ELECTRONIC MATERIALS
MICROELECTRONIC TECHNOLOGIES

MEGAPOSIT™ SPR3600 i-LINE SERIES PHOTORESIST

For Microlithography Applications

DESCRIPTION

MEGAPOSIT SPR3600 i-Line Series Photoresist is a positive photoresist designed for very high-throughout process requirements while still delivering excellent lithographic performance coupled with very good wet etch and thermal stability.

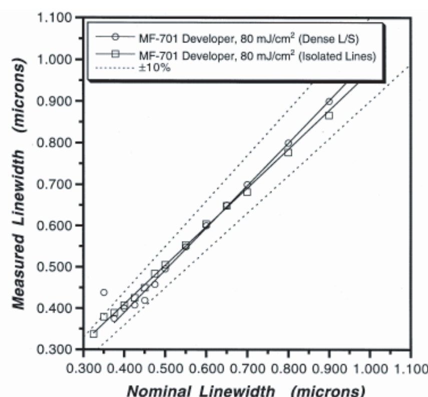
The MEGAPOSIT i-LineSPR3600 Series Photoresist also possesses multi-wavelength capabilities and is an ideal cross over photoresist allowing mix and match capability.

The MEGAPOSIT i-Line SPR3600 Series Photoresist shows good performance on line and space and contact hole applications, it also has a complementary range of L and M dyed products which are ideal for reflective substrates. The dilutions available for SPR3600 allow it to cover resist thickness requirements from 1 µm up to 4 µm allowing a single resist family to meet all the process requirements.

ADVANTAGES

- Extremely high-throughput process—67 mJ/cm² (0.800 µm L/S) and 88 mJ/cm² (0.700 µm CH) i-Line E_s using 30 SSP develop with 0.26N developer at 1.0 µm film thickness
- Flexible develop process allows for maimizing overall throughput by matching exposure and develop process throughput
- Compatible with both 0.24N and 0.26N developers
- g-Line, i-Line and broadband capabilities
- Robust process latitudes
- High thermal (130°C)/etch resistance
- Applications requiring 1.0–4.0 µm film thicknesses
- Recommended for 0.600 µm process design rules and above
- Comprehensive range of L and M dye dilutions also available for reflective substrates

Figure 1. Masking Linearity



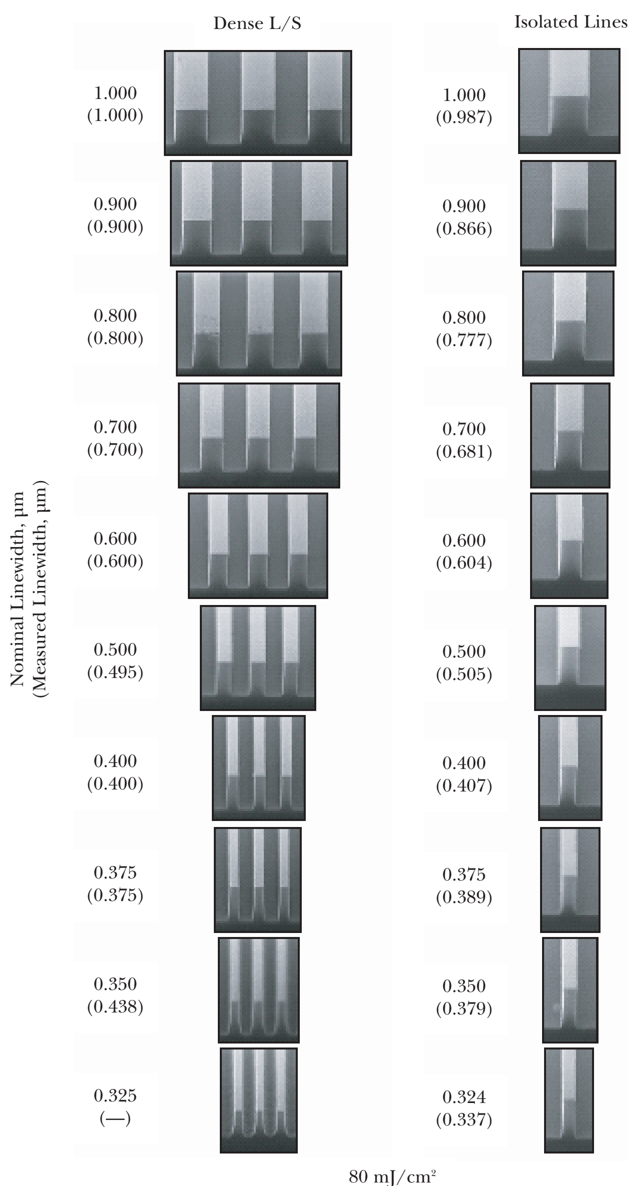


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Figure 2. Exposure Latitude

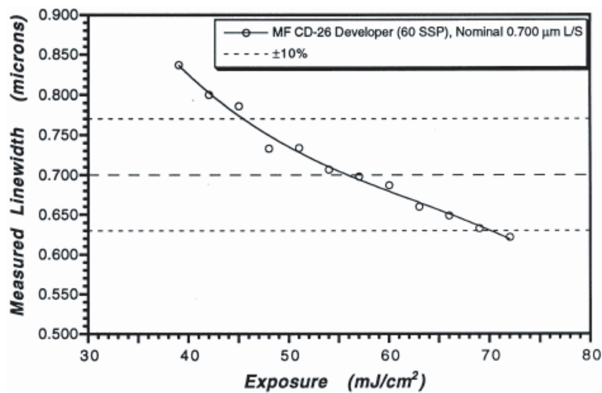
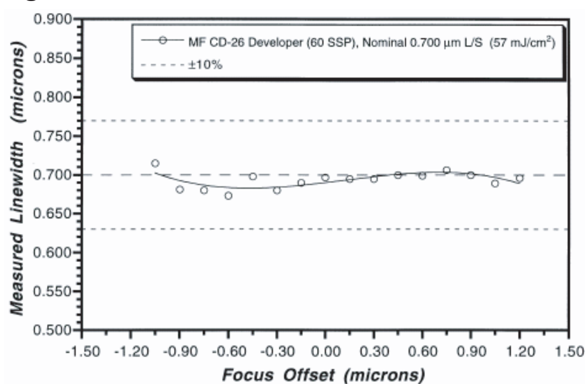
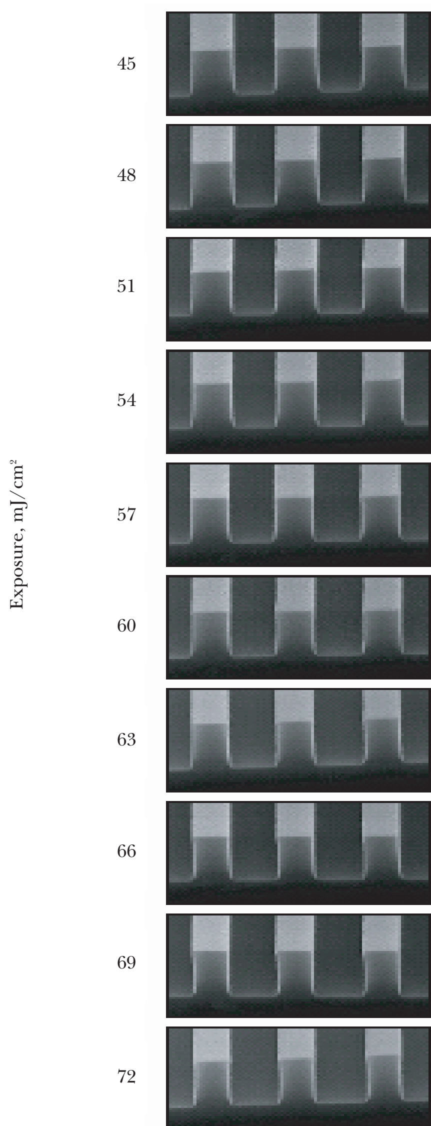
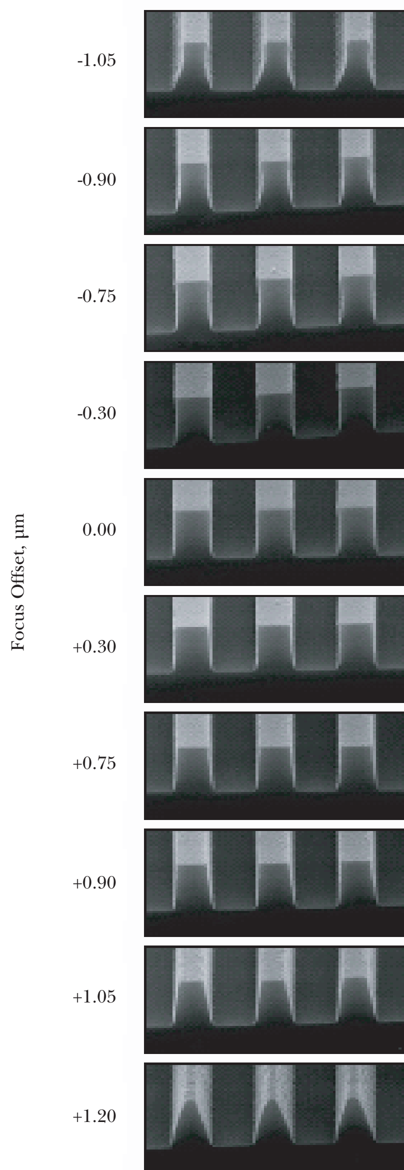


Figure 3. Focus Latitude







0.700 µm Dense Lines/Spaces	
Sizing Energy (mJ/cm²)	57
%EL (±10% LW)	44.6%

0.700 µm Dense Lines/Spaces	
Depth of Focus (µm) Total (@ Full Film Thickness)	1.95 µm

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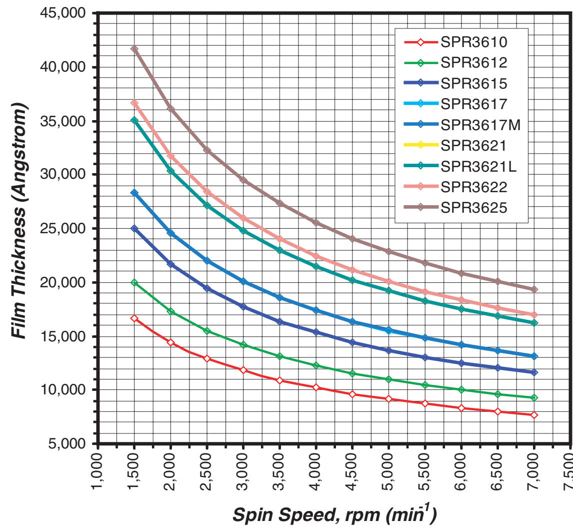
COAT

Figure 4 shows the relationship between spin speed and resist thickness for silicon substrates. Nominal film thickness may vary slightly due to process, equipment and ambient conditions.

Figure 4. Spin Speed Curve



Cauchy Coefficients	
Nx	**SPR3600**
N1	1.611
N2	7.9E + 05
N3	1.3E + 13

Refractive Index	
Wavelength	**n**
365 nm	1.744
436 nm	1.689
633 nm	1.639

SUBSTRATE

SPR3600 is compatible with a wide range of substrates, including but not limited to silicon, SiO_2, polysilicon, nitride and highly reflective metal substrates.

A hexamethyldisilizane (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.

SOFTBAKE

The recommended softbake conditions for SPR3600 are shown in the table below.

Softbake Process Conditions	
Temperature	90°
Time	90 sec. Proximity Hotplate (150 µm) 60 sec. Contact Hotplate

EXPOSE

SPR3600 is sensitive to both g-Line and i-Line exposure wavelengths and can be used as a multi-wavelength crossover photoresist ideal for consolidating processes and reducing the number of photoresists used. The standing wave curve on silicon is shown.

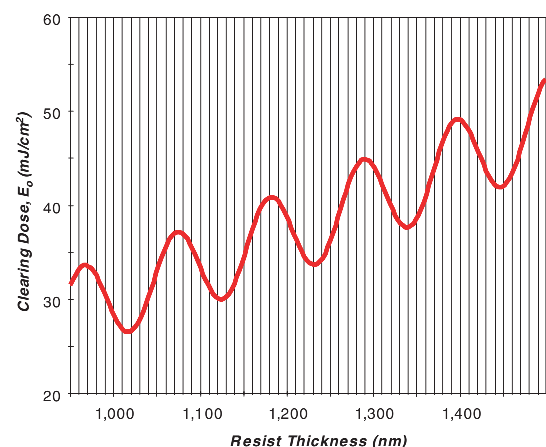
Dill Parameters—365 nm	
	SPR3600
Dill A	0.8100
Dill B	0.0450

Dill Parameters—436 nm	
	SPR3600
Dill A	0.4930
Dill B	0.0480

DEVELOP

SPR3600 is optimized for use with both 0.24N and 0.26N Developers. A single puddle spray process is recommended for most applications and the time can be tailored between 30–60 seconds to give additional throughput benefits. For resist thicknesses above >18,000Å a double puddle spray process can be used, these can be shorter puddles due to the high throughput nature of SPR3600.

Figure 5. 365 nm Swing Curve on Silicon



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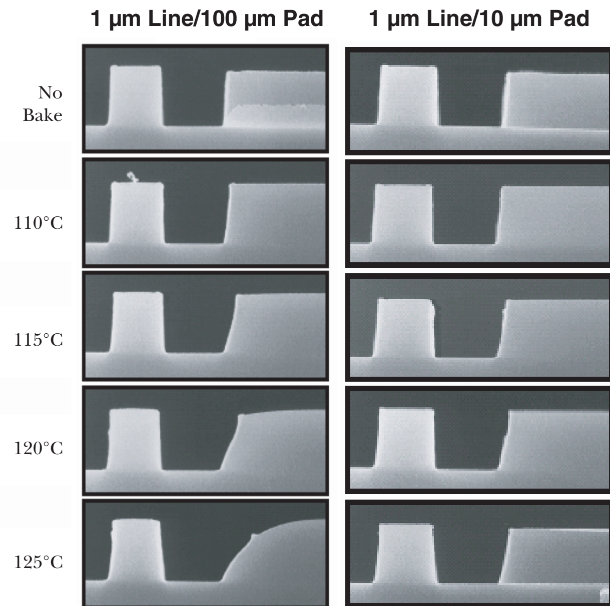
POST EXPOSURE BAKE

The recommended Post Exposure Bake (PEB) conditions for SPR3600 on reflective and non-reflective substrates is shown in the table below.

PEB Process Conditions	
Temperature	115°C
Time	90 sec. Proximity Hotplate (150 µm) 60 sec. Contact Hotplate

Figure 6. Thermal Deformation



Lithographic Summary—i-Line—10,750Å (E_0 max.) Film Thickness, MF-701 Developer			
Property	**0.700 µm Dense L/S**	**0.700 µm Iso Lines**	**0.800 µm CH**
Photospeed, E_0	47 mJ/cm^2	47 mJ/cm^2	47 mJ/cm^2
Sizing Energy, E_s	83 mJ/cm^2	76 mJ/cm^2	100 mJ/cm^2
E_s/E_0 Ratio	1.77	1.62	2.13
Masking Linearity	0.375 µm	0.325 µm	0.500 µm
Resolution @ E_s	0.350 µm	0.325 µm	0.450 µm
Exposure Latitude	39.8%	43.4%	56.0%
Focus Latitude	1.80 µm	1.80 µm	2.40 µm
Iso/Dense Bias @ E_s	0.018 µm	—	—

Recommended Process Conditions		
	i/g-Line Process	**i/g-Line Process**
Thickness	~10,000–16,000Å	>18,000Å
Softbake	90°C/90 sec. Proximity Hotplate	90°C/90 sec. Proximity Hotplate
PEB	110°C/90 sec. Proximity Hotplate	110°C/90 sec. Proximity Hotplate
Developer	MF CD-26 or MF-26A @ 22°C, 30–60 sec. single puddle	MF CD-26 or MF-26A @ 22°C, 60 sec. double puddle

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.

ELECTRONIC MATERIALS

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