



UV™ 210 POSITIVE DUV PHOTORESIST

For Microlithography Applications

DESCRIPTION

UV210 is a multipurpose resist that can be utilized for gate, phase shift mask contact holes, and trench applications in the 180–130 nm CD range.

FEATURES:

Sizing Energy

- 28 mJ/cm² for 130 nm 1:1.5 lines/spaces
- 33 mJ/cm² for 180 nm 1:1 trenches
- 60 mJ/cm² for 180 nm 1:1 contact holes

Depth-of-Focus

- 1.00 μm DoF for 130 nm 1:1.5 lines/spaces
- 0.80 μm DoF for 180 nm 1:1 trenches
- 0.70 μm DoF for 180 nm 1:1 contact holes

Resolution

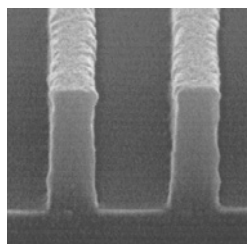
- 130 nm for 1:1.5 lines/spaces
- 150 nm for 1:1 contact holes (70 nm bias)
- 160 for 1:1 trenches

Other Responses

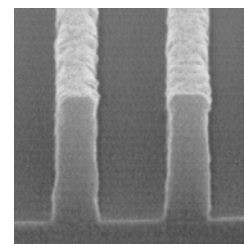
- 1 hour post-exposure bake stability
- <4 nm/°C post-exposure bake sensitivity
- 9-month shelf life
- 150°C thermal stability

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

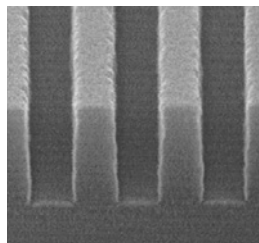
Figure 1. Lithographic Performance



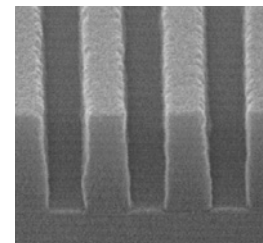
150 nm
1:1.5 Lines/Spaces
(27.4 mJ/cm²)



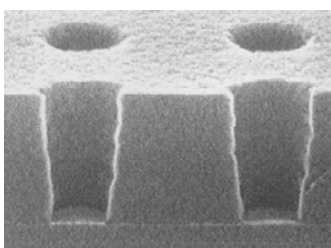
130 nm
1:1.5 Lines/Spaces
(28.0 mJ/cm²)



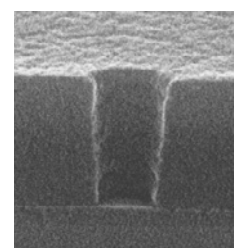
170 nm Dense Trenches
(Dark Field)
(37.4 mJ/cm²)



160 nm Dense Trenches
(Dark Field)
(37.4 mJ/cm²)



150 nm 1:1 Contact Holes
6% APSM (70 nm bias)
(66.0 mJ/cm²)



150 nm 1:3 Contact Holes
6% APSM (70 nm bias)
(66.0 mJ/cm²)

Table 1. Recommended Process Conditions*

	Contact Holes	Lines/Spaces
Thickness	3,000–8,000Å	3,000–8,000Å
Softbake	140°C/60 sec. Proximity Hotplate	130°C/60 sec. Proximity Hotplate
Developer	140°C/90 sec. Proximity Hotplate	130°C/90 sec. Proximity Hotplate
PEB	MF™ CD-26 @ 21°C, 45 sec. single puddle	MF CD-26 @ 21°C, 45 sec. single puddle

*All data shown within this flyer used the process conditions listed above unless otherwise stated.

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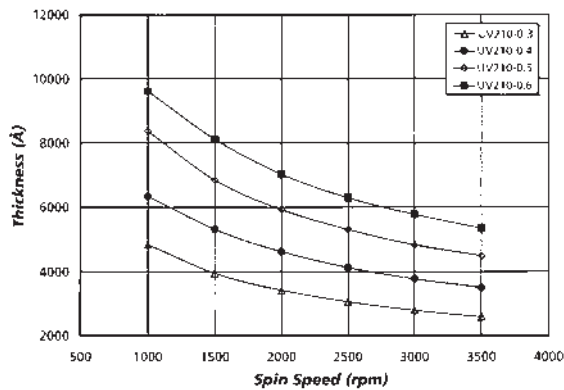
SUBSTRATE

UV210 photoresist is compatible with a wide range of substrates, including silicon, and both 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 silicon substrates. Nominal film thickness may vary slightly due to process, equipment and ambient conditions.

Figure 2. Spin Speed Curves



SOFTBAKE

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

Table 2. Softbake Process Conditions

	Contact Holes	Lines/Spaces and Isolated Lines
Temperature	140°C	130°C
Time	60 sec. Proximity Hotplate	60 sec. Proximity Hotplate

FILM THICKNESS MEASUREMENT

Cauchy coefficients are listed in Table 3. Figure 3 shows the refractive index of UV210 as a function of wavelength. Resist thicknesses of 3,900-6,200Å were used to characterize UV210. Figure 4 displays the E_0 interference curve for UV210 on silicon.

Table 3. Cauchy Coefficients

n_1	1.532
n_2	8.97e+5
n_3	3.00e+10

Figure 3. Dispersion Curve—Cauchy Relationship

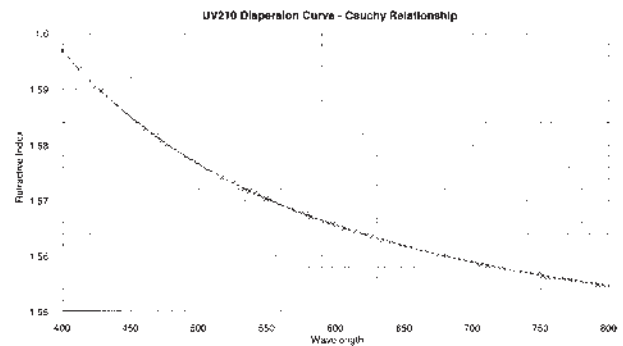
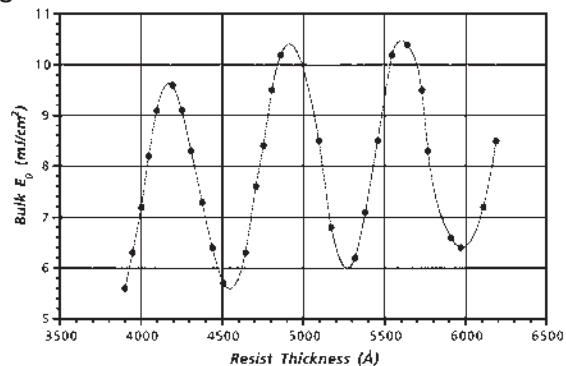


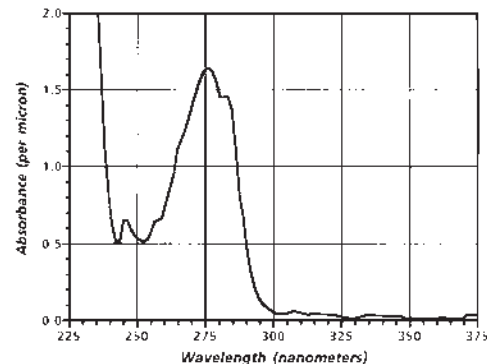
Figure 4. Interference Curve on Silicon



EXPOSE

Figure 6 displays the absorbance curve for the unexposed resist film. Table 4 (next page) lists the parameters needed for resist modeling.

Figure 6. Absorbance Curve



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Table 4. Prolith Parameters

Dill A	0.0564 l/ μ m
Dill B	0.5251 l/ μ m
Dill C	0.034 cm ² /mJ
R _{min}	0.014 Å/sec.
R _{max}	1,028 Å/sec.
n	—
RI @ 673 nm	1.56
RI @ 248 nm	1.79

Note: Chemically-amplified resist requires additional modeling parameters which are currently being determined. Please see you TSR for an updated copy of modeling parameters.

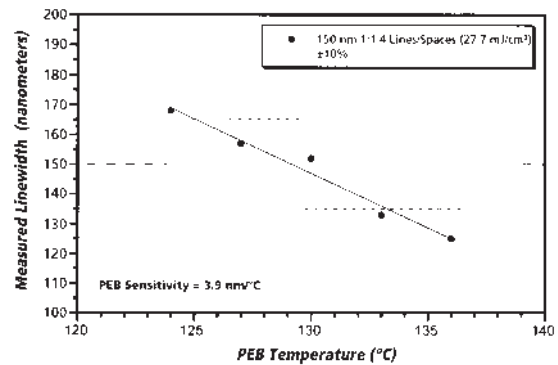
POST-EXPOSURE BAKE

The recommended PEB conditions for UV210 on reflective and non-reflective substrates are listed in *Table 5*. *Figure 7* shows the PEB sensitivity of UV210.

Table 5. PEB Process Conditions

	Contact Holes	Lines/Spaces and Isolated Lines
Temperature	140°C	130°C
Time	90 sec. Proximity Hotplate	90 sec. Proximity Hotplate

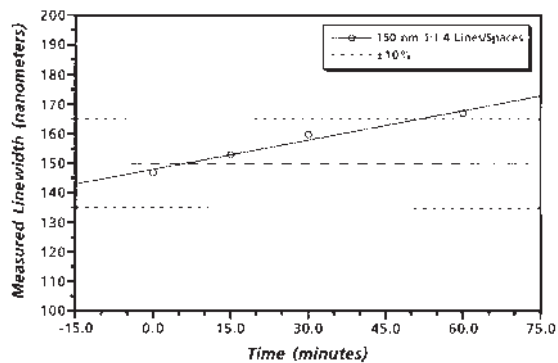
Figure 7. PEB Sensitivity Plot



POST-EXPOSURE DELAY STABILITY

The post-exposure delay stability for UV210 is shown in *Figure 8*.

Figure 8. PED Stability Plot



DEVELOP

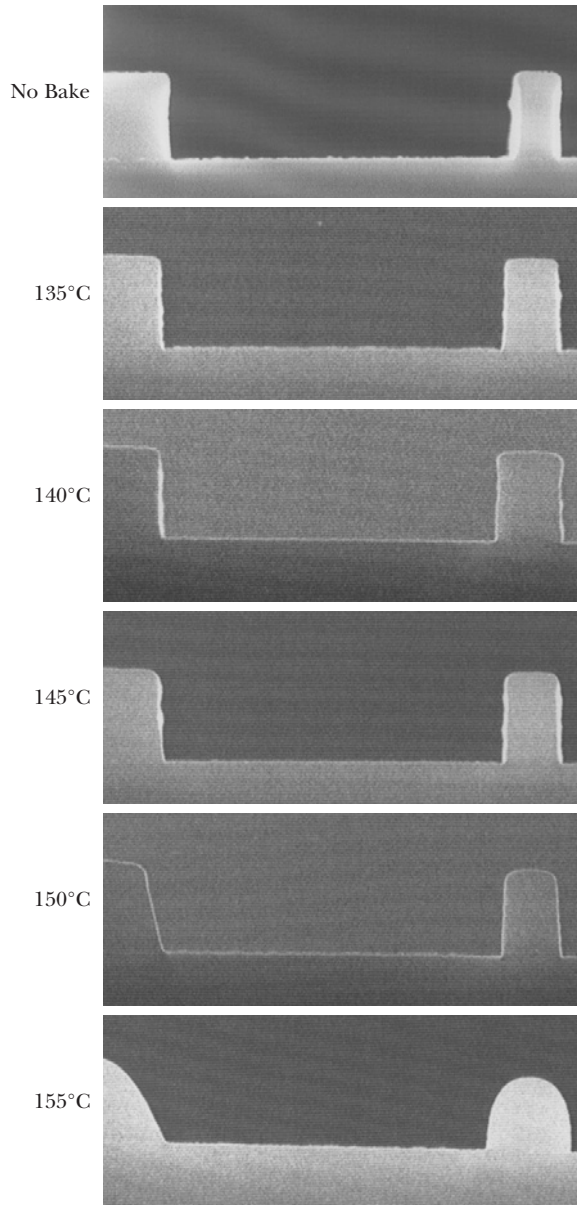
UV210 is optimized for 0.26N developers. A 45 second single puddle with no pre-wet is recommended for most applications including lines/spaces, isolated lines and contact holes.

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HARDBAKE

Figure 9 shows the thermal flow characteristics of UV210.

Figure 9. Thermal Flow Characteristics



PHOTORESIST REMOVAL

UV210 can be removed with MICROPOSIT REMOVER 1165. A two-bath process is recommended with each bath at a temperature of 80°C. The first removes the bulk of the photoresist and the second removes residual traces of photoresist. Consult specific remover datasheets for additional process information.

HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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