



UV113™ POSITIVE DUV PHOTORESIST

For Microlithography Applications

DESCRIPTION

UV113 has been optimized to provide vertical profile imaging of isolated and semi-dense features for device production design rules to 150 nm. This resist is ideally suited for use with AR3™ anti-reflectant and a variety of inorganic substrates. UV113 offers metal etch resistance equivalent to that of conventional i-Line photoresist. Its minimal sensitivity to post-exposure bake (PEB) temperature variation (<4 nm/°C), superior etch resistance, wide process window, and very low bias properties provide high-yielding device fabrication. UV113 is compatible with 0.26N developers (2.38% TMAH).

FEATURES

Sizing energy

- ≤40 mJ/cm² for 130 nm 1:1.5 lines/spaces
- ≤60 mJ/cm² for 200 nm 1:1 contact holes
- ≤45 mJ/cm² for 160 nm 1:1.5 trenches

Depth-of-focus

- 1.00 μm DoF for 150 nm 1:1.2 lines/spaces
- 1.00 μm DoF for 130 nm 1:1.5 lines/spaces
- 0.50 μm DoF for 110 nm 1:2 lines/spaces
- 0.90 μm DoF for 200 nm 1:1 contact holes
- 0.80 μm DoF for 160 nm 1:1.5 trenches

Other Responses

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

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

SUBSTRATE

UV113 photoresist is compatible with a wide range of substrates, including silicon, silicon nitride, and organic and inorganic anti-reflective materials.

Figure 1. Lithographic Performance

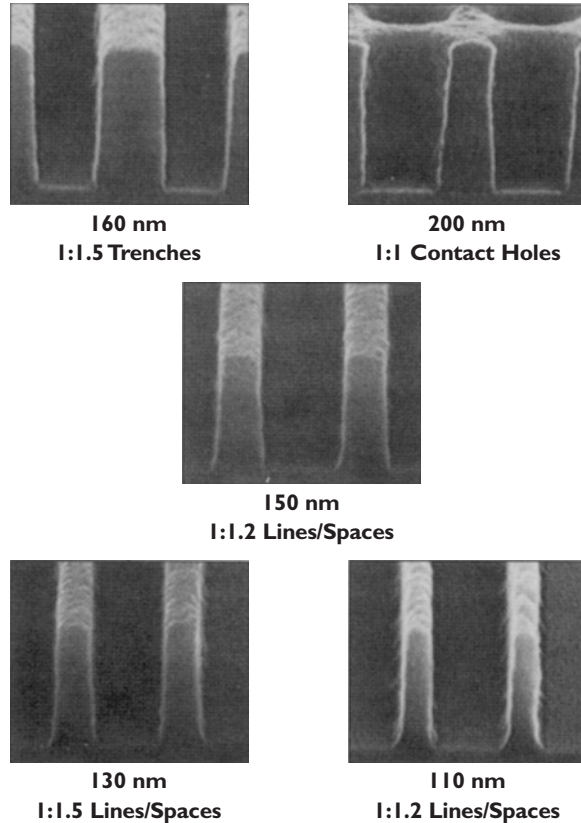


Table 1. Recommended Process Conditions

	Contact Holes
Thickness	4,000–10,000Å
Softbake	135°C/60 sec. Proximity Hotplate
PEB	130°C/90 sec. Proximity Hotplate
Developer	MF™ CD-26 at 21°C, 45 sec. single puddle
	Lines/Spaces and Isolated Lines
Thickness	4,000–10,000Å
Softbake	120°C/60 sec. Proximity Hotplate
PEB	130°C/90 sec. Proximity Hotplate
Developer	MF CD-26 at 21°C, 45 sec. single puddle

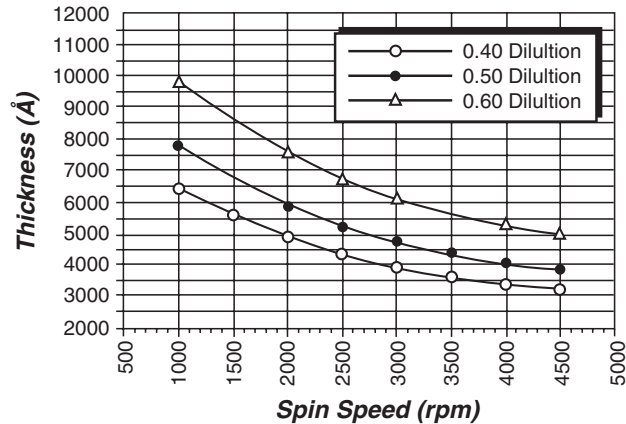
Note: All data shown within this data sheet used the process conditions listed above unless otherwise stated.

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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.

Figure 2. Spin Speed Curves



SOFTBAKE

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

Table 2. Soft Bake Process Conditions

Contact Holes	
Temperature	135°C
Time	60 sec. Proximity Hotplate
Lines/Spaces and Isolated Lines	
Temperature	120°C
Time	60 sec. Proximity Hotplate

FILM THICKNESS MEASUREMENT

Cauchy coefficients are listed in Table 3. Figure 3 shows the refractive index of UVI13 as a function of wavelength. Resist thicknesses of 4,000–6,000Å were used to characterize UVI13. Figure 4 displays the E_0 and interference curves for silicon and AR3. Table 4 lists the Dill parameters for UVI13.

Table 3. Cauchy Coefficients

n_1	1.5481
n_2	9.7739e+5
n_3	2.318e+12

Figure 3. Dispersion Curve

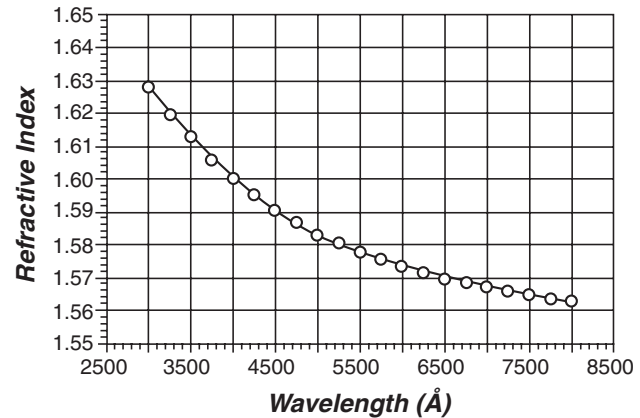


Figure 4. Interference Curve

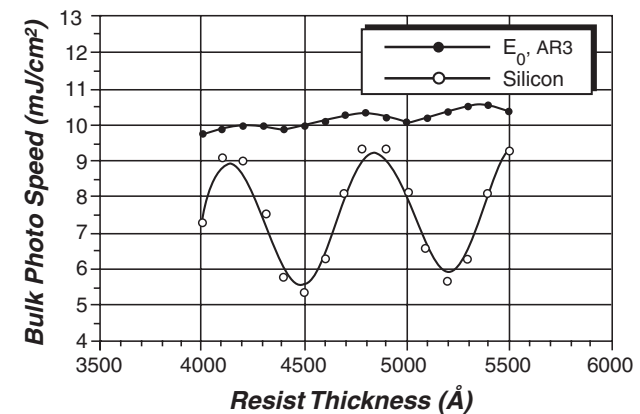


Table 4. Dill Parameters

Dill A	0.0746 1/μm
Dill B	0.5634 1/μm

Note: Chemically-amplified resists require additional modeling parameters currently being determined. Please contact your Rohm and Haas Electronic Materials Representative for an updated copy of modeling parameters.

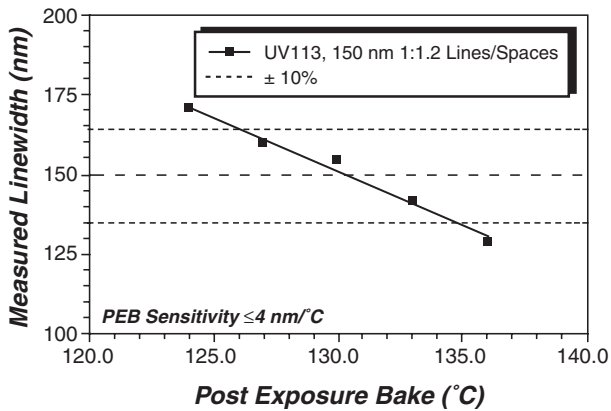
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POST-EXPOSURE BAKE

The recommended PEB conditions for UV113 on reflective and non-reflective substrates are listed in Table 5. Figure 6 shows the PEB sensitivity of UV113.

Table 5. PEB Process Conditions	
	Contact Holes
Temperature	130°C
Time	90 sec. Proximity Hotplate
	Lines/Spaces and Isolated Lines
Temperature	130°C
Time	90 sec. Proximity Hotplate

Figure 6. PEB Sensitivity



POST-EXPOSURE DELAY STABILITY

The post-exposure delay stability for UV113 is shown in Figure 7 and Figure 8 to be greater than 60 minutes in a chemically-filtered environment.

Figure 7. PEB Stability Plot

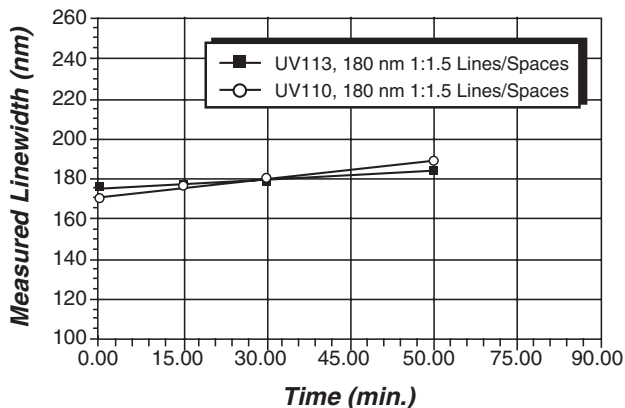


Figure 8. PED Stability

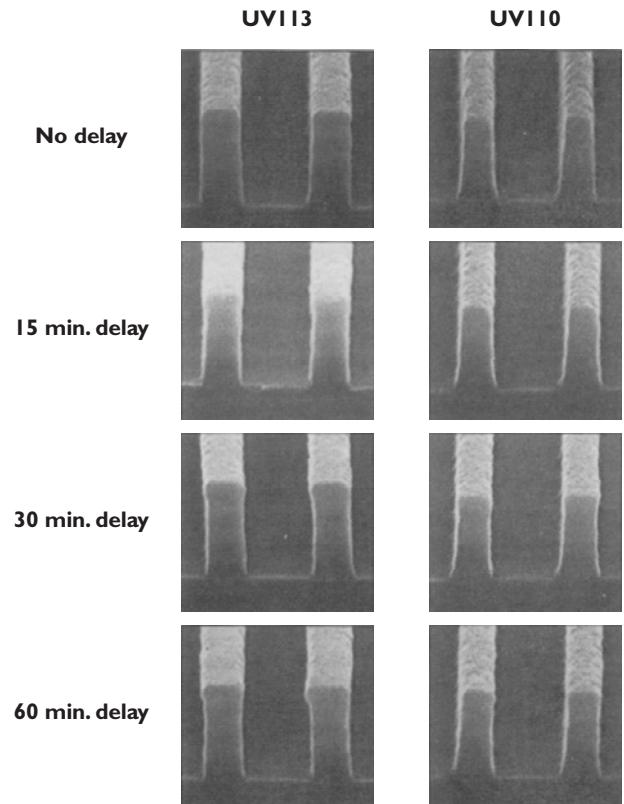
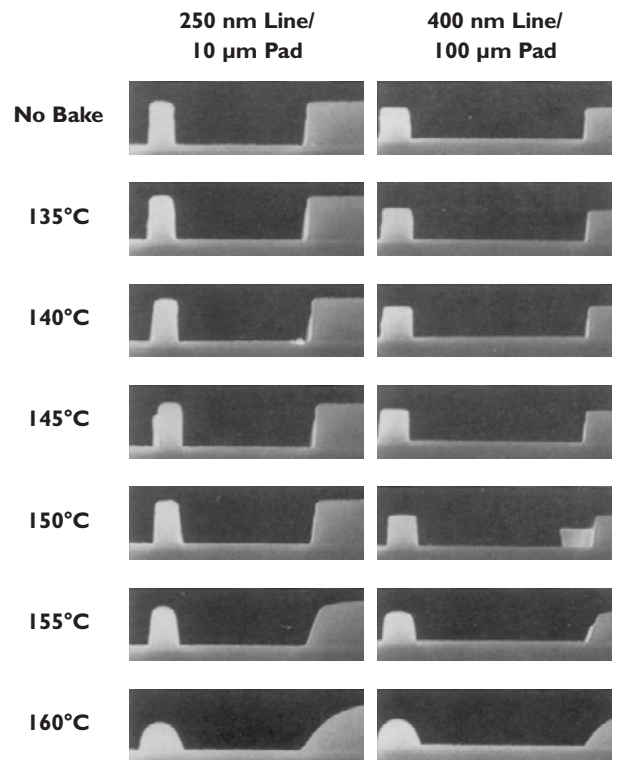


Figure 9. Thermal Flow Characteristics



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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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