



SHIPLEY

MICROPOSIT[®] S1800[®] SERIES PHOTO RESISTS

MICROPOSIT S1800 SERIES PHOTO RESISTS 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.

MICROPOSIT S1800 SERIES PHOTO RESISTS FEATURE:

Product Assurance

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

Coating Properties

- ¹Cellosolve[®] 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

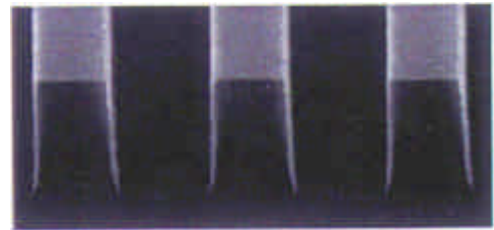
Develop Properties

- Optimized for use with the MICROPOSIT[®] MF[®]-319 Metal-Ion-Free DEVELOPER family
- Compatible with Metal-Ion-Bearing MICROPOSIT DEVELOPERS

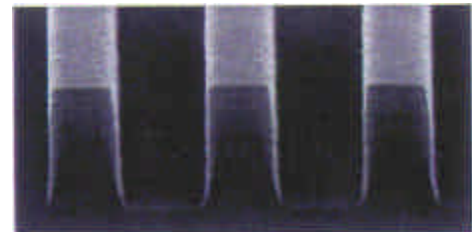
Removal Property

- Residue-free photoresist removal using standard MICROPOSIT REMOVERS

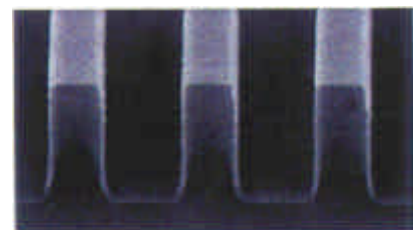
High Resolution Process Parameters (Refer to Figure 1)	
Substrate:	Polysilicon
Photoresist:	MICROPOSIT [®] S1813 [®] PHOTO RESIST
Coat:	12,300Å
Softbake:	115°C/60 sec. Hotplate
Exposure:	Nikon 1505 G6E, G-Line (0.54 NA), 150 mJ/cm ²
Develop:	MICROPOSIT [®] MF [®] -321 DEVELOPER 15 + 50 sec. Double Spray Puddle (DSP) @ 21°C



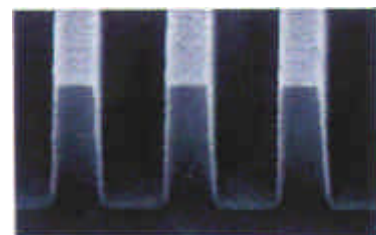
0.80 µm Lines/Spaces



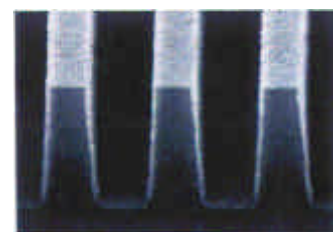
0.70 µm Lines/Spaces



0.60 µm Lines/Spaces



0.50 µm Lines/Spaces



0.48 µm Lines/Spaces

**Masking Linearity SEMS
Figure 1.**

¹Registered trademark of Union Carbide Corporation

Instructions for Use

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

Substrate Preparation

MICROPOSIT S1800 SERIES PHOTO RESISTS 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 SERIES PHOTO RESISTS provide uniform defect-free coatings over a wide range of film thicknesses. The film thickness versus spin speed plots displayed in **Figures 1 and 2** provide the information required to properly select a MICROPOSIT S1800 PHOTO RESIST version to meet process dependent thickness specifications. Maximum coating uniformity is typically attained between the spin speeds of 3500 rpm and 5500 rpm.

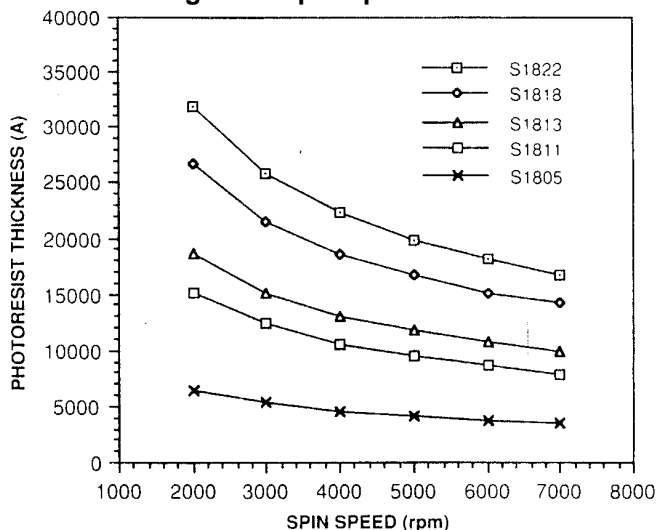
Process Parameters (Refer to Figures 1 and 2)	
Substrate	Silicon
Coat	SVG 81
Softbake	115°C/60 seconds Hotplate
Measure	Nanometrics 210

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.

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

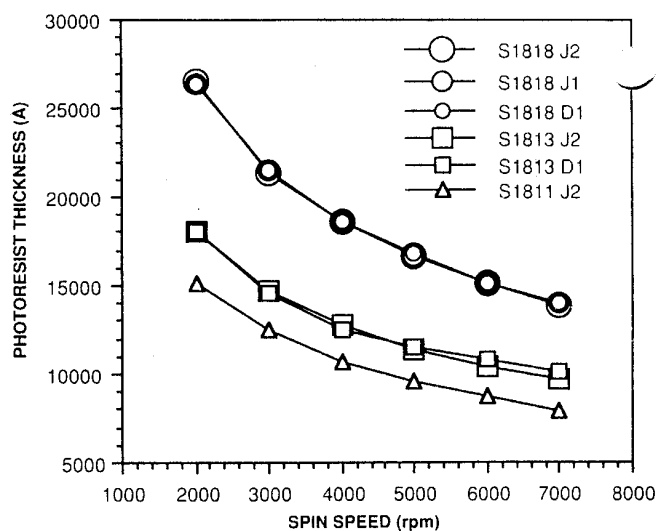
MICROPOSIT S1800 PHOTO RESIST UNDYED SERIES

Figure 1. Spin Speed Curves



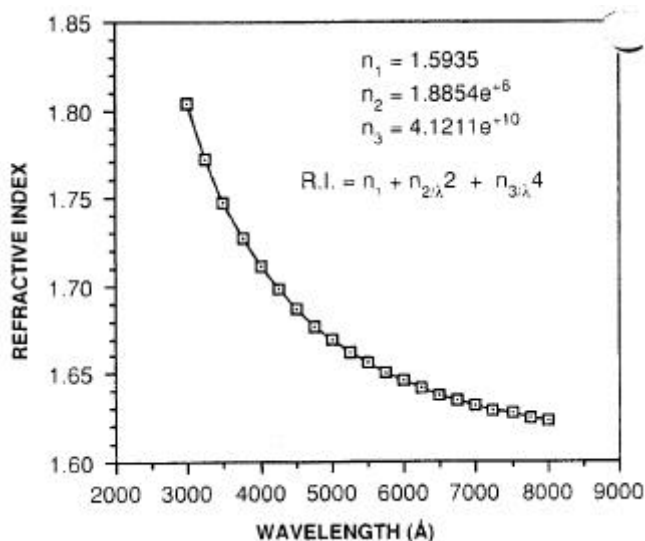
MICROPOSIT S1800 PHOTO RESIST DYED SERIES

Figure 2. Spin Speed Curves



MICROPOSIT® S1813® PHOTO RESIST

Figure 3. 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. Dyed versions suppress the interference effects which are more pronounced when exposing with monochromatic light sources and when using reflective substrates.

Process Parameters (Refer to Figure 4)	
Substrate	Silicon
Coat	GCA 1006 ² WAFERTRAC [®]
Softbake	115°C/60 seconds Hotplate
Expose	GCA 8500 G-Line (0.35 NA)
Developer	MF-321 /10 + 30 DSP @ 21°C

MICROPOSIT S1800 SERIES PHOTO RESISTS can be exposed with light sources in the spectral output range of 350 nm -450 nm. The exposure properties have been optimized for use at 436 nm. **Figures 5 and 6** show the absorbance spectrums for MICROPOSIT S1813 and S1813 J2[®] PHOTO RESISTS.

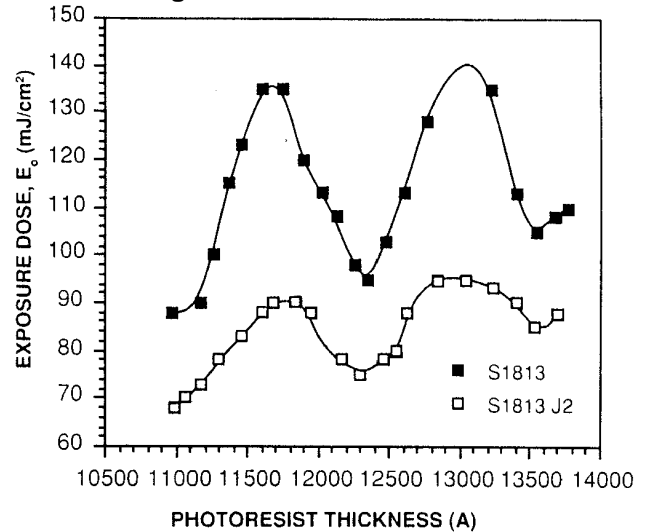
Process Parameters (Refer to Figures 5 and 6)	
Substrate	Quartz
Coat	12,300Å
Softbake	115°C/60 seconds Hotplate
Expose	Oriel Scanning Wedge
Measure	Hewlett Packard 8450A Spectrophotometer

Table 1 summarizes the Dill parameters for each MICROPOSIT S1800 SERIES PHOTO RESIST version. Dill parameters are used in optical exposure models such as SAMPLE and PROLITH.

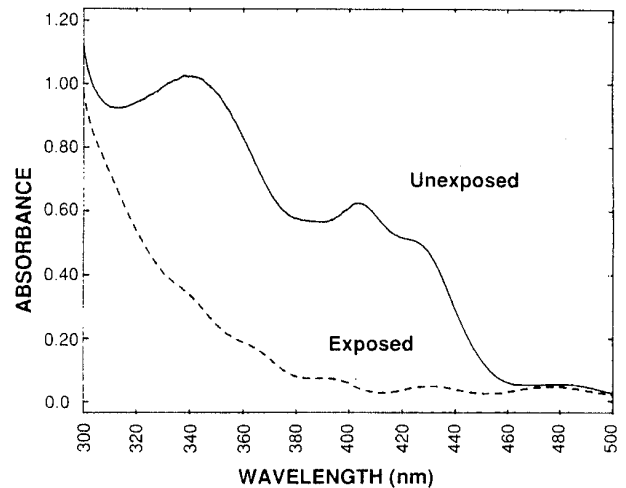
MICROPOSIT S1800 SERIES PHOTO RESISTS
Table 1. Dill Parameters

Photoresist	365 nm		436 nm	
	A (μm^{-1})	B (μm^{-1})	A (μm^{-1})	B (μm^{-1})
S1813	1.07	0.31	0.61	0.08
S1813 D1	1.05	0.34	0.58	0.26
S1811 J2	1.07	0.49	0.59	0.61
S1818 J1	1.06	0.42	0.57	0.37

MICROPOSIT S1813 and S1813 J2 PHOTO RESISTS
Figure 4. Interference Curves



MICROPOSIT S1813 PHOTO RESIST
Figure 5. Absorbance Spectrum



MICROPOSIT S1813 J2 PHOTO RESIST
Figure 6. Absorbance Spectrum

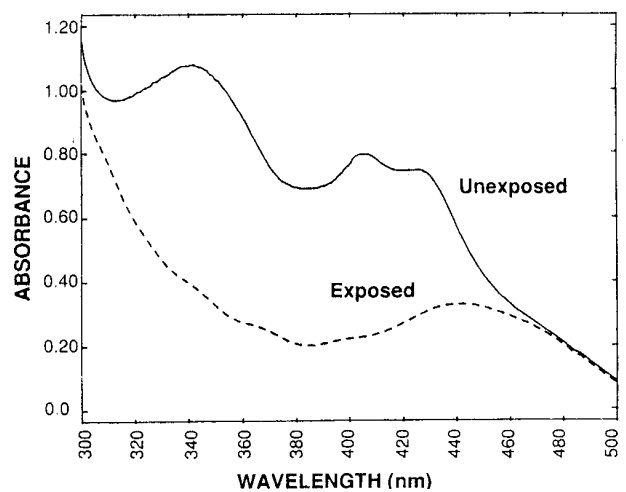


Figure 7 displays a contrast curve for MICROPOSIT S1813 PHOTO RESIST developed with MICROPOSIT® MF®-321 DEVELOPER. In general, high contrast values correlate to higher angle wall profiles.

Process Parameters (Refer to Figure 7)	
Substrate	Silicon
Coat	12,300Å
Softbake	115°C/60 seconds Hotplate
Expose	GCA 8500 G-Line (0.35 NA)
Develop	MF-321 /10 + 30 DSP @ 21°C

DEVELOP

MICROPOSIT S1800 SERIES PHOTO RESISTS 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 Shipley Technical Sales Representative for additional product information.

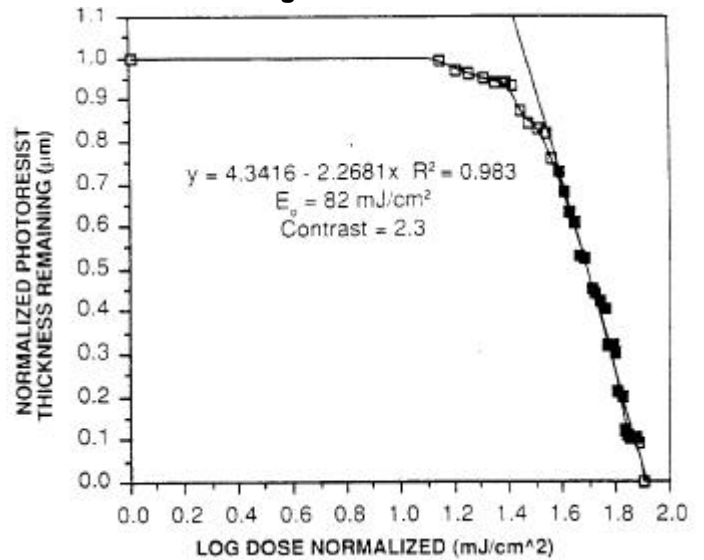
Figures 8 thru 10 illustrate the lithographic functionality of MICROPOSIT S1813 PHOTO RESIST using process parameters designed to maximize resolution while maintaining excellent exposure and focus latitude (refer to SEM photographs in **Figure 1**). The functional lithographic responses are summarized in **Table 2**.

Process Parameters (Refer to Figures 8 thru 10)	
Substrate	Silicon
Coat	12,300Å
Softbake	115°C/60 seconds Hotplate
Expose	Nikon 1505 G6E G-Line (0.54 NA)
Develop	MF-321 /15 + 50 DSP @ 21°C

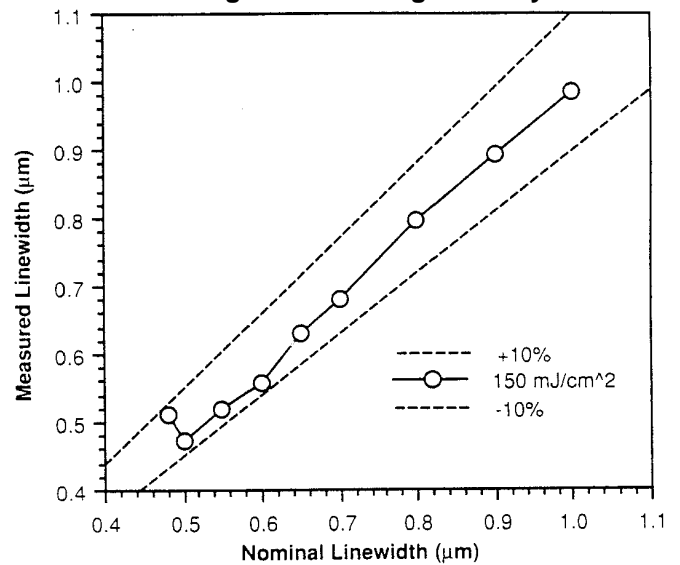
MICROPOSIT S1813 PHOTO RESIST with MICROPOSIT MF-321 DEVELOPER
Table 2. Functional Lithographic Summary Data

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

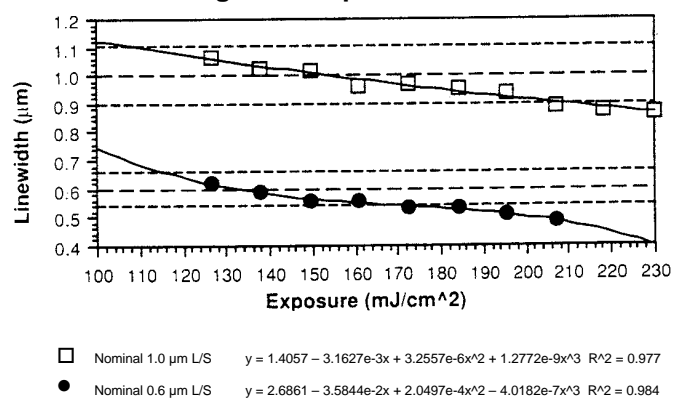
MICROPOSIT S1813 PHOTO RESIST
Figure 7. Contrast Curve



MICROPOSIT S1813 PHOTO RESIST
Figure 8. Masking Linearity Plot

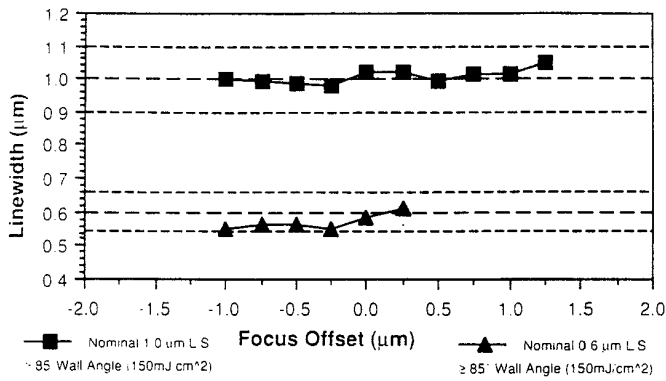


MICROPOSIT S1813 PHOTO RESIST
Figure 9. Exposure Latitude Plot



MICROPOSIT S1813 PHOTO RESIST

Figure 10. Focus Latitude Plot



Equipment

MICROPOSIT S1800 SERIES PHOTO RESISTS are compatible with most commercially available photo-resist processing equipment. Compatible materials include stainless steel, glass, ceramic, unfilled polypropylene, high density polyethylene, polytetrafluoroethylene, or equivalent materials.

Technical Literature

Please contact your Shipley Technical Sales Representative for information on the use and performance of Shipley products.

Handling Precautions

WARNING: MICROPOSIT S1800 SERIES PHOTO RESISTS are combustible mixtures containing propylene glycol monomethyl ether acetate. Contact with eyes, skin and mucous membranes causes irritation. Handle with care. Do not get in eyes, on skin or on clothing. Avoid breathing vapors or mists. Use with adequate ventilation. Wash thoroughly after handling.

Wear chemical goggles, chemical gloves and suitable protective clothing when handling MICROPOSIT S1800 SERIES PHOTO RESISTS.

In case of eye or skin contact, flush affected areas with plenty of water for at least 15 minutes. Then contact a physician at once.

Consult product Material Safety Data Sheet before using.

Toxicological and Health Advantages

The solvent used in MICROPOSIT S1800 SERIES PHOTO RESISTS is propylene glycol monomethyl ether acetate. Toxicological studies reported that propylene glycol derivatives contained in MICROPOSIT S1800 SERIES PHOTO RESISTS do **not** demonstrate the adverse blood effects and reproductive effects that ethylene glycol derived ether acetates demonstrate (NIOSH Current Intelligence Bulletin 9 -5/2/83).

Storage

Store MICROPOSIT S1800 PHOTO RESISTS only in upright, original containers in a dry area at 50°-70°F (10°-21°C). Store away from light, oxidants, heat, and sources of ignition. Do not store in sunlight. Keep container sealed when not in use.



Worldwide Operations

Shibley Company
455 Forest Street
Marlborough, MA 01752-3001
TEL: (508) 481-7950
FAX: (508) 485-9113

European Operations

Shibley Europe Ltd.
Herald Way
Coventry CV3 2RQ
United Kingdom
TELEX:851311316
TEL: 441 203 457 203

Far East Operations

Shibley Far East Ltd.
Nishidai-NC Bldg.
1-83-1, Takashimadaira
Itabashi-ku, Tokyo 175
Japan
TELEX: 781 28875
TEL: 81 35 920 5300

Domestic Sales Offices

Marlborough, MA
(508) 481-7950
(800) 832-6200

Carrollton, TX
(214) 446-2400
(800) 527-3730

Tempe, AZ
(602) 894-5499
(800) 262-6377

Santa Clara, CA
(408) 988-3600
(800) 423-9937

International Sales Offices

Evry, France
33 1 60 86 81 82

Milano, Italy
39 2 938 1586

Geldrop, The Netherlands
31 40 853 335

Norrkoeping, Sweden
46 11 108170

Jona, Switzerland
41 55 284 646/647

Esslingen, Germany
49 711-931 32-0

Kowloon, Hong Kong
852 6 940 661

Singapore
65-862-1888

International Distributors

Australia, China, India, Israel, Mexico, Singapore, South Africa, South Korea, Spain, Taiwan, Western Canada.

Manufacturing Locations

Marlborough, MA; Coventry, United Kingdom; Sasagami, Japan.



For Industrial Use Only This information is based on our experience and is, to the best of our knowledge, true and accurate. However, since the conditions for use and handling of products are beyond our control, we make no guarantee or warranty, expressed or implied, regarding the information, the use, handling, storage or possession of the products, or the application of any process described herein or the results sought to be obtained. Nothing herein shall be construed as a recommendation to use any product in violation of any patent rights.