DESCRIPTION
UV6 Positive DUV Photoresist has been optimized to provide vertical profile imaging of dense and semi-isolated features for device production design rules to 180 nm. This resist is ideally suited for use with AR2™ Anti-reflectant and a variety of inorganic substrates. Minimal sensitivity to PEB temperature variation (<5 nm/°C), superior etch resistance, wide process window, and low bias properties provides high yielding device fabrication. UV6 is most compatible with 0.26N developers (2.38% TMAH).

FEATURES & LITHOGRAPHIC PERFORMANCE:
- Sizing energy
  - 18.0–28.0 mJ/cm² for lines/spaces
  - 25.0–40.0 mJ/cm² for contact holes
- Depth of focus
  - 1.00 μm DOF for 200 nm lines/spaces
  - 0.80 μm DOF for 250 nm contact holes
- Resolution
  - <200 nm resolution for lines/spaces
  - <200 nm resolution for contact holes
- >1 hour post-exposure bake stability (unfiltered environment)
- >6 month shelf life
- <5 nm/°C post-exposure bake sensitivity
- 150°C thermal stability

See Figures 1 and 2 for lithographic performance and Table 1 for recommended process conditions.

SUBSTRATE
UV6 photoresist is compatible with a wide range of substrates including silicon, organic, and inorganic anti-reflective materials (Figure 2). A hexamethyldisilazane (HMDS) based MICROPOSIT® primer is recommended to promote adhesion with substrates that require such treatment. Vacuum vapor priming at 120°C for 30 seconds with concentrated HMDS is recommended.

Table 1. Recommended Process Conditions

<table>
<thead>
<tr>
<th></th>
<th>Contact Holes</th>
<th>Lines/Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>6,800–9,125Å</td>
<td>6,800–9,125Å</td>
</tr>
<tr>
<td>Softbake</td>
<td>130°C/60 sec. Proximity Hotplate</td>
<td>130°C/60 sec. Proximity Hotplate</td>
</tr>
<tr>
<td>PEB</td>
<td>140°C/90 sec. Proximity Hotplate</td>
<td>130°C/90 sec. Proximity Hotplate (for non-reflective substrates)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>140°C/90 sec. Proximity Hotplate (for reflective substrates)</td>
</tr>
<tr>
<td>Developer</td>
<td>MEGAPOSIT™ LDD-26W @ 21°C, 45 sec. single puddle</td>
<td>MEGAPOSIT LDD-26W @ 21°C, 45 sec. single puddle</td>
</tr>
</tbody>
</table>
UV6 POSITIVE DUV PHOTORESIST

COAT

*Figure 3* shows the relation between spin speed and resist thickness for 6-inch substrates. Nominal film thickness may vary slightly due to process, equipment and ambient conditions.

![Figure 3. Spin Speed Curves](image)

**SOFTBAKE**

The recommended softbake process for lines/spaces and contact holes is listed in *Table 2* for silicon and anti-reflective substrates.

![Figure 4. Dispersion Curve](image)

**Table 2. Softbake Process Conditions**

<table>
<thead>
<tr>
<th></th>
<th>Contact Holes</th>
<th>Lines/Spaces and Isolated Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>130°C</td>
<td>130°C</td>
</tr>
<tr>
<td>Time</td>
<td>60 sec. Proximity Hotplate</td>
<td>60 sec. Proximity Hotplate</td>
</tr>
</tbody>
</table>

**FILM THICKNESS MEASUREMENT**

*Figure 4* shows the refractive index of UV6 as a function of wavelength. Cauchy coefficients are listed in *Table 3*. Resist thicknesses of 6,800–9,125Å were used to characterize UV6. *Figures 5* and *6* display the $E_0$ and CD interference curves for silicon, BARL 900 and AR2.

![Table 3. Cauchy Coefficients](image)

| $n_1$ | 1.5612 |
| $n_2$ | -1.0297e5 |
| $n_3$ | 1.5492e13 |

![Figure 5. Interference Curves - Bulk $E_0$](image)

**Figure 6. Interference Curves—250 nm 1:1 Lines/Spaces CD**
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**EXPOSE**

*Figure 7* displays the absorbance curve for the unexposed resist film. *Table 4* lists the parameters needed for resist modeling.

![Figure 7. Absorbance Curve](image)

**POST-EXPOSURE BAKE**

A 10-degree temperature differential (softbake lower then PEB) is used to reduce standing waves on reflective substrates. On non-reflective substrates, no temperature difference is required. The recommended processing conditions for reflective and non-reflective substrates are listed in *Table 5*. *Figure 8* shows the PEB sensitivity of UV6.

**POST-EXPOSURE DELAY STABILITY**

As shown in *Figure 9*, the delay stability for UV6 is greater than 1 hour in a non-filtered environment.

![Figure 9. Delay Stability on BARL 900](image)

**DEVELOP**

UV6 is optimized for 0.26N developers (*Figure 10, next page*). A 45 second single puddle with no pre-wet is recommended for most applications including lines/spaces and contact holes. *Figure 11* (next page) shows the dissolution rate as a function of exposure dose.

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**Table 4. Prolith Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dill A Value</td>
<td>0.13053</td>
</tr>
<tr>
<td>Dill B Value</td>
<td>0.6016</td>
</tr>
<tr>
<td>Dill C Value</td>
<td>0.0257 cm²/mJ</td>
</tr>
<tr>
<td>R&lt;sub&gt;min&lt;/sub&gt;</td>
<td>0.49 Å/sec.</td>
</tr>
<tr>
<td>R&lt;sub&gt;max&lt;/sub&gt;</td>
<td>3.841 Å/sec.</td>
</tr>
<tr>
<td>Acid Generation Coefficient</td>
<td>0.051 cm²/mJ</td>
</tr>
<tr>
<td>n</td>
<td>6.78</td>
</tr>
<tr>
<td>RI @ 633 nm</td>
<td>1.57</td>
</tr>
<tr>
<td>RI @ 248 nm</td>
<td>1.70</td>
</tr>
</tbody>
</table>

*Chemically-amplified resists require additional modeling parameters currently being determined. Please see your TSR for an updated copy of modeling parameters.

<table>
<thead>
<tr>
<th>Lines/Spaces</th>
<th>Contact Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Temperature</td>
</tr>
<tr>
<td>140°C (Reflective Substrates)</td>
<td>140°C</td>
</tr>
<tr>
<td>130°C (Anti-Reflective Substrates)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>90 sec. Proximity Hotplate</td>
</tr>
</tbody>
</table>

![Figure 8. PEB Sensitivity](image)
Figure 10. Developer Compatibility
200 nm 1:1 Lines/Spaces

- LDD-26W
- MF-926HS
- MF-86MX
- NMD-W

Figure 11. Dissolution Curve on Silicon

Figure 12. Thermal Flow Characteristics
250 nm 1:1 Lines/Spaces 10 µm Pad

- No Bake
- 140°C/3 min.
- 145°C/3 min.
- 150°C/3 min.
- 155°C/3 min.

HARDBAKE

Figure 12 displays the thermal flow characteristics of UV6 photoresist.
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PHOTORESIST REMOVAL
UV6 can be removed with MICROPOSIT REMOVER 1165®. A two-bath process is recommended with each bath at a temperature of 80°C. The first bath removes the bulk of the photoresist and the second removes residual traces of photoresist. Please consult specific remover datasheets for additional process information.

ETCH RESISTANCE
Figure 13 shows the etch performance of UV6 with a chlorine-based metal etch process. Blanket etch studies performed in an Applied Materials, Inc. Model 5000 etcher.

HANDLING PRECAUTIONS
UV6 is a combustible liquid and vapor; keep away from heat sparks and open flame. Irritation to eyes, nose and respiratory track can occur. Use with adequate ventilation and avoid breathing vapors and mists. Wash thoroughly after handling and always wear chemical goggles, gloves, and suitable protective clothing. In case of eye or skin contact, flush affected areas with plenty of water for at least 15 minutes.

Contact a physician at once. Consult Product Material Safety Data Sheet before using.

WASTE TREATMENT
UV6 contains ethyl lactate and may be included with other wastes containing similar organic solvents to be discarded for destruction or reclaim in accordance with local, state, and federal regulations.

It is your responsibility to ensure the disposal of UV6 and residues therefrom is made in compliance with all applicable environmental regulations.

STORAGE
Store UV6 only in upright, sealed, original containers in a dry area at 30–50°F (-1–10°C) away from heat and sunlight. Keep away from alkaline materials, acids and oxidizers. Keep container closed when not in use.
UV6 POSITIVE DUV PHOTORESIST

For locations and information please visit; http://electronicmaterials.rohmhaas.com