AZ 1500 Photoresist

Data Package

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AZ 1500 Photoresist

AZ 1500 series positive photoresists are well established g-line and broad-band resists. Wide exposure latitude and good resolution and depth of focus improve yield and throughput. Various viscosity grades are available for a multitude of applications and dyed versions are engineered to control reflective notching. Resists of AZ’s 1500 series can be developed in a variety of metal ion free developers (with and without surfactants) using a spray/puddle process.

For high throughput batch processing in a tank, inorganic developers are an excellent alternative.
AZ 1500 Photoresist Products

AZ 1500 Photoresist
AZ 1505
AZ 1512
AZ 1518
AZ 1529
AZ 1500-SFD Photoresist
AZ 1512-SFD
AZ 1518-SFD
AZ 1500 Photoresist
g-line Resolution at Specific Film Thickness

AZ 1505
AZ 1512
AZ 1518/ 1518-SFD
AZ 1500 Photoresist
g-line Resolution at Specific Film Thickness

AZ 1529
AZ 1512-SFD
AZ 1518/ 1518-SFD
AZ 1505
AZ 1512
AZ 1518/ 1518-SFD
AZ 1500 Photoresist
g-line Resolution at Specific Film Thickness

AZ 1529
AZ 1512-SFD
AZ 1518/ 1518-SFD
AZ 1505
AZ 1512
AZ 1518/ 1518-SFD
AZ 1500 Photoresist
g-line Resolution at Specific Film Thickness

AZ 1529
AZ 1512-SFD
AZ 1518/ 1518-SFD
AZ 1505
AZ 1512
AZ 1518/ 1518-SFD
AZ 1500 Photoresist
g-line Resolution at Specific Film Thickness

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<table>
<thead>
<tr>
<th>AZ 1500 Photoresist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AZ 1505</strong></td>
</tr>
</tbody>
</table>
| **AZ 1512**         | Good process latitude in g-line, and broad band  
                      | Excellent for wet etch processes |
| **AZ 1518**         | Good process latitude in g-line, and broad band  
                      | Excellent for wet etch processes  
                      | Thicker film for increased etch resistance |
| **AZ 1529**         | Great for pad layer applications  
                      | Can be coated from 2.5 to 5µm  
<pre><code>                  | Ideal for plating processes |
</code></pre>
<table>
<thead>
<tr>
<th><strong>AZ 1500-SFD Photoresist</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AZ 1512-SFD</strong></td>
</tr>
<tr>
<td>Dyed version</td>
</tr>
<tr>
<td>Suppresses swing and reflective notching effects on substrates with high or varying reflectivity, e.g. metals and contacts</td>
</tr>
<tr>
<td><strong>AZ 1518-SFD</strong></td>
</tr>
<tr>
<td>Dyed version</td>
</tr>
<tr>
<td>Higher film thickness, can be coated from 1.5 – 3µm</td>
</tr>
<tr>
<td>Suppresses swing and reflective notching effects on substrates with high or varying reflectivity, e.g. metals and contacts</td>
</tr>
</tbody>
</table>
## AZ 1500 Photoresist
### Recommended Process Conditions

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soft Bake:</strong></td>
<td>90-100°C for 30-60sec (hotplate)</td>
</tr>
<tr>
<td><strong>Exposure:</strong></td>
<td>g-line or broadband</td>
</tr>
<tr>
<td><strong>Post Exposure Bake:</strong></td>
<td>optional</td>
</tr>
<tr>
<td><strong>Developer:</strong></td>
<td>AZ 300MIF Developer</td>
</tr>
<tr>
<td></td>
<td>AZ 917 MIF Developer</td>
</tr>
<tr>
<td></td>
<td>AZ 1:1 Developer</td>
</tr>
<tr>
<td><strong>Develop Cycle:</strong></td>
<td>30-50sec spray@ 100-200rpm</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>60-120sec immersion @ 23±1°C</td>
</tr>
</tbody>
</table>
Spin Speed Curve for AZ 1500 Photoresist Products

Film Thickness, µm

Spin Speed, rpm

AZ 1505
AZ 1512
AZ 1518
AZ 1529

6” silicon wafers
Static dispense
SB: 100°C/60sec
# Summary
## g-Line Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>1µm L/S</th>
<th>0.9µm L/S</th>
<th>1µm Trench</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Focus</td>
<td>1.8µm</td>
<td>1.8µm</td>
<td>2.4µm</td>
</tr>
<tr>
<td>Exposure Latitude</td>
<td>20%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Dose to Print (DTP)</td>
<td>319mJ/cm²</td>
<td>339mJ/cm²</td>
<td>339mJ/cm²</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resolution</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.9µm</td>
<td>0.8µm</td>
</tr>
</tbody>
</table>
# AZ 1500 Photoresist
## Optical Parameters

### ◊ Refractive Index

<table>
<thead>
<tr>
<th></th>
<th>365nm</th>
<th>405nm</th>
<th>435nm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bleached</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1.6994</td>
<td>1.6714</td>
<td>1.6571</td>
</tr>
<tr>
<td>k</td>
<td>0.0058</td>
<td>0.0010</td>
<td>0.0003</td>
</tr>
<tr>
<td><strong>Unbleached</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>1.7123</td>
<td>1.6906</td>
<td>1.6948</td>
</tr>
<tr>
<td>k</td>
<td>0.0358</td>
<td>0.0336</td>
<td>0.0227</td>
</tr>
</tbody>
</table>

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AZ 1500 Photoresist
Optical Parameters

◊ Dill Parameters

**i-line:**

A = 1.0133 (µm-1)
B = 0.2177 (µm-1)
C = 0.0239 (cm²/mJ)

**g-line:**

A = NA
B = NA
C = NA

◊ Cauchy Coefficients

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleached</td>
<td>1.5966</td>
<td>0.003758</td>
<td>2.45E-03</td>
</tr>
<tr>
<td>Unbleached</td>
<td>1.5996</td>
<td>0.013498</td>
<td>1.90E-04</td>
</tr>
</tbody>
</table>
# AZ 1500-SFD Photoresist
## Optical Parameters

◊ **Refractive Index**

<table>
<thead>
<tr>
<th></th>
<th>Bleached</th>
<th>Unbleached</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>365nm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>1.6947</td>
<td>1.7057</td>
</tr>
<tr>
<td>( k )</td>
<td>0.0058</td>
<td>0.0337</td>
</tr>
<tr>
<td><strong>405nm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>1.6665</td>
<td>1.6822</td>
</tr>
<tr>
<td>( k )</td>
<td>0.0021</td>
<td>0.0327</td>
</tr>
<tr>
<td><strong>435nm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )</td>
<td>1.6503</td>
<td>1.6846</td>
</tr>
<tr>
<td>( k )</td>
<td>0.0047</td>
<td>0.0257</td>
</tr>
</tbody>
</table>
AZ 1500-SFD Photoresist
Optical Parameters

◊ Dill Parameters

**i-line:**
A = 0.9765 (µm⁻¹)
B = 0.2037 (µm⁻¹)
C = 0.0254 (cm²/mJ)

**g-line:**
A = 0.48 (µm⁻¹)
B = 0.265 (µm⁻¹)
C = 0.0223 (cm²/mJ)

◊ Cauchy Coefficients

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleached</td>
<td>1.5933</td>
<td>0.007923</td>
<td>1.39E-03</td>
</tr>
<tr>
<td>Unbleached</td>
<td>1.6028</td>
<td>0.002763</td>
<td>5.21E-03</td>
</tr>
</tbody>
</table>

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AZ 1500-SFD Photoresist
Optical Parameters - Absorptivity
AZ 1512 Photoresist
Resolution for Dense Lines, FT = 1.21 µm

Focus –0.4µm
SB: 95°/ 50sec; PEB 105°C/50 sec
GCA 0.42NA g-line stepper, 70 mJ/cm²
AZ 327 MIF developer, 40 sec spray/puddle @ 21°C

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AZ 1512 Photoresist
DOF for 1.3 µm Dense Lines, FT = 1.21 µm

SB: 95°/ 50sec; PEB 105°C/50 sec
GCA 0.42NA g-line stepper, 70 mJ/cm²
AZ 327 MIF developer, 40 sec spray/puddle @ 21°C
AZ 1518-SFD Photoresist

g-line Performance
AZ 425 MIF and 917 MIF Developer
AZ 1518-SFD Photoresist
Exposure Latitude for Dense Lines, FT = 2.22 µm

SB: 100°/60 sec; PEB 110°C/60 sec
GCA 0.42NA g-line stepper
AZ 425 MIF developer
AZ 1518-SFD Photoresist
Linearity/Resolution - Dense Lines, FT = 2.32µm

1.20 µm 1.10 µm 1.00 µm 0.90 µm 0.85 µm 0.80 µm 0.75 µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, 319 mJ/cm²
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer./ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
Linearity - Dense Lines, FT = 2.32 µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, 339 mJ/cm²
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
Exposure Latitude – 1.0 µm Dense Lines, FT = 2.32µm

260 mJ/cm²  
270 mJ/cm²  
280 mJ/cm²  
290 mJ/cm²  
319 mJ/cm²  
310 mJ/cm²  
300 mJ/cm²  

SB : 95°C for 60sec contact  
Exposure : GCA 0.42 NA g-line stepper  
PEB : 115°C for 60sec contact  
Develop: AZ 917 MIF Developer./ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
Exposure Latitude - 0.9 µm Dense Lines, FT = 2.32µm

280 mJ/cm²  290 mJ/cm²  300 mJ/cm²
310 mJ/cm²

339 mJ/cm²  329 mJ/cm²  319 mJ/cm²

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
DOF for 1.0 µm Dense Lines, FT = 2.32µm

1.20 µm  0.90 µm  0.60 µm

0.30 µm

-0.60 µm  -0.30 µm  0.00 µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, 319 mJ/cm²
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle  for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
DOF for 1.0 µm Dense Lines, FT = 2.32 µm

1.20 µm
0.90 µm
0.60 µm
0.30 µm
-0.60 µm
-0.30 µm
0.00 µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, \(319\text{ mJ/cm}^2\)
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
DOF for 0.9 µm Dense Lines, FT = 2.32µm

1.20 µm
0.90 µm
0.60 µm
0.30 µm
-0.60 µm
-0.30 µm
0.00 µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, 339 mJ/cm²
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21.0°C
AZ 1518-SFD Photoresist
Exp.Latitude – 1.0 µm Trench – Pitch 1:2, FT = 2.32µm

240 mJ/cm²  250 mJ/cm²  260 mJ/cm²  270 mJ/cm²  280 mJ/cm²

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper
PEB : 115°C for 60sec contact
Develop: **AZ 917 MIF Developer**/ Single puddle for 60 sec @ 21.0°C

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**AZ 1518-SFD Photoresist**
**DOF for 1.0 µm Trench – Pitch 1:2, FT = 2.32µm**

- **SB**: 95°C for 60sec contact
- **Exposure**: GCA 0.42 NA **g-line** stepper, **339 mJ/cm²**
- **PEB**: 115°C for 60sec contact
- **Develop**: **AZ 917 MIF Developer**/ Single puddle for 60 sec @ 21.0°C

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AZ 1518-SFD Photoresist
Linearity - Pitch 1:2, FT = 2.32µm

SB : 95°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper, 339 mJ/cm²
PEB : 115°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21.0°C
AZ 1529 Photoresist
Thermal Stability - Large Pads

Film Thickness: 3.5µm
SB : 95°C for 25min convection oven
Exposure : Ultratech 1500 stepper
Develop: AZ Developer (diluted to 0.21N)
Hardbake: 2min hot plate
AZ 1518-SFD Photoresist
Exp. Latitude for 1.30 µm Dense Lines, FT = 1.825 µm

- 155 mJ/cm²
- 170 mJ/cm²
- 185 mJ/cm²
- 200 mJ/cm²
- 245 mJ/cm²
- 230 mJ/cm²
- 215 mJ/cm²

SB : 100°C for 60sec contact
Exposure : GCA 0.42 NA g-line stepper
PEB : 110°C for 60sec contact
Develop: AZ 917 MIF Developer/ Single puddle for 60 sec @ 21°C

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