



MICROPOSIT™ S1800™ G2 SERIES PHOTORESISTS

For Microlithography Applications

Regional Product Availability

- North America
- Europe, Middle East and Africa
- Latin America
- Asia-Pacific

Description

MICROPOSIT S1800 G2 Series Photoresists are positive photoresist systems engineered to satisfy the microelectronics industry's requirements for advanced IC device fabrication. The system has been engineered using a toxicologically-safer alternative casting solvent to the ethylene glycol derived ether acetates. The dyed photoresist versions are recommended to minimize notching and maintain linewidth control when processing on highly reflective substrates.

Advantages

Product Assurance

- Lot-to-lot consistency through state-of-the-art physical, chemical and functional testing
- Filtered to 0.2 µm absolute

Coating Properties

- Cellosolve™ acetate and xylene-free
- Striation-free coatings
- Excellent adhesion
- Excellent coating uniformity
- A variety of standard viscosities are available for single-layer processing

Exposure Properties

- Optimized for g-line exposure
- Effective for broad-band exposure
- Reflective notch and linewidth control using dyed versions

Develop Properties

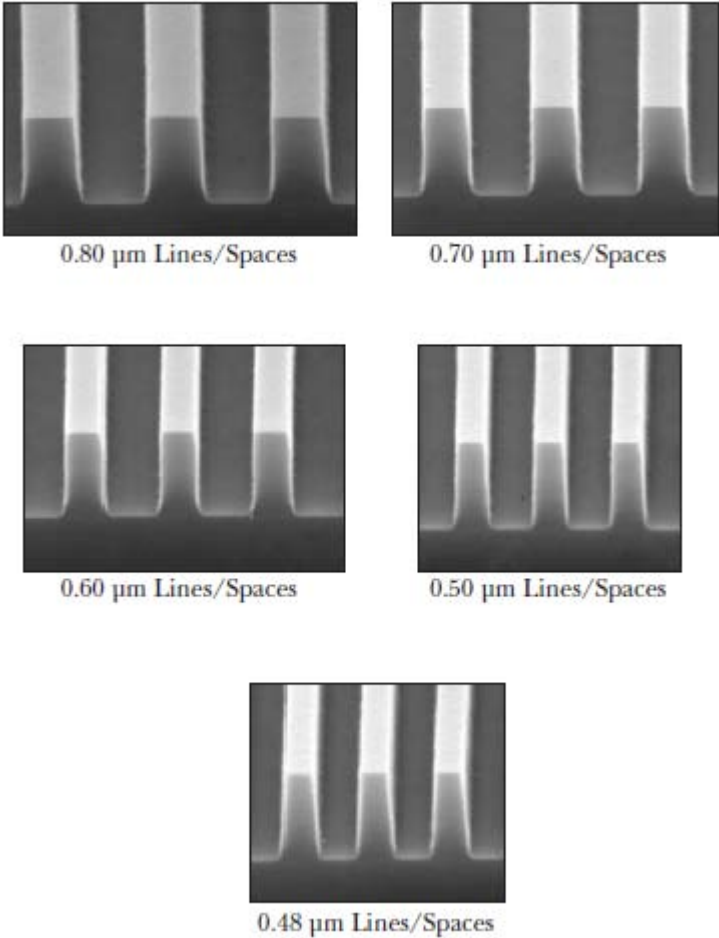
- Optimized for use with the MICROPOSIT MF™-319 metal-ion-free developer family
- Compatible with metal-ion-bearing MICROPOSIT developers

Removal Property

- Residue-free photoresist removal using standard MICROPOSIT removers

Table 1. Process Conditions (Refer to Figure 1)	
Substrate	Silicon
Photoresist	MICROPOSIT S1813 G2 Photoresist
Coat	12,300Å
Softbake	115°C/60 sec. Hotplate
Exposure	Nikon 1505 G6E, g-Line (0.54 NA), 150 mJ/cm ²
Develop	15 +50 sec. Double Spray Puddle (DSP) @ 21°C

Figure 1. Masking Linearity SEMS



Instructions for Use

The following instructions cover the use of MICROPOSIT S1800 G2 Series Photoresists for all levels of microelectronic device fabrication. Exact process parameters are application and equipment dependent.

Substrate Preparation

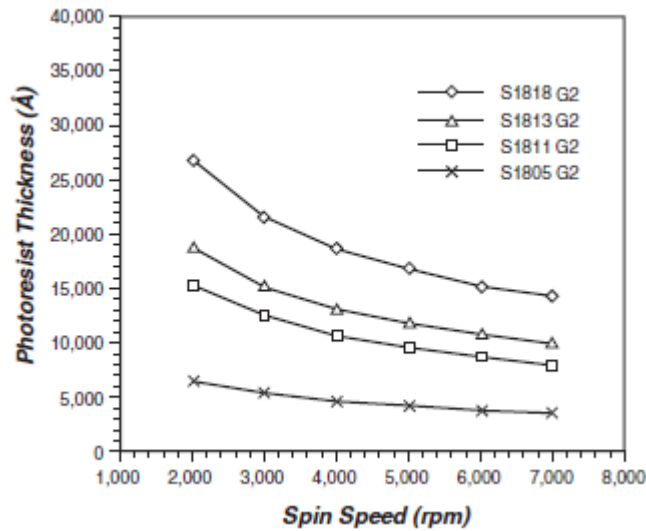
MICROPOSIT S1800 G2 Series Photoresist work well with the hexamethyldisilazane-based MICROPOSIT Primers. Concentrated MICROPOSIT Primer is recommended when vacuum vapor priming. Diluted primer is recommended for liquid phase priming applications.

Coat

MICROPOSIT S1800 G2 Series Photoresists provide uniform defect-free coatings over a wide range of film thicknesses. The film thickness versus spin speed plot displayed in Figure 2 provides the information required to properly select a MICROPOSIT S1800 G2 Photoresist version to meet process dependent thickness specifications. Maximum coating uniformity is typically attained between the spin speeds of 3,500–5,500 rpm.

Table 2. Process Conditions (Refer to Figure 2)	
Substrate	Silicon
Coat	SVG 81
Softbake	115°C/60 sec. Hotplate
Measure	Nanometrics 210

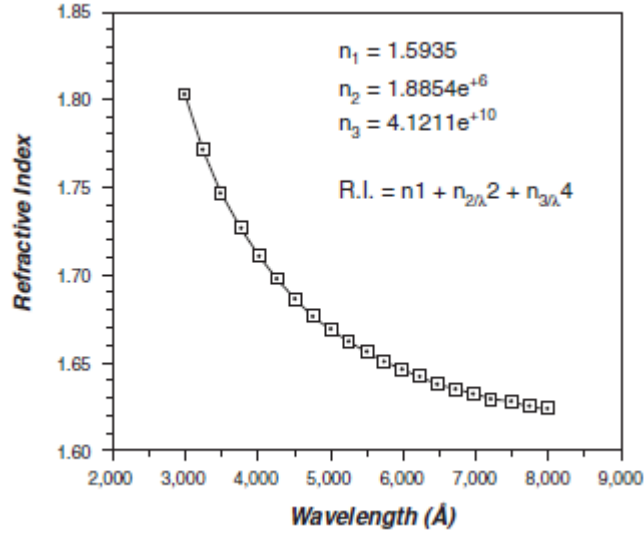
Figure 2. MICROPOSIT S1800 G2 Photoresist Undyed Series Spin Speed Curves



The dispersion curve and Cauchy equation displayed in Figure 3 describe how the refractive index of the photoresist film varies as a function of the wavelength of light incident upon the film. This information is required to program ellipsometric and other optically-based photoresist measuring equipment.

Table 3. Process Conditions (Refer to Figure 3)	
Substrate	Silicon
Coat	13,675Å
Softbake	115°C/60 sec. Hotplate
Measure	Prometrix SM300

Figure 3. MICROPOSIT S1800 G2 Photoresist Dispersion Curve

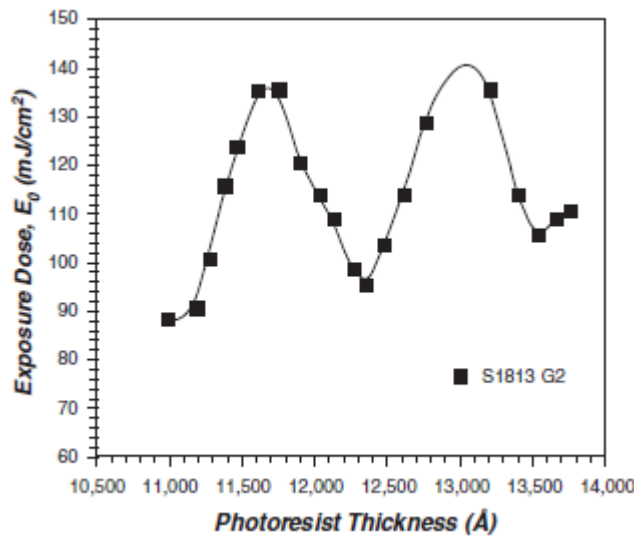


Exposure

Proper film thickness selection is critical in order to reduce photospeed and critical dimension variability. The interference curves displayed in Figure 4 illustrate the photospeed variability as a function of film thickness. The dyed version suppresses the interference effects which are more pronounced when exposing with monochromatic light sources and when using reflective substrates.

Table 4. Process Conditions (Refer to Figure 4)	
Substrate	Silicon
Coat	GCA 1006 WAFERTRAC™
Softbake	115°C/60 sec. Hotplate
Expose	GCA 8500 g-Line (0.35 NA)
Develop	MF-31/10 +30 DSP @ 21°C

Figure 4. MICROPOSIT S1813 G2 Photoresist Interference Curve



MICROPOSIT S1800 G2 Series Photoresists can be exposed with light sources in the spectral output range of 350–450 nm. The exposure properties have been optimized for use at 436 nm. *Figure 5* shows the absorbance spectra for MICROPOSIT S1813 G2 photoresists.

Table 5. Process Conditions (Refer to Figures 5 and 6)	
Substrate	Quartz
Coat	12,300Å
Softbake	115°C/60 sec. Hotplate
Expose	Oriel Scanning Wedge
Develop	Hewlett Packard 8450A Spectrophotometer

Figure 5. MICROPOSIT S1813 G2 Photoresist Absorbance Spectrum

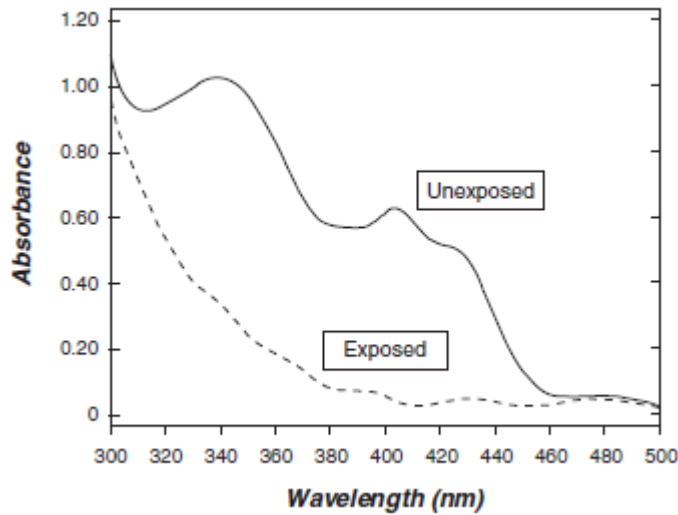


Table 6 summarizes the Dill parameters for MICROPOSIT S1800 G2 Series Photoresist. Dill parameters are used in optical exposure models such as SAMPLE and PROLITH.

Table 6. Dill Parameters				
Photoresist	365 nm		436 nm	
	A (μm^{-1})	B (μm^{-1})	A (μm^{-1})	B (μm^{-1})
S1813 G2	1.07	0.31	0.61	0.08

Figure 6 displays a contrast curve for MICROPOSIT S1813 G2 Photoresist developed with MICROPOSIT MF-321 Developer. In general, high contrast values correlate to higher wall angle profiles.

Figure 6. MICROPOSIT S1813 G2 Photoresist Contrast Curve

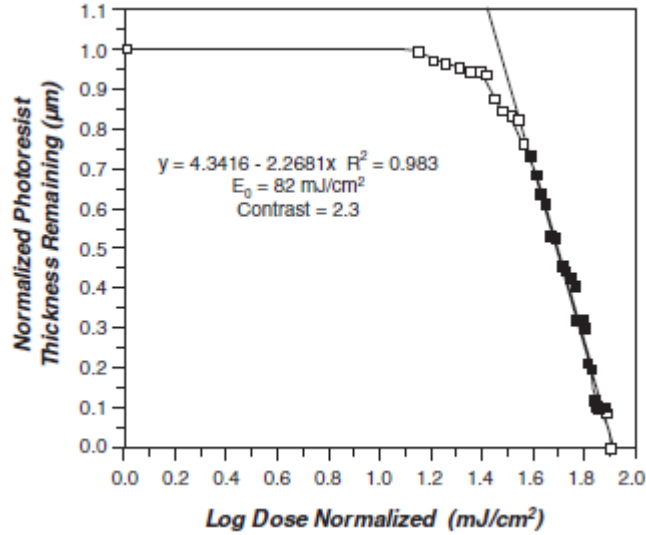


Table 7. Process Conditions (Refer to Figures 7)

Substrate	Silicon
Coat	12,300Å
Softbake	115°C/60 sec. Hotplate
Expose	GCA 8500 g-Line (0.35 NA)
Develop	MF-321/10 +30 DSP @ 21°C

Develop

MICROPOSIT S1800 G2 Series Photoresists are compatible with both metal-ion-free (MIF) and metal-ion-bearing (MIB) developers. A photoresist and developer system is dependent upon specific application requirements. Contact your local Dow Electronic Materials Technical Sales Representative for additional product information.

Figures 7–9 (next page) illustrate the lithographic functionality of MICROPOSIT S1813 G2 Photoresist using process parameters designed to maximize resolution while maintaining excellent exposure and focus latitude. The functional lithographic responses are summarized in Table 9.

Table 8. Process Conditions (Refer to Figures 8)

Substrate	Silicon
Coat	12,300Å
Softbake	115°C/60 sec. Hotplate
Expose	Nikon 1505 G6E g-Line (0.54 NA)
Develop	MF-321/10 +30 DSP @ 21°C

Figure 7. MICROPOSIT S1813 G2 Photoresist Masking Linearity Plot

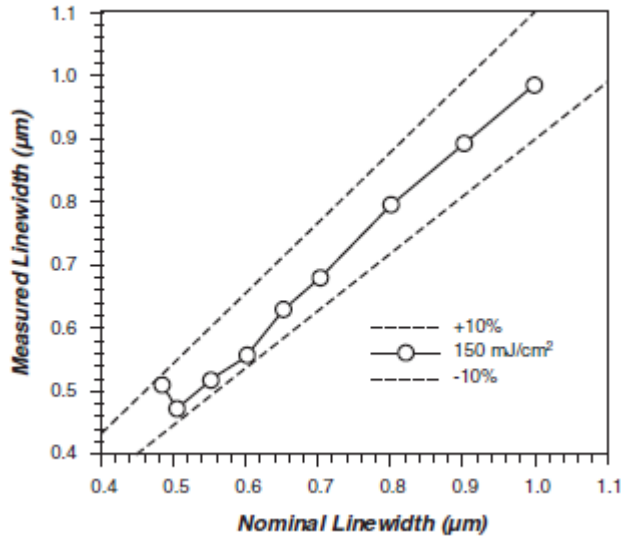


Figure 8. MICROPOSIT S1813 G2 Photoresist Exposure Latitude Plot

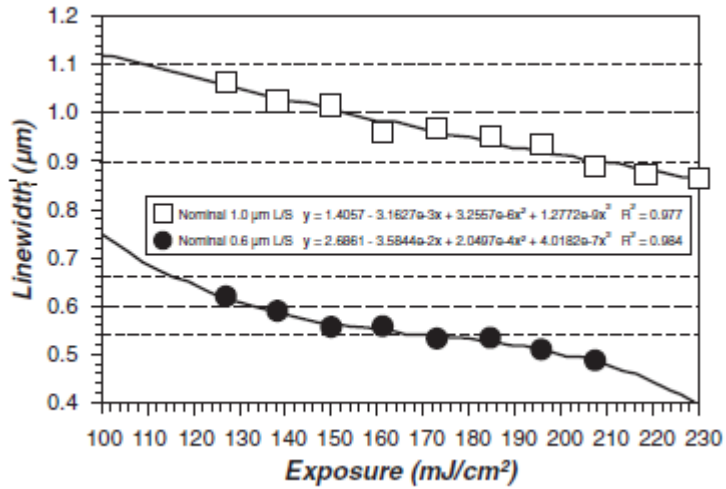


Figure 9. MICROPOSIT S1813 G2 Photoresist Focus Latitude Plot

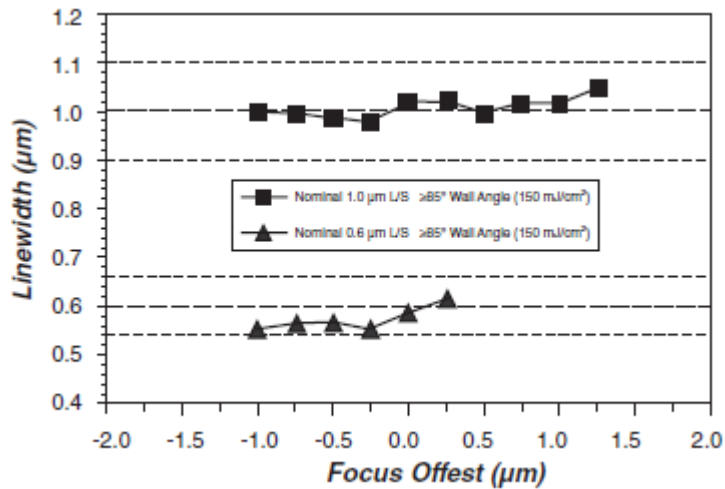


Table 9. Lithography Responses Summary		
Sizing Energy	150 mJ/cm ² (1.3 E ₀)	
Resolution	0.48 μm	
Masking Linearity (±10% CD)	0.50 μm	
	1.0 μm L/S	0.60 μm L/S
Exposure Latitude (±10% CD)	65%	45%
Focus Latitude (±10% CD) ≤85° Wall Angle	2.25 μm	1.25 μm

Handling Precautions

Before using this product, associated generic chemicals or the analytical reagents required for its control, consult the supplier's Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on material 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 Dow Electronic Materials Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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