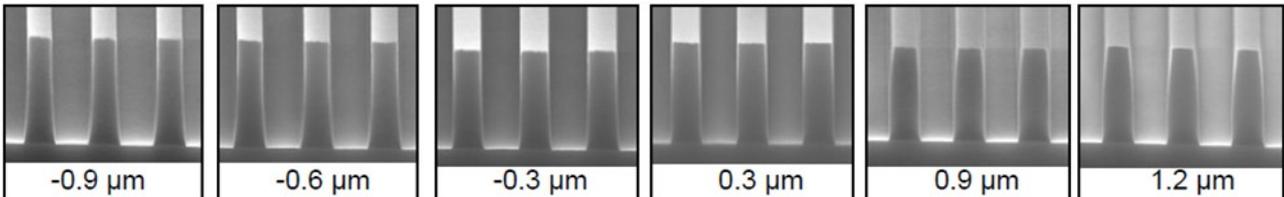
REFERENCE PROCESS (Dense lines in AZ ECI 3027 Photoresist)

Process Step	Parameters
Coat	2.5 μ m thick AZ ECI 3027 on bare Si
Soft Bake	100°C, 60 seconds, proximity hotplate
Exposure	i-line @ 262mJ/cm ² nominal* (0.54NA, 0.6s) Nikon Stepper
Post Expose Bake	120°C, 60 seconds, proximity hotplate
Develop	AZ 726MIF, 60s single puddle @ 23°C

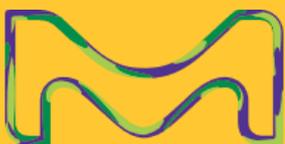
Dense Line Linearity @ 262 mJ/cm²



Dense Line Focus Latitude, 1.30 μ m Lines @ 262 mJ/cm²

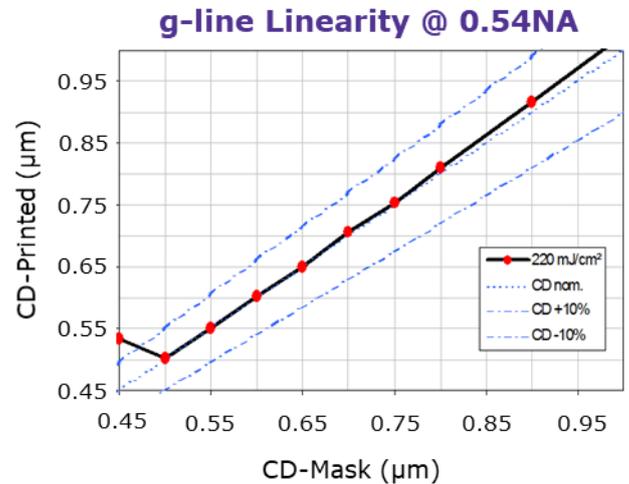
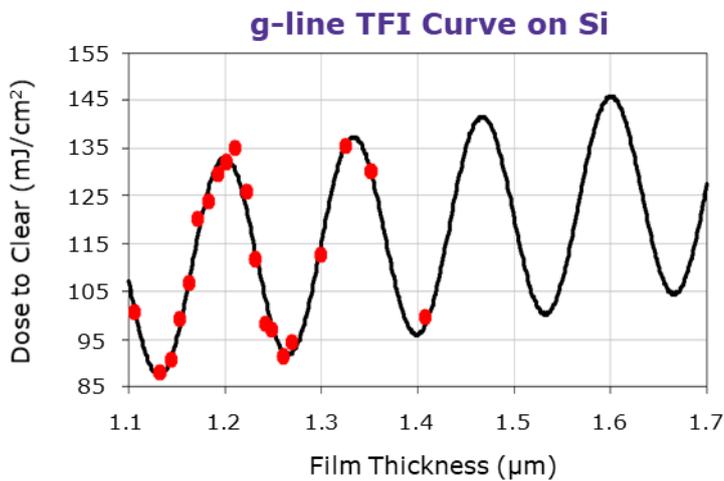


* NOTE: Adjust nominal dose for this film thickness to \sim 240mJ/cm² when using AZ 300MIF Developer.

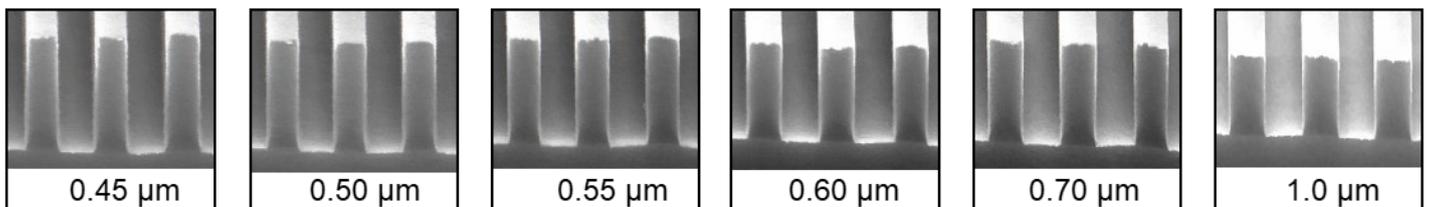


REFERENCE PROCESS (Dense lines in AZ ECI 3012 Photoresist, g-line exposure)

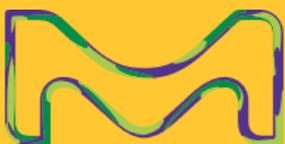
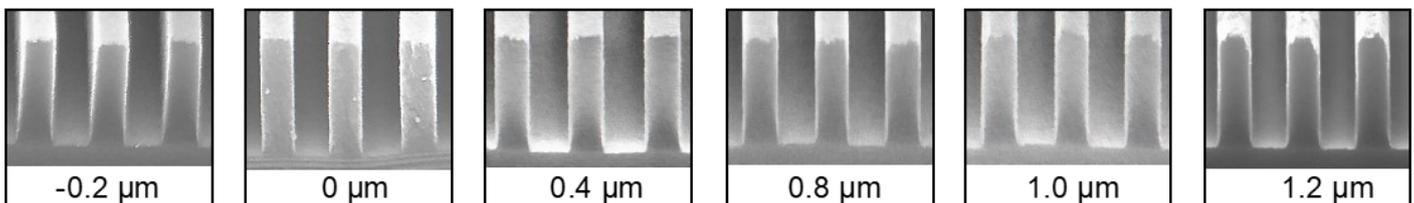
Process Step	Parameters
Coat	1.2 μm thick AZ ECI 3012 on bare Si
Soft Bake	90°C, 90 seconds, proximity hotplate
Exposure	g-line @ 220mJ/cm ² nominal (0.54NA) Nikon Stepper
Post Expose Bake	110°C, 90 seconds, proximity hotplate
Develop	AZ 300MIF, 60s single puddle @ 23°C



Dense Line Linearity @ 220 mJ/cm²

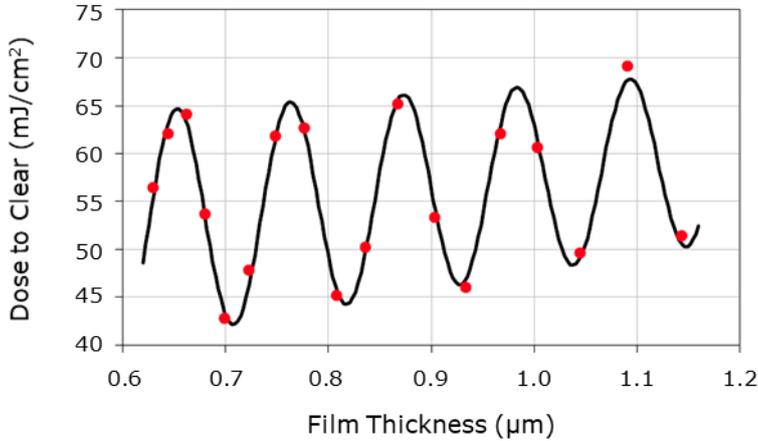


Dense Line Focus Latitude, 0.5 μm Lines @ 220 mJ/cm²

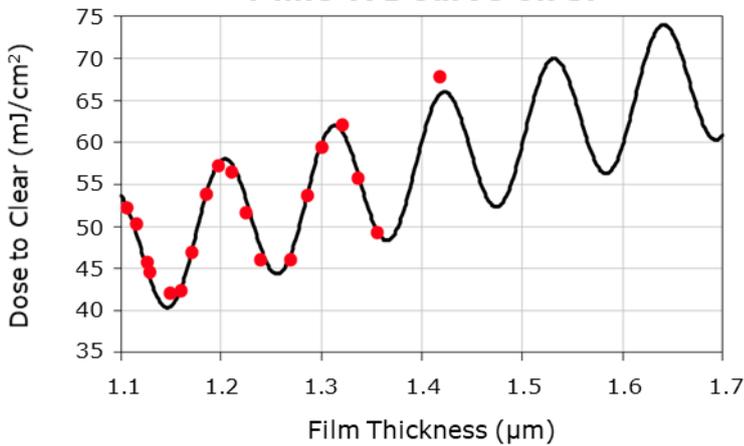


THIN FILM INTERFERENCE AND LINEARITY CURVES for i-line

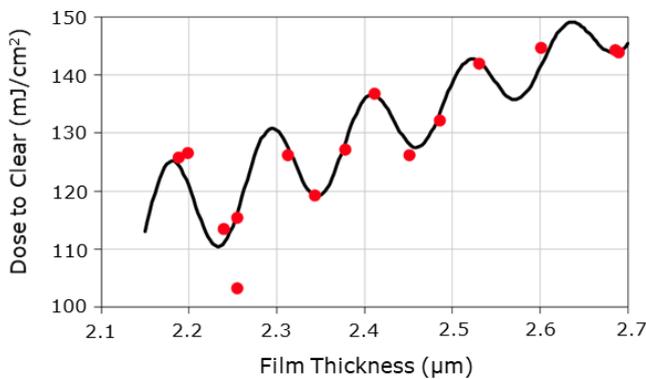
ECI 3007
i-line TFI Curve on Si



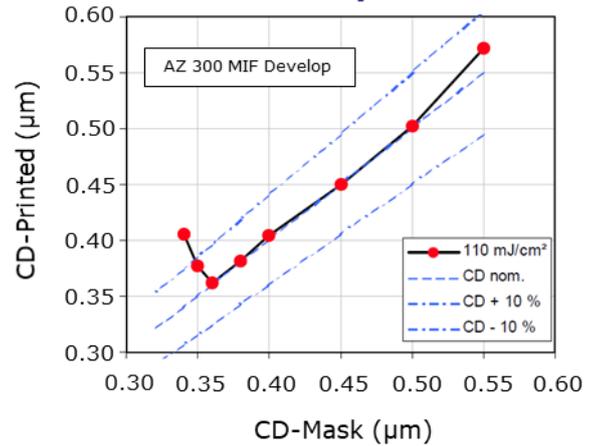
ECI 3012
i-line TFI Curve on Si



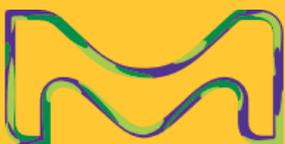
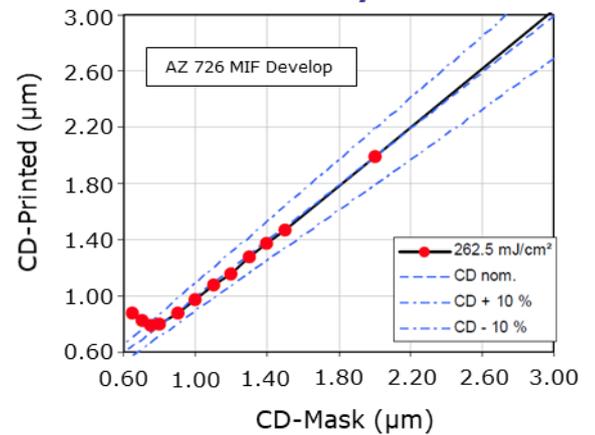
ECI 3027
i-line TFI Curve on Si



i-line Linearity @ 0.54NA



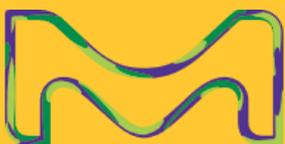
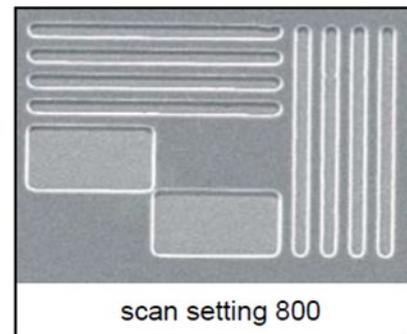
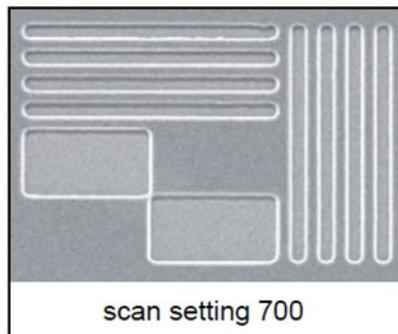
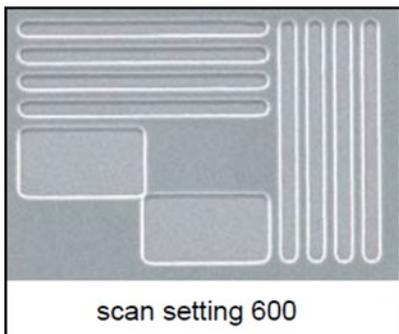
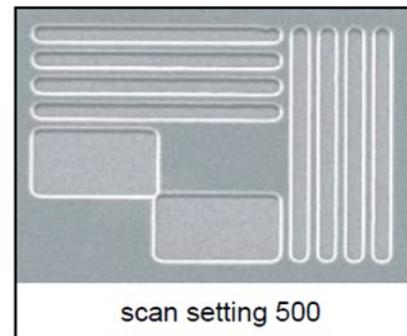
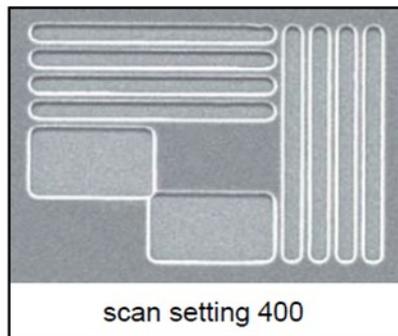
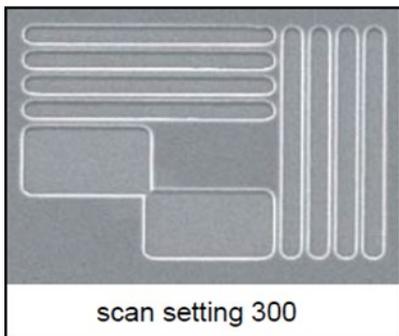
i-line Linearity @ 0.54NA



REFERENCE PROCESS (3.0 μ m Lines, ECI 3012 Broadband Mask Aligner)

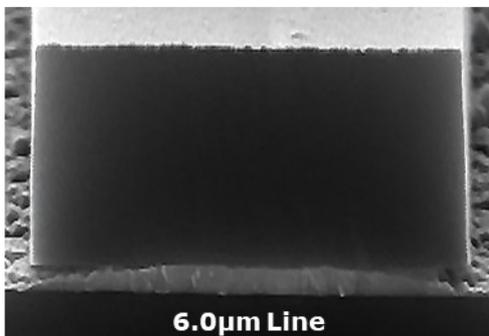
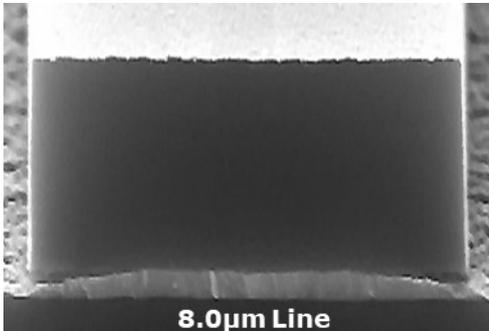
Process Step	Parameters
Coat	1.2 μ m thick AZ ECI 3012 on bare Si
Soft Bake	90°C, 60 seconds, contact hotplate
Exposure	Perkin Elmer 340 Series Mask Aligner, Aperture 1, Slit Width 1mm
Post Expose Bake	110°C, 60 seconds, contact hotplate
Develop	AZ 300MIF, 60s single puddle @ 23°C

3.0 μ m Line/Space features at Various Scan Settings



WET ETCH ADHESION CHARACTERISTICS

AZ ECI 3012 on Indium Tin Oxide (ITO)



AZ ECI 3012 Photoresist Post ITO Etch

Resist Thickness: 1.7µm

Soft Bake: 90°C, 90s proximity hot plate

Exposure: Nikon Stepper, 0.54NA

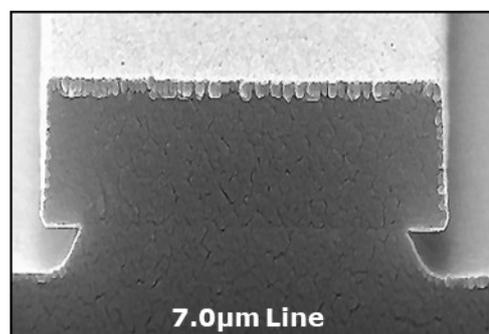
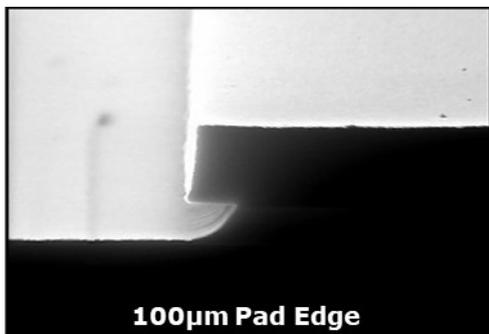
Post Expose Bake: 110°C, 90s proximity hot plate

Develop: AZ 300MIF, 60s single puddle

ITO Etch: 70s in FeCl₃/HCL @ 45°C

ITO Film Thickness: 200nm

AZ ECI 3012 Thermal Oxide



AZ ECI 3012 Photoresist Post Oxide Etch

Resist Thickness: 1.33µm

Primer: HMDS vapor

Soft Bake: 90°C, 60s contact hot plate

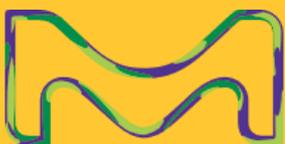
Exposure: Suss MA 56 Aligner

Post Expose Bake: 110°C, 60s contact hot plate

Develop: AZ 300MIF, 60s single puddle

Oxide Etch: 6 minutes @ 22°C

ITO Film Thickness: 690nm



PROLITH Modeling Parameters for AZ ECI 3000 in i-line

- Dill Parameters:

	<u>A</u>	<u>B</u>	<u>C</u>
i-line	0.64 μm^{-1}	0.075 μm^{-1}	0.0159 cm^2/mJ
h-line	0.76 μm^{-1}	0.035 μm^{-1}	0.0244 cm^2/mJ
g-line	0.45 μm^{-1}	0.036 μm^{-1}	0.0152 cm^2/mJ

- Development Parameters (i-line)

Rmax: 1200 nm/s

Rmin: 0.1 nm/s

Mth: 0.3

n:8

Surface Development Rate: 0.1

Inhibition Depth: 400 nm

THERMAL STABILITY (100 μm pads backed for 60s, FT = 1.2 μm)

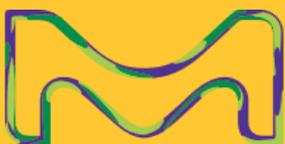


No Bake

110°C

115°C

120°C



PROCESS CONSIDERATIONS

SUBSTRATE PREPARATION

Substrates must be clean, dry, and free of organic residues. Oxide forming substrates (Si, etc.) should be primed with HMDS (hexamethyl disilazane) or other suitable primer prior to coating AZ ECI 3000. Contact your products representative for detailed information on pre-treating with HMDS.

COATING

AZ ECI 3000 series resists are compatible with all common coating methods including spin, spray, and roller coating.

SOFT BAKE

Optimum soft bake times and temperatures may be application specific. Process optimization is recommended to ensure stable lithographic and adhesion performance. Soft bake temperatures for AZ ECI 3000 should be in the 90-110C range. Temperatures towards the high end of this range will improve adhesion to metals. Bakes may be performed on hotplates or in vented bake ovens.

EXPOSURE

AZ ECI 3000 is sensitive to exposure wavelengths between 310 and 450nm. 365-436nm is recommended.

POST EXPOSE BAKE

A PEB may be employed to maximize process latitudes and mitigate standing wave effects caused by monochromatic exposure. PEB temperatures and times may be application specific. As a general rule, PEB temperatures should be in the 105° to 115°C range.

DEVELOPING

AZ ECI 3000 series photoresists are compatible with both metal ion free (TMAH) and inorganic (Sodium or Potassium based) developers. MIF developers are recommended.

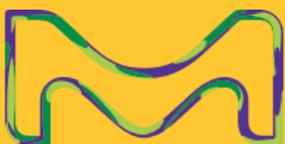
HARD BAKE

Hard baking (post develop bake) improves adhesion in wet etch or plating applications and improves pattern stability in dry etch processes. Hard bake temperatures should be in the 100° to 115°C range to ensure minimal thermal distortion of the pattern.

STRIPPING

Under normal process conditions, AZ ECI 3000 strips readily in removers designed for DNQ/novolac type photoresists. AZ 100 Remover, AZ 300T, AZ 400T, and AZ Kwik Strip removers are recommended. Contact your products representative for application/substrate specific remover recommendations and data sheets.

Strip times may vary depending upon the thermal history of the photoresist pattern. Patterns subjected to high processing temperatures (above 140°C) may cross link and become more difficult to remove. Care should be taken to avoid excessive processing temperatures which may char the photoresist pattern. Charred photoresist patterns will not dissolve in solvent based removers.



COMPATIBLE MATERIALS

AZ ECI 3000 Series materials are compatible with all commercially available lithography processing equipment. Compatible materials of construction include glass, quartz, PTFE, PFA, stainless steel, HDPE, polypropylene, and ceramic.

HANDLING/DISPOSAL

AZ ECI 3000 Series materials contain Ethyl Lactate and n-Butyl Acetate solvents. Refer to the current version of the SDS and to local regulations for up to date information on safe handling and proper disposal. Wear solvent resistant gloves, protective clothing, and eye/face protection. AZ 3300 is compatible with drain lines handling similar organic solvent based materials.

AZ ECI 3000 is compatible with drain lines handling similar organic solvent based materials.

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