ELECTRONIC MATERIALS
MICROELECTRONIC TECHNOLOGIES

UVN™30 NEGATIVE DUV PHOTORESIST

For DUV Applications

DESCRIPTION

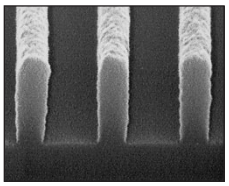
UVN30 is a negative-tone photoresist for DUV, X-ray, and e-beam applications. This resist is targeted for fast throughput device production rules down to 150 nm. Nested lines/spaces, isolated lines, posts, and contacts can be resolved with wide process windows. Minimal PEB sensitivity, insensitivity to airborne contaminants, and superior metal etch resistance are only some of the properties UVN30 offers. Recommended substrates include polysilicon, 300Å capped SiON, and Rohm and Haas Electronic Materials' organic anti-reflection coating. UVN30 has been optimized for 0.26N developers.

FEATURES & LITHOGRAPHIC PERFORMANCE:

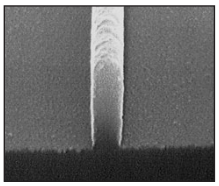
- Sizing energy
  - 10.0–30.0 mJ/cm² for lines/spaces
- Depth of Focus
  - 1.00 µm DoF for 350 nm 1:2 posts
  - 0.80 µm DoF for 300 nm 1:2 posts
  - 0.75 µm DoF for 250 nm 1:2 posts
  - 0.80 µm DoF for 150 nm 1:2 lines/spaces
  - 0.60 µm DoF for 150 nm isolated lines
- 1 hour post-exposure bake stability
- >1 hour post-exposure bake stability
- <2 nm/°C post-exposure bake sensitivity
- 9 months shelf life
- 175°C thermal stability

See *Figure 1* for lithographic performance and *Table 1* for recommended process conditions.

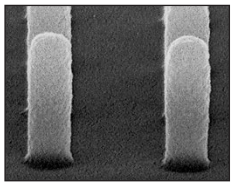
Figure 1. Lithographic Performance (0.60 NA, 0.60σ)



150 nm 1:2 Lines/Spaces



150 nm Isolated Lines



250 nm 1:2 Posts

SUBSTRATE

UVN30 photoresist is compatible with a wide range of substrates, including silicon, and organic and inorganic anti-reflective materials. 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.

COAT

Figure 2 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.

Table 1. Recommended Process Conditions

	Reflective Substrates	Non-reflective Substrates
Thickness	5,000–8,000Å	5,000–8,000Å
Softbake	90°C/60 sec. Proximity Hotplate	110°C/60 sec. Proximity Hotplate
PEB	95°C/60 sec. Proximity Hotplate	105°C/60 sec. Proximity Hotplate
Developer	MEGAPOSIT™ MF™ CD-26 @ 21°C, 30 sec. single puddle	MEGAPOSIT™ MF™ CD-26 @ 21°C, 30 sec. single puddle

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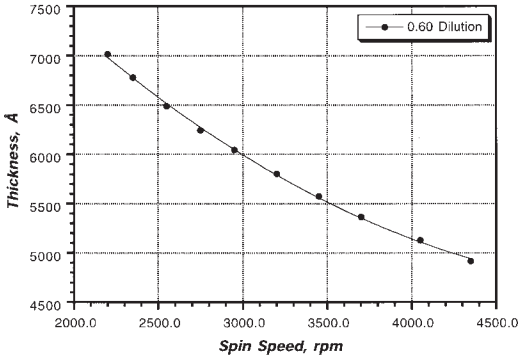
Figure 2. Spin Speed Curve



SOFTBAKE

The recommended softbake processes for reflective and non-reflective substrates are listed in *Table 2.*

Table 2. Softbake Process Conditions

	Reflective Substrates	Non-reflective Substrates
Temperature	90°C Proximity Hotplate	110°C Proximity Hotplate
Time	60 sec.	60 sec.

FILM THICKNESS MEASUREMENT

Figure 3 shows the refractive index of UVN30 as a function of wavelength. Cauchy coefficients are listed in *Table 3.*

Figure 3. Dispersion Curve

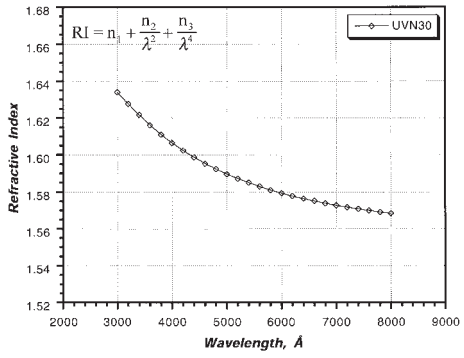
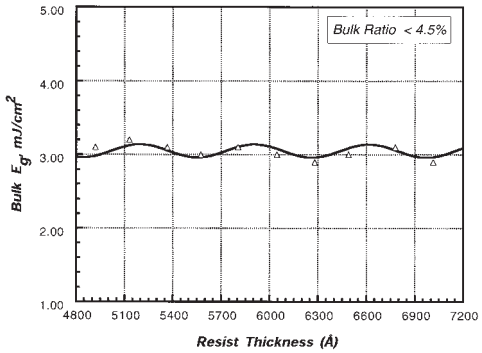


Table 3. Cauchy Coefficients

n_1	1.5532
n_2	1.01e6
n_3	-2.54e12

Figure 4 displays the E_g interference curves for AR3.

Figure 4. Interference Curve—Bulk E_g



EXPOSE

Figure 5 displays the absorbance curve for the unexposed resist film. *Table 4* lists the parameters needed for resist modeling.

Figure 5. Absorbance Curves

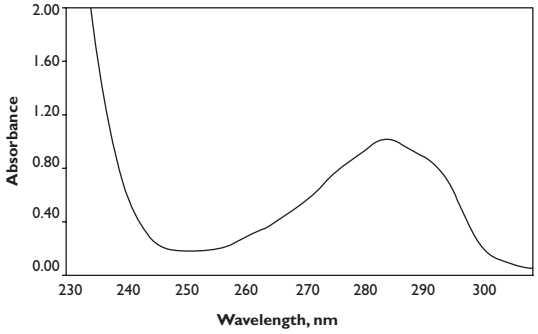


Table 4. Prolith Parameters*

Dill A Value	-0.0199/µm
Dill B Value	0.4386/µm
Dill C Value	0.0150 cm²/mJ
RI @ 633 nm	1.57
RI @ 248 nm	1.77

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

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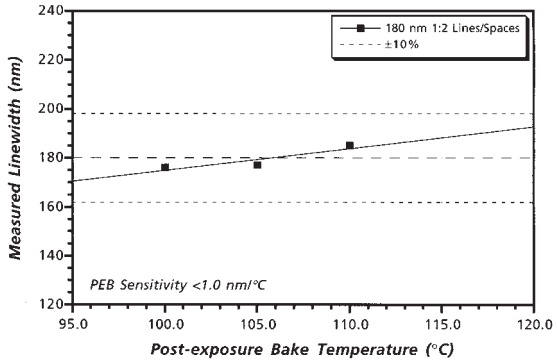
POST-EXPOSURE BAKE

The recommended PEB conditions for reflective and non-reflective surfaces are listed in *Table 5*. *Figure 6* shows the PEB sensitivity of UVN30 on AR3™.

Table 5. Post-exposure Bake Process Conditions

	Reflective Substrates	Non-reflective Substrates
Temperature	95°C Proximity Hotplate	105°C Proximity Hotplate
Time	60 sec.	60 sec.

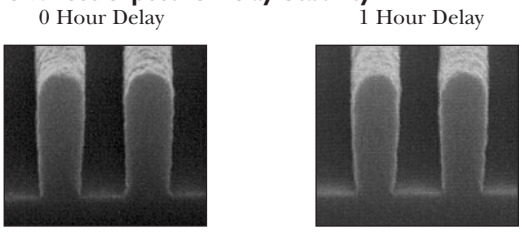
Figure 6. PEB Sensitivity UVN30 on AR3



POST-EXPOSURE DELAY STABILITY

As shown in *Figure 7*, the delay stability for UVN30 is greater than 1 hour in a non-filtered environment.

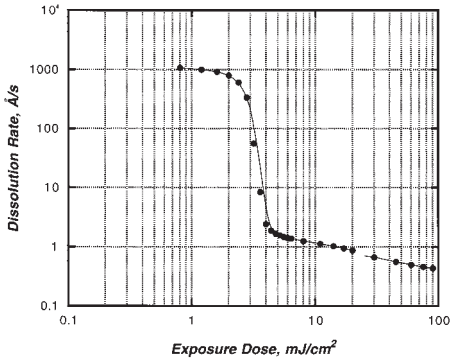
Figure 7. Post-exposure Delay Stability



DEVELOP

UVN30 is optimized for 0.26N developers. MEGAPOSIT MF CD-26 is the recommended developer. A 30 second single puddle with no pre-wet is recommended for most applications, including isolated lines, semi-dense lines/spaces and posts. *Figure 8* shows the dissolution rate as function of exposure dose for both reflective and non-reflective applications.

Figure 8. Dissolution Rate



HARDBAKE

Figure 9 shows the thermal flow characteristics of UVN30.

PHOTORESIST REMOVAL

UVN30 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 data sheets for additional process information.

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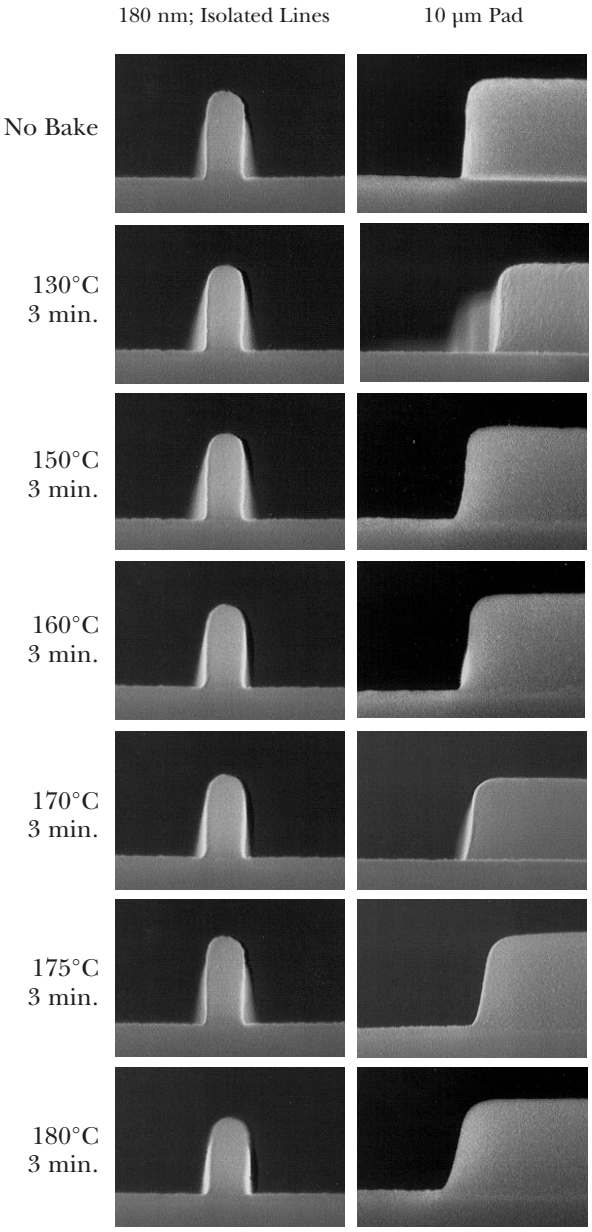
Figure 9. Thermal Flow Characteristics



HANDLING PRECAUTIONS

UVN30 is a combustible liquid containing propylene glycol monomethyl ether acetate. Handle with care.* Contact with eyes and mucous membranes may cause irritation. In case of eye or skin contact, flush affected areas with plenty of water for at least 15 minutes. If irritation persists, contact your physician immediately. Avoid breathing vapor or mists. Use with adequate ventilation. Wash thoroughly after handling and always wear chemical goggles, gloves, and suitable protective clothing.

Consult Product Material Safety Data Sheet before using.

WASTE TREATMENT

UVN30 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 and residues therefrom is made in compliance with all applicable environmental regulations.

STORAGE

Store UVN30 in upright, sealed original containers in a dry area at 30–50°F (-1–10°C) away from heat and sunlight. Keep away from oxidizers, acids, and bases. Keep container sealed when not in use.

*Skin contact may cause allergic senitization.

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