

## AZ<sup>®</sup> 9200 Photoresist

### High-Resolution Thick Resist

AZ<sup>®</sup> 9200 thick film photoresist is designed for the more demanding higher-resolution thick resist requirements. It provides high resolution with superior aspect ratios, as well as wide focus and exposure latitude and good sidewall profiles. AZ<sup>®</sup> 9200 photoresist is available in two viscosity grades for film thicknesses of 4 to 24 μm. Critical dimension resolutions range from < 1 μm lines and spaces at a film thickness of 4.6 μm, to 3.5 μm lines and spaces at a film thickness of 24 μm on silicon using today's standard broadband exposure tools. Aspect ratios of 5 – 7 can be achieved.

Under the guidance of leading thin film recording head manufacturers, AZ<sup>®</sup> 9200 photoresist is optimized for both coil plating and top pole recording head applications.

AZ<sup>®</sup> 9200 photoresist can be used as a higher resolution replacement for AZ<sup>®</sup> P4000 photoresist. It can be processed on the same exposure tools using similar processing conditions; it is developed from the same chemistry and has similar curing, electrical and thermal properties.

Sensitivity to both h- and i-line makes AZ<sup>®</sup> 9200 photoresist capable for both broadband and i-line steppers.

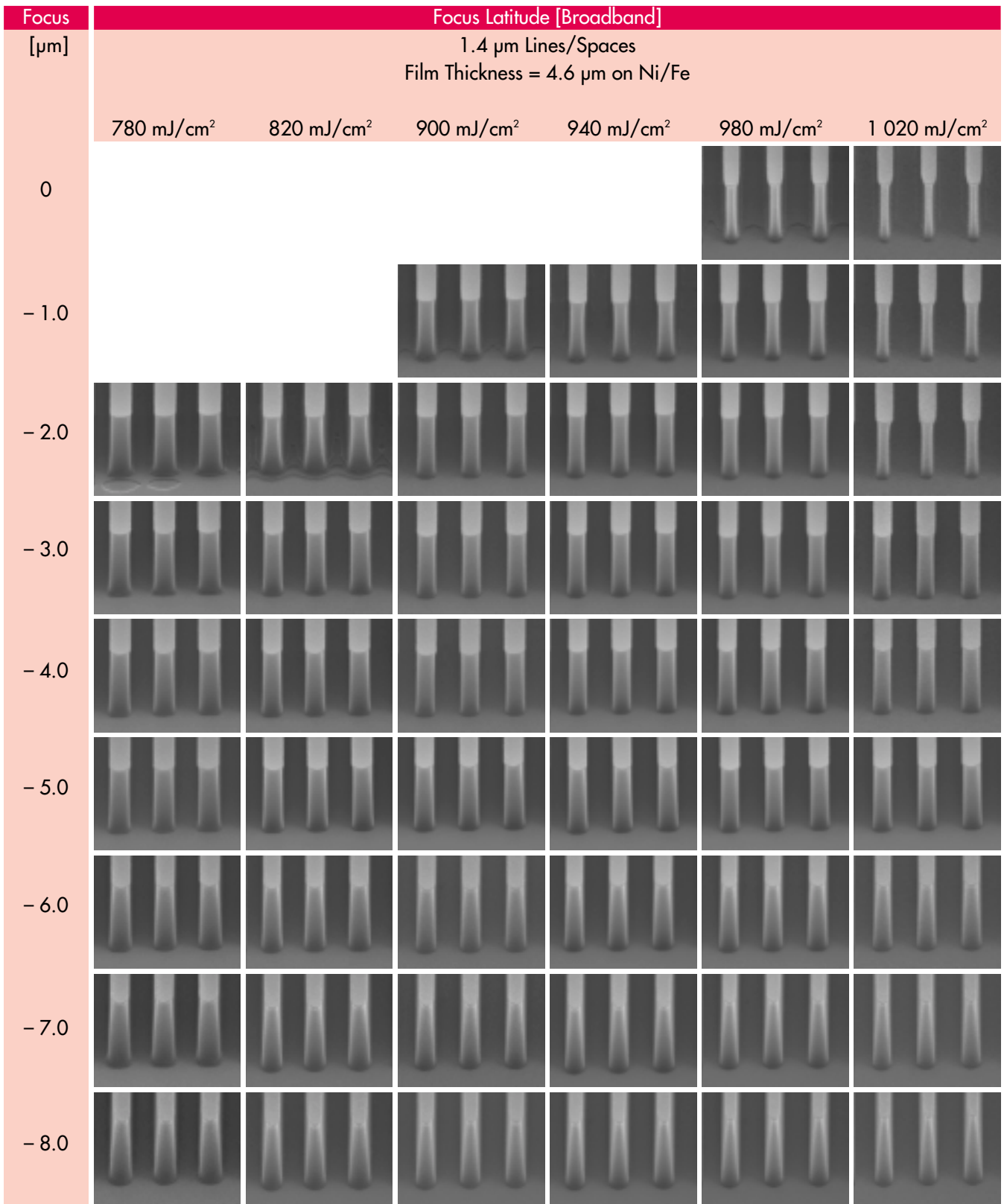
Recommended developers are inorganic based upon potassium hydroxide. The preferred developer is AZ<sup>®</sup> 400K Developer 1:4, a buffered developer designed to maximize bath life and process stability. For integrated circuit applications, TMAH developers such as AZ<sup>®</sup> 300 MIF developer can be used.

Linewidth [ $\mu\text{m}$ ]	Linearity [Broadband]					
	Film Thickness = 4.6 $\mu\text{m}$ on Ni/Fe					
	780 mJ/cm <sup>2</sup>	820 mJ/cm <sup>2</sup>	900 mJ/cm <sup>2</sup>	940 mJ/cm <sup>2</sup>	980 mJ/cm <sup>2</sup>	1 020 mJ/cm <sup>2</sup>
2.0						
1.40						
1.20						
1.10						
1.0						
0.95						
0.90						
0.80						

Softbake Hotplate 110°C, 120 sec  
 Exposure Ultratech Model 1500 stepper, 0.315 NA  
 Focus = -5  $\mu\text{m}$   
 AZ® 400K Developer 1:4, 180 sec spray at 27°C



AZ<sup>®</sup> 9200 Photoresist Functional Performance

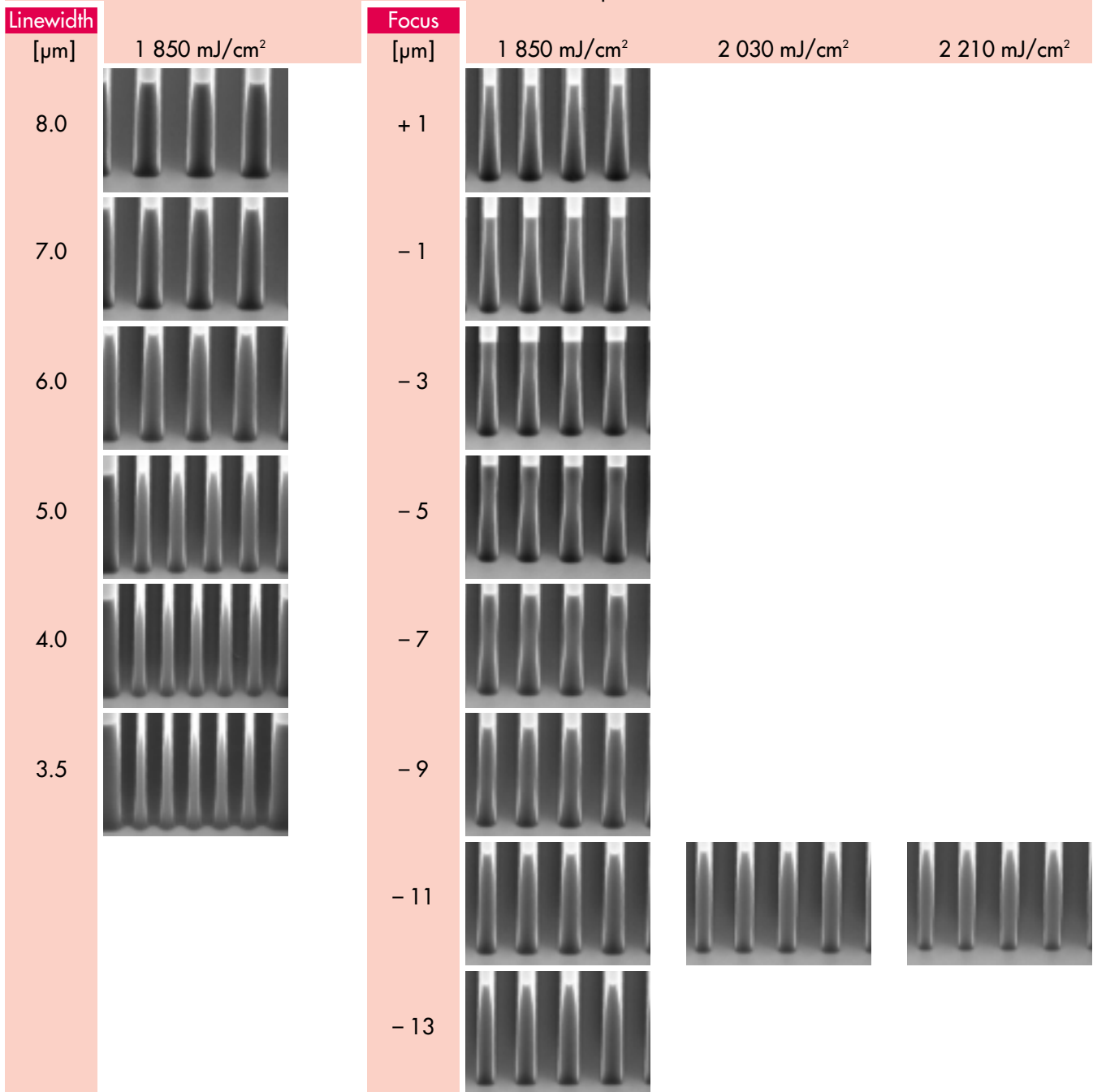


Softbake Hotplate 110°C, 120 sec  
 Exposure Ultratech Model 1500 stepper, 0.315 NA  
 AZ<sup>®</sup> 400K Developer 1:4, 180 sec spray at 27°C

## Linearity and Latitude [Broadband]

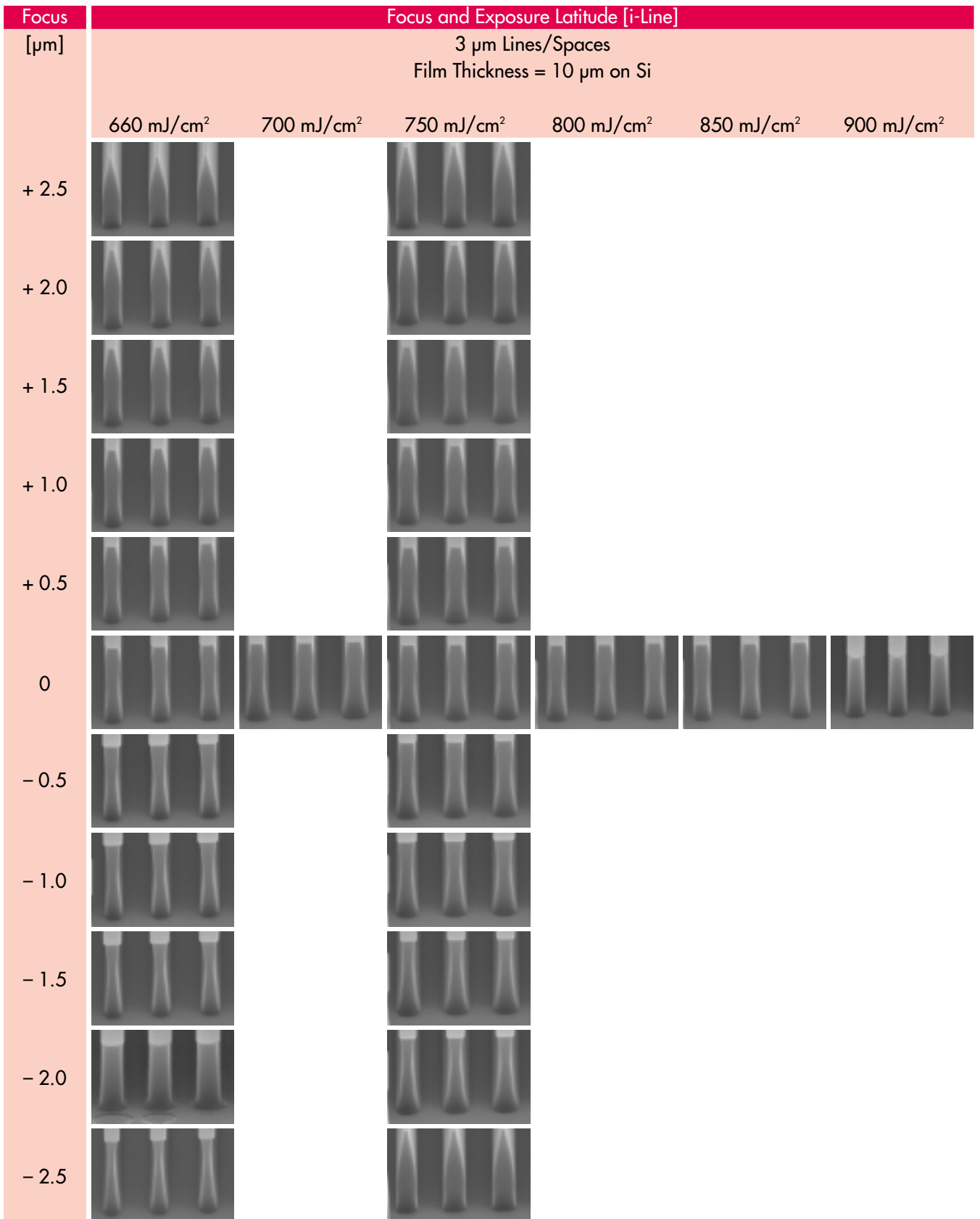
6  $\mu\text{m}$  Lines/Spaces

Film Thickness = 24  $\mu\text{m}$  on Si



Softbake Hotplate 110°C, 240 sec  
 Exposure Ultratech Model 1500 stepper, 0.315 NA  
 AZ® 400K Developer 1:4, 260 sec spray at 27°C





Softbake Hotplate 90°C, 155 sec  
 Exposure NIKON<sup>®</sup> i-line stepper, 0.54 NA  
 AZ<sup>®</sup> 300 MIF Developer, 360 sec spray at 22°C

**Typical Process for 4.6 µm Film Thickness [AZ® 9245 Photoresist (220 CPS)]**

Coat	Dispense: static or dynamic @ 300 rpm Spin: 3 800 rpm, 60 sec
Softbake	110 °C, 120 sec hotplate
Edge Bead Removal	Rinse: 500 rpm, 10 sec Dry: 1 000 rpm, 10 sec
Exposure (10% bias)	900 mJ/cm <sup>2</sup> , broadband stepper
Post Exposure Bake	not recommended in most applications
Development	AZ® 400K Developer 1:4, 120 sec spray Dispense temp. 27 °C Rinse: 300 rpm, 20 sec. Dry: 4 000 rpm, 15 sec.

**Typical Process for 10 µm Film Thickness [AZ® 9260 Photoresist (520 CPS)]**

Coat	Dispense: static or dynamic @ 300 rpm Spin: 2 400 rpm, 60 sec
Softbake	110 °C, 165 sec hotplate
Edge Bead Removal	Rinse: 500 rpm, 10 sec Dry: 1 000 rpm, 10 sec
Exposure (10% bias)	1 500 mJ/cm <sup>2</sup> , broadband stepper
Post Exposure Bake	not recommended in most applications
Development	AZ® 400K Developer 1:4, 180 sec spray Dispense temp. 27°C Rinse: 300 rpm, 20 sec. Dry: 4 000 rpm, 15 sec.

**Typical Process for 24 µm Film Thickness [AZ® 9260 Photoresist (520 CPS)]**

First Coat	Target: 10 µm film thickness Dispense: static or dynamic @ 300 rpm Spin: 2 400 rpm, 60 sec
Edge Bead Removal	Rinse: 500 rpm, 10 sec Dry: 1 000 rpm, 10 sec
First Softbake	110 °C, 80 sec hotplate
Second Coat	Target: 24 µm total film thickness Dispense: static or dynamic @ 300 rpm Spin: 2 100 rpm, 60 sec
Edge Bead Removal	Rinse: 500 rpm, 10 sec Dry: 1 000 rpm, 10 sec
Second Softbake	110 °C, 160 sec hotplate
Exposure Dose (10% bias)	2 100 mJ/cm <sup>2</sup> , broadband stepper
Post Exposure Bake	not recommended in most applications
Development	AZ® 400K Developer 1:4, 260 sec spray Dispense temp. 27°C Rinse: 300 rpm, 20 sec. Dry: 4 000 rpm, 15 sec.

Note: Recommendations on single-coat 24 µm processes are also available



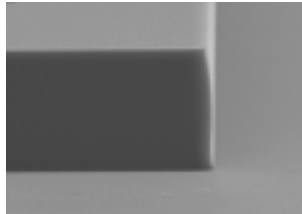
**Thermal Comparison**

Results after 2 Minutes at Temperature  
Vacuum Chuck Hotplate

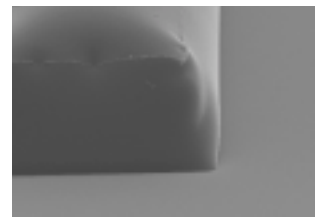
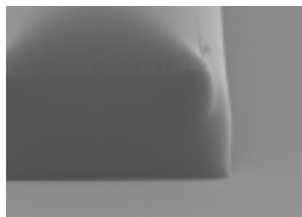
AZ® 9260 Photoresist

AZ® P4620 Photoresist

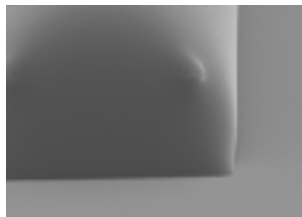
No Bake



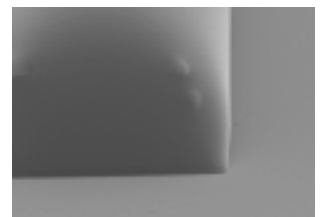
110°C



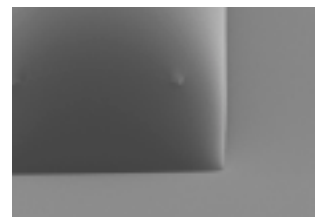
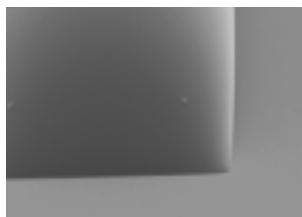
115°C



120°C



125°C



Film Thickness = 24 µm on Si  
Softbake Hotplate 110 °C, 120 sec

Film Thickness	2 000 rpm	2 500 rpm	3 000 rpm	3 500 rpm
AZ® 9245 Photoresist 220 cP	6 600 Å	5 800 Å	5 200 Å	4 800 Å
AZ® 9260 Photoresist 520 cP	11 400 Å	9 600 Å	8 800 Å	7 900 Å
Electrical Properties	200 °C	225 °C	250 °C	
Dielectric Constant	4.03	4.37	4.90	
Breakdown Voltage (v/µm)	694	642	600	
Modeling Parameters				
Cauchy Coefficients (unexposed)	$N_1 = 1.61406$	$N_2 = -0.00087 \mu\text{m}^2$	$N_3 = -0.00196 \mu\text{m}^4$	
Cauchy Coefficients (exposed)	$N_1 = 1.60843$	$N_2 = 0.00994 \mu\text{m}^2$	$N_3 = -0.00165 \mu\text{m}^4$	

## Companion Products

**Developers:** AZ<sup>®</sup> 400K Developer 1:4 is the recommended developer for thick films of AZ<sup>®</sup> 9200 photoresist. This developer may be used for both spray and immersion development processes. AZ<sup>®</sup> 400K is a buffered potassium-based developer that provides the process latitude associated with inorganic developers while minimizing the risk associated with mobile ion contamination.

AZ<sup>®</sup> 300 MIF Developer, a standard non-surfactant TMAH developer, can be used with AZ<sup>®</sup> 9200 photoresist for high resolution IC applications.

**Strippers:** AZ<sup>®</sup> 400T and 300T strippers are recommended for removal of AZ<sup>®</sup> 9200 photoresist. AZ<sup>®</sup> S-46 stripper is a non-NMP solvent stripper particularly suited to thin film recording head applications.

**Edge Bead Removers:** AZ<sup>®</sup> EBR 70/30 and AZ<sup>®</sup> EBR solvent are recommended for AZ<sup>®</sup> 9200 photoresist for both front- and back-side edge bead removal.

## Solvent Safety

AZ<sup>®</sup> 9200 photoresist is formulated with propylene glycol monomethyl ether acetate (PGMEA), a safer solvent patented by Hoechst Celanese Corp. for use in photoresists (U.S. patent number 4,550,069). This is one of the safest and most thoroughly tested solvents in the industry.

## Equipment Compatibility

AZ<sup>®</sup> 9200 photoresist is compatible with all commercially available wafer and photomask processing equipment. Recommended materials of construction include stainless steel, glass, ceramic, PTFE, polypropylene, and high-density polyethylene.

## Storage

Keep in sealed original container. Protect from light and heat. Store between 30 and 70°F (-1 to 24°C). Refrigerate whenever possible. Refrigeration may extend shelf life. Empty container may contain harmful residue and vapors.

## Handling Precautions First Aid

Refer to the current Material Safety Data Sheet (MSDS) for detailed information prior to handling.

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