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)

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

VISICOSITIES
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**

<table>
<thead>
<tr>
<th>Spin Speed / krpm</th>
<th>Film Thickness / µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 rpm</td>
<td>0.99 µm</td>
</tr>
<tr>
<td>3000 rpm</td>
<td>0.81 µm</td>
</tr>
<tr>
<td>4000 rpm</td>
<td>0.70 µm</td>
</tr>
<tr>
<td>5000 rpm</td>
<td>0.63 µm</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Spin Speed / krpm</th>
<th>Film Thickness / µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 rpm</td>
<td>1.88 µm</td>
</tr>
<tr>
<td>3000 rpm</td>
<td>1.54 µm</td>
</tr>
<tr>
<td>4000 rpm</td>
<td>1.33 µm</td>
</tr>
<tr>
<td>5000 rpm</td>
<td>1.19 µm</td>
</tr>
</tbody>
</table>

**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 3027 PHOTORESIST**

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

**FILM THICKNESS**

<table>
<thead>
<tr>
<th>Spin Speed / krpm</th>
<th>2000 rpm</th>
<th>3000 rpm</th>
<th>4000 rpm</th>
<th>5000 rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Thickness / µm</td>
<td>3.80 µm</td>
<td>3.11 µm</td>
<td>2.69 µm</td>
<td>2.41 µm</td>
</tr>
</tbody>
</table>

**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 MIF Developer

**AZ® ECI 3007 PHOTORESIST PROCESS** on bare silicon substrate

Softbake: 90°C, 90 sec, proximity  
0.763 µm film thickness Emax  
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  
CD 0.5µm dense C/H process window summary at best point: 140 mJ/cm², 1.37 µm DOF, 29.1% exposure latitude

**FOCUS LATITUDE** 0.5 µm dense contact holes
**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 \( \sigma \)  
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 \( \sigma \) // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

**LINEARITY** dense lines, 110 mJ/cm²

![CD nominal / µm](chart)

**FOCUS LATITUDE** 0.4 µm dense lines, 110 mJ/cm²

![CD measured / µm](chart)

**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 1.3µm 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

![Lineararity Graph](image)

**FOCUS LATITUDE** 1.3 µm dense lines, 262.5 mJ/cm²

![Focus Latitude Images](image)
**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-17557B i-line stepper, 0.54 NA, 0.6 \( \sigma \) // PEB: 110°C, 90 sec, proximity // Development: 60 sec, puddle, AZ® 300 MIF Developer @ 23°C

![Thermal Stability Images](image1.jpg)

**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

![Broadband Exposure Latitude Images](image2.jpg)

**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

![DOF / Exposure Latitude Graph](image3.jpg)
**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 FeCl₃/HCl at 45°C, ITO thickness: 200 nm

![Image of ITO adhesion](image)

**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

![Image of thermal oxide adhesion](image)
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

REFRACTIVE INDEX

DILL PARAMETERS
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