

# Technical datasheet

## AZ<sup>®</sup> 125nXT Series

### Photopolymer Negative Tone Photoresists

#### APPLICATIONS

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Thick photopolymer photoresists featuring aspect ratios and photospeed not possible with conventional DNQ type materials, plus etch resistance, chemical resistance, and thermal stability far superior to typical chemically amplified photoresists.

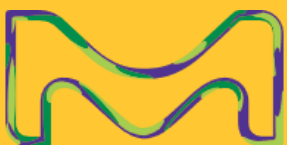
- MIF developer compatible
- No post bake rehydration delays required
- No post exposure bake required
- Single coat thicknesses from 20 to >100µm
- Excellent for Through Silicon Via (TSV), plating, and RIE etch applications
- Compatible with Cu, Solder, Pb/Sn, Sn/Ag, and Au (cyanic and non-cyanic) plating solutions

#### TYPICAL PROCESS

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- Soft Bake: 115°-140°C/5-20min
- Rehydration Hold: None
- Expose: broadband sensitive
- Post Expose Bake: optional
- Develop: Puddle, spray or immersion
- Developer Type: MIF

\* SB time is film thickness dependent

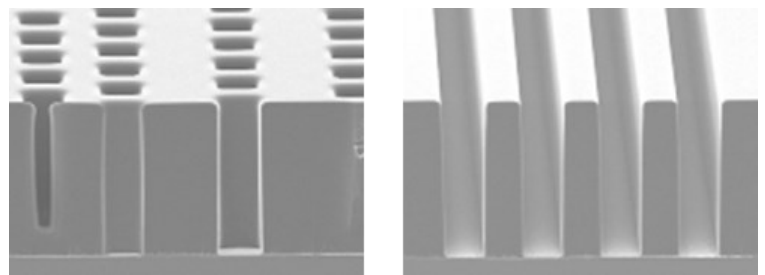


## THICKNESS GRADES

Grade	Viscosity (cSt)	Film Thickness Range ( $\mu\text{m}$ )
AZ 125nXT-7B	1035	$\sim 18\text{-}35\mu\text{m}$
AZ 125nXT-10B	5000	$\sim 35\text{-}120\mu\text{m}$

## OPTICAL CONSTANTS\*

Cauchy A	1.5206
Cauchy B ( $\mu\text{m}^2$ )	0.008114
Cauchy C ( $\mu\text{m}^4$ )	-0.000217
n @ 633nm	1.539
k @ 633nm	0.00



15 $\mu\text{m}$  holes and 15 $\mu\text{m}$  lines in 70 $\mu\text{m}$  thick AZ 125nXT  
Cu substrate, 1800mJ/cm<sup>2</sup> broadband exposure  
AZ® 300 MIF Develop (120s)

\* Unexposed photoresist film

## COMPANION PRODUCTS

### THINNING/EDGE BEAD REMOVAL

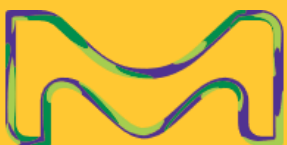
AZ EBR Solvent or AZ EBR 70/30

### MIF DEVELOPERS

AZ 300MIF

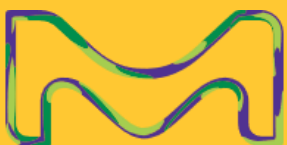
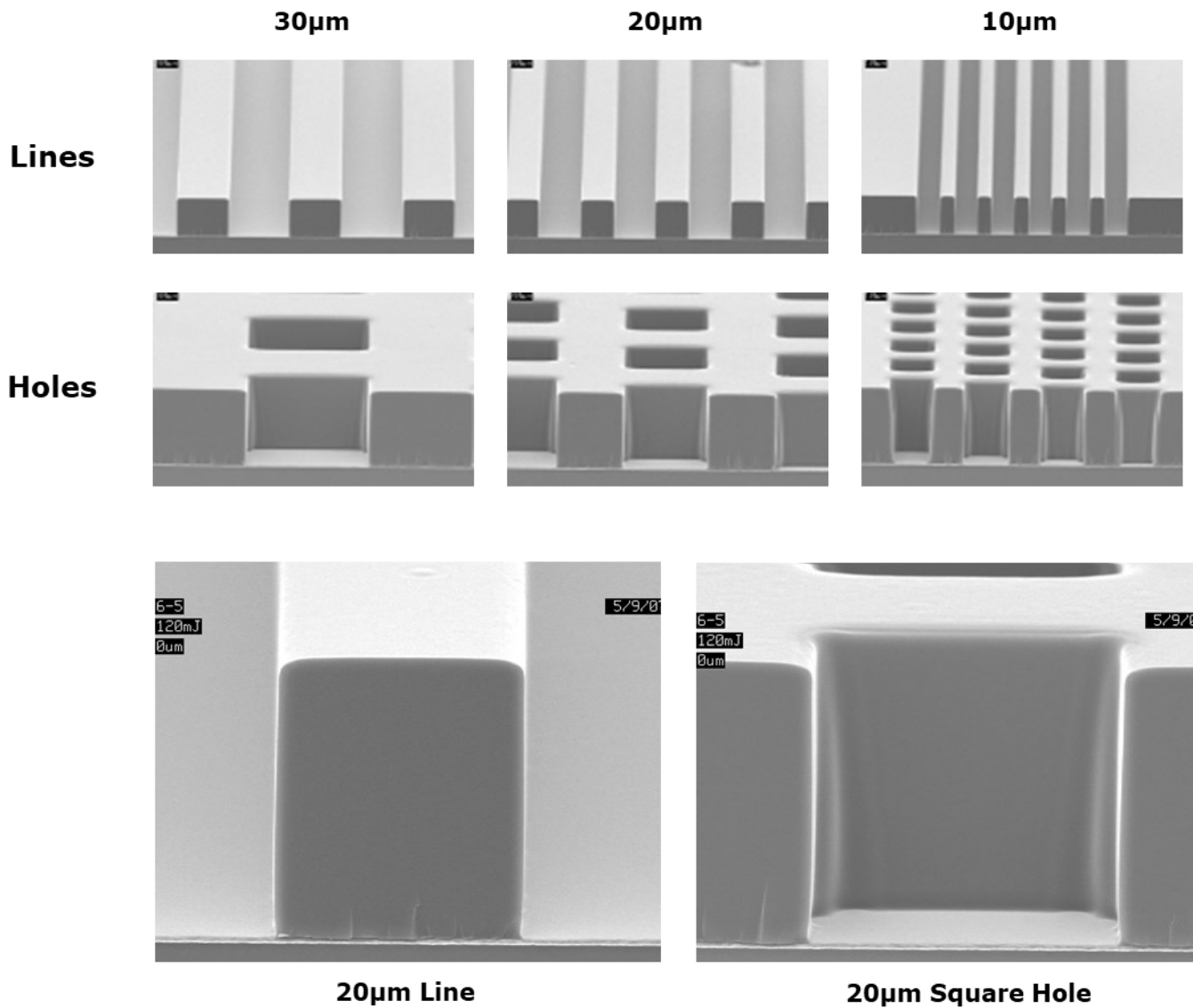
### REMOVERS

AZ 400T



## EXAMPLE PROCESS (AZ 125NXT-7B @ 20 $\mu$ m FILM THICKNESS ON CU)

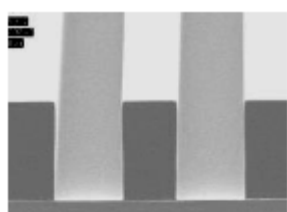
Process Step	Parameters
Coat	125nXT-7B @ 1400rpm, 200mm Cu wafer
Soft Bake	115C stepping proximity; 30s@0.2in, 30s@0.05in, 30s@0.005in, 120s@0.002in
Post Bake Delay	None
Expose	Suss MA-200 Aligner, 1120mj/cm <sup>2</sup> , ghi mode
Post Expose Bake	None
Develop	AZ 300MIF, 2 x 25 second puddles



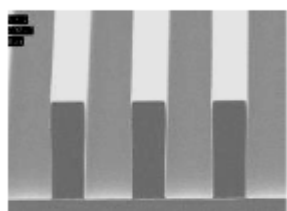
## EXAMPLE PROCESS (125NXT-10B @ 50µm FILM THICKNESS ON CU)

Process Step	Parameters
Coat	Dispense 30rpm, Spread 300rpm/5s, Spin 2400rpm/1.4s, Dry 2300 rpm/8s
Soft Bake	130°C, 13 minutes (hotplate)
Post Bake Delay	None
Expose	Suss MA-200 proximity aligner, gap=60µm (10µm above resist), ghi mode
Post Expose Bake	None
Develop	AZ 300MIF, 2 x 30 second puddles

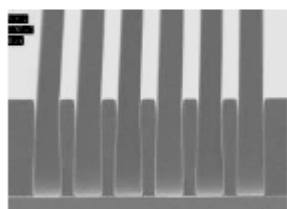
### RESOLUTION-LINES



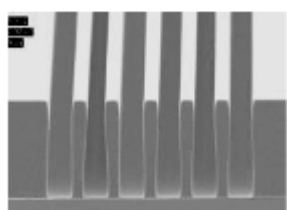
30µm



20µm

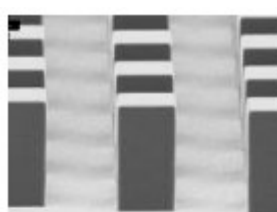


10µm

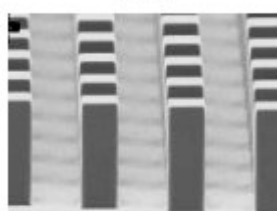


9µm

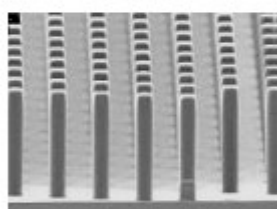
### RESOLUTION-POSTS



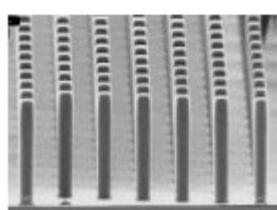
30µm



20µm

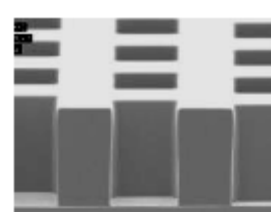


10µm

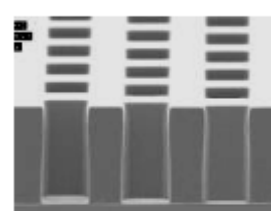


9µm

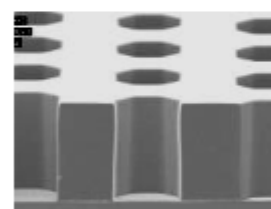
### RESOLUTION-HOLES



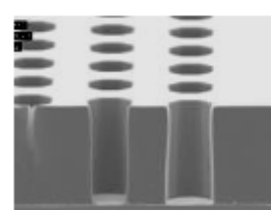
30µm (square)



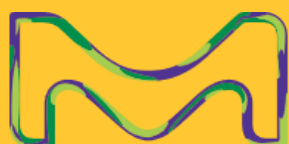
20µm (square)



30µm (round)

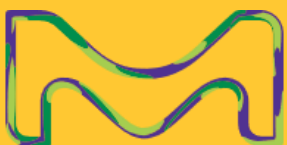
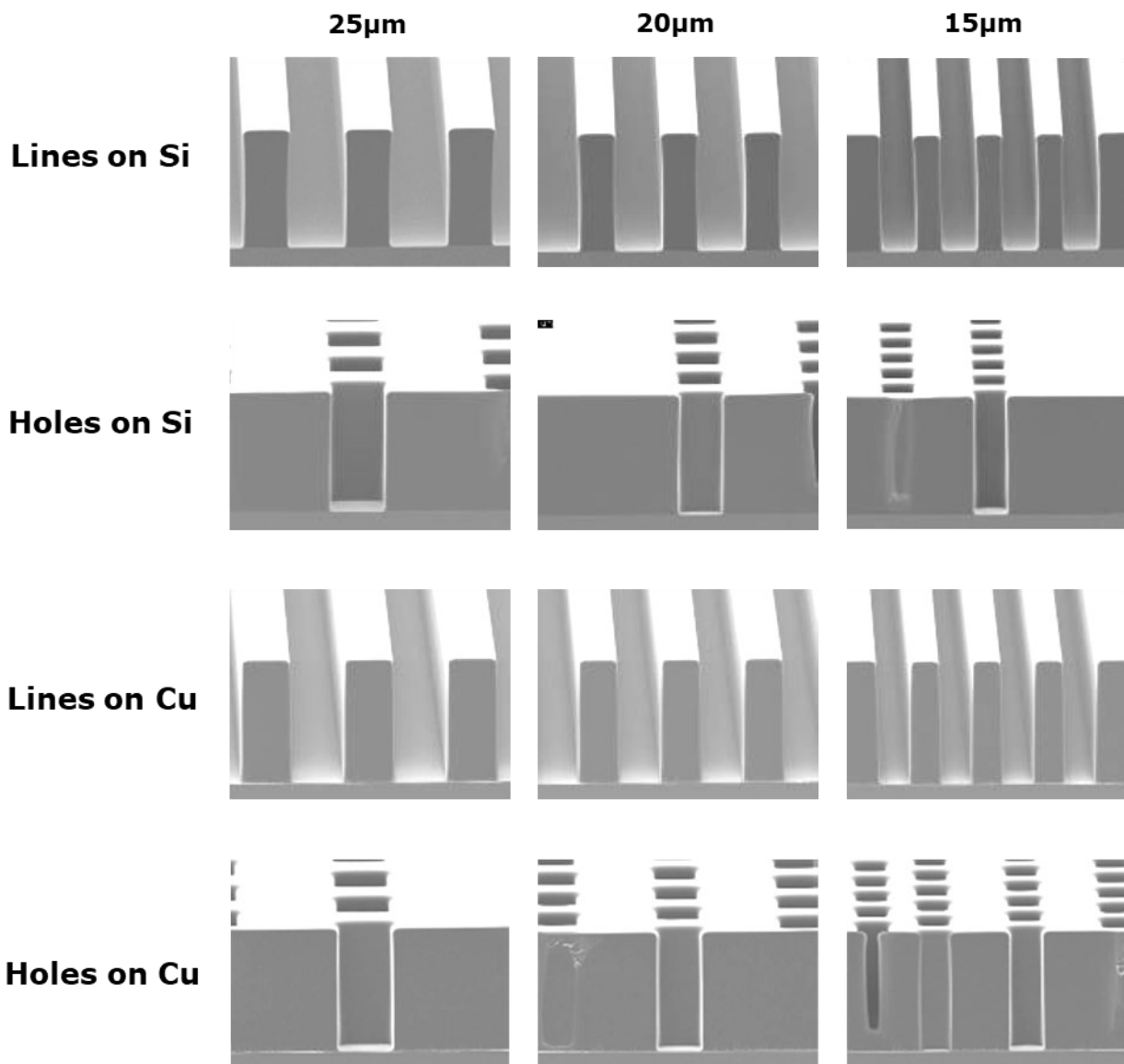


20µm (round)



## EXAMPLE PROCESS (AZ 125NXT-7B @ 20 $\mu$ M FILM THICKNESS ON CU)

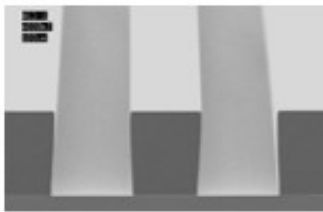
Process Step	Parameters
Coat	Dispense 30rpm, Spread 300rpm/5s, Spin 1600rpm/1s, Dry 970 rpm/15s
Soft Bake	120°C stepping proximity; 30s@5.1mm, 60s@1.3mm, 180s@0.1mm, 400s contact
Post Bake Delay	None
Expose	Ultratech AP 300 Stepper, 2000mj/cm <sup>2</sup> , Focus = -15 $\mu$ m
Post Expose Bake	None
Develop	AZ 300MIF, 2 x 60 second puddles



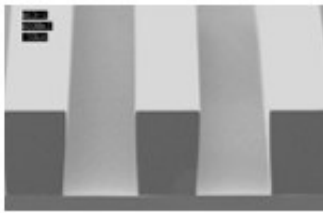
## EXAMPLE PROCESS (125NXT-10B @120μM FILM THICKNESS ON CU)

Process Step	Parameters
Coat	Dispense 30rpm, Spread 300rpm/5s, Spin 1100rpm/1.2s, Dry 620 rpm/12s
Soft Bake	135°C, 25min
Post Bake Delay	None
Expose	Suss MA-200 Aligner, ghi mode
Post Expose Bake	None
Develop	AZ 300MIF, 3 x 60 second puddles

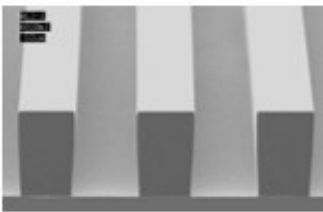
### RESOLUTION-LINES



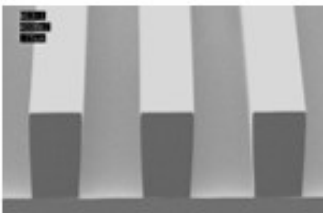
100μm



90μm

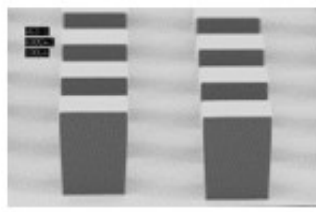


80μm

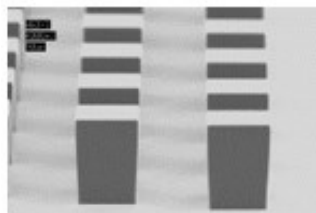


75μm

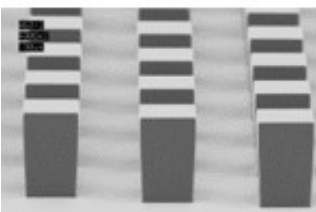
### RESOLUTION-POSTS



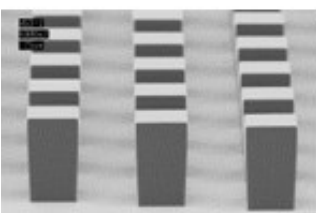
100μm



90μm

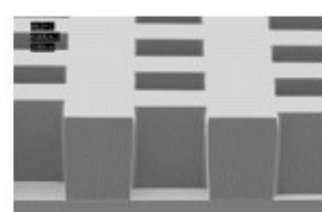


80μm

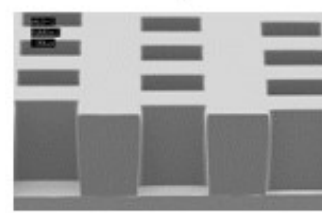


75μm

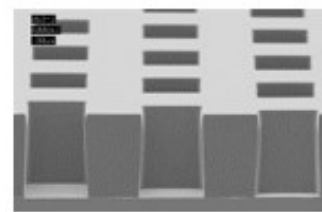
### RESOLUTION-HOLES



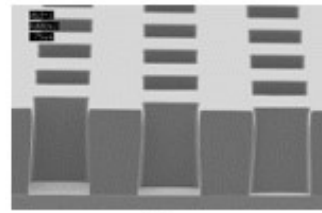
100μm



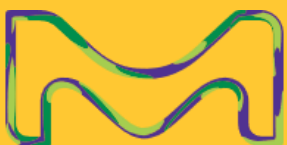
90μm



80μm



75μm

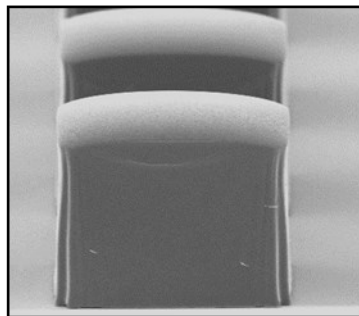
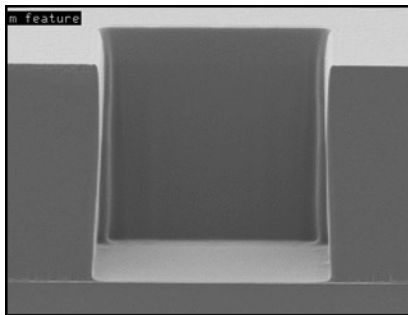


## TYPICAL ELECTROPLATING RESULTS (CU)

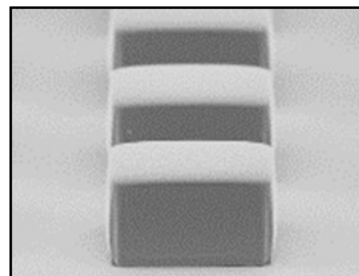
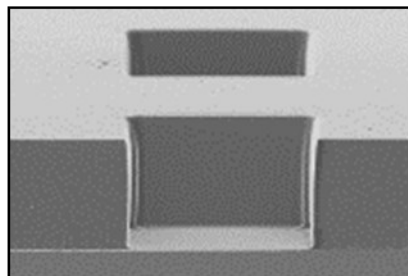
Process Step	Parameters
Coat	25, 50, 60, and 100µm thick AZ 125nXT-10B on Cu substrate
Descum	O <sub>2</sub> Plasma
Copper Plating	Intervia 8540 Cu Plating Solution
Equipment	Semitool CFD 2, 30°C, flow 5gpm, wafer rotation 60rpm, deposition rate 0.4-0.8µm/min.

### PHOTORESIST PATTERN

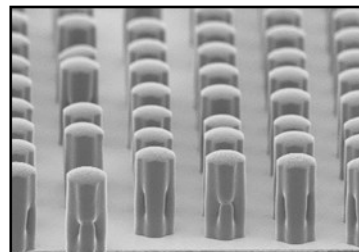
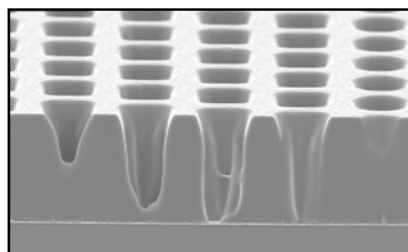
### POST PLATE AND STRIP



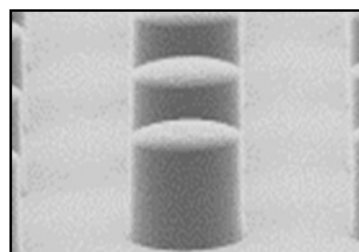
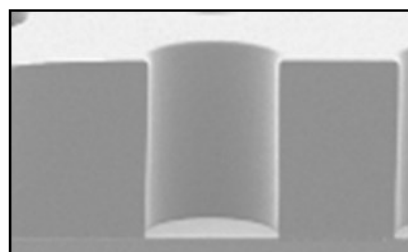
Mask CD: 75µm square holes, 1:1 pitch  
Coated resist thickness: 100µm  
Strip: AZ 400T @ 75C



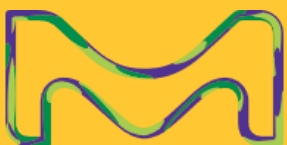
Mask CD: 75µm square holes, 1:1 pitch  
Coated resist thickness: 50µm  
Strip: AZ 400T @ 75C



Mask CD: 8µm square holes 1:1 pitch  
Coated resist thickness: 25µm  
Strip: AZ 400T @ 75C

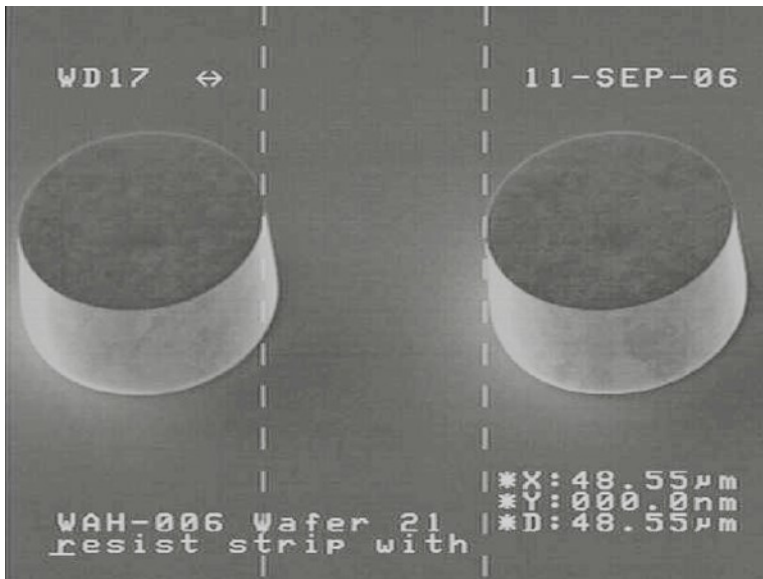


Mask CD: 50µm round holes 1:1 pitch  
Coated resist thickness: 60µm  
Strip: AZ 400T @ 75C

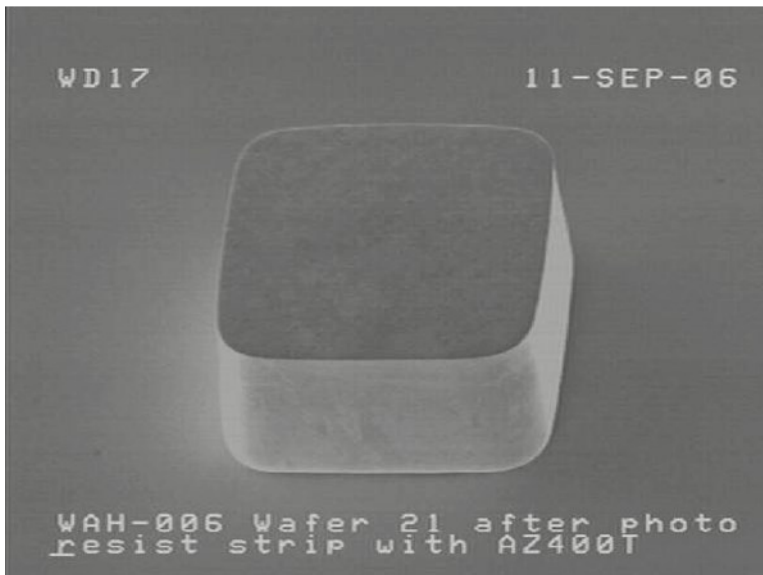


## TYPICAL ELECTROPLATING RESULTS (AU)

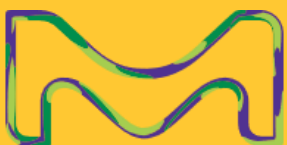
Process Step	Parameters
Coat	40µm thick AZ 125nXT-10B on Au seed
Gold Plating	Enthone 309 (sulfite plating solution), 40C
Photoresist Strip	AZ 400T @ 75°C



Gold bumps post photoresist strip  
 Diameter: 40µm  
 Height: 35µm

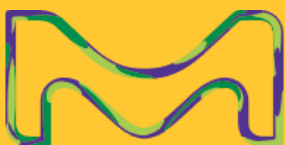
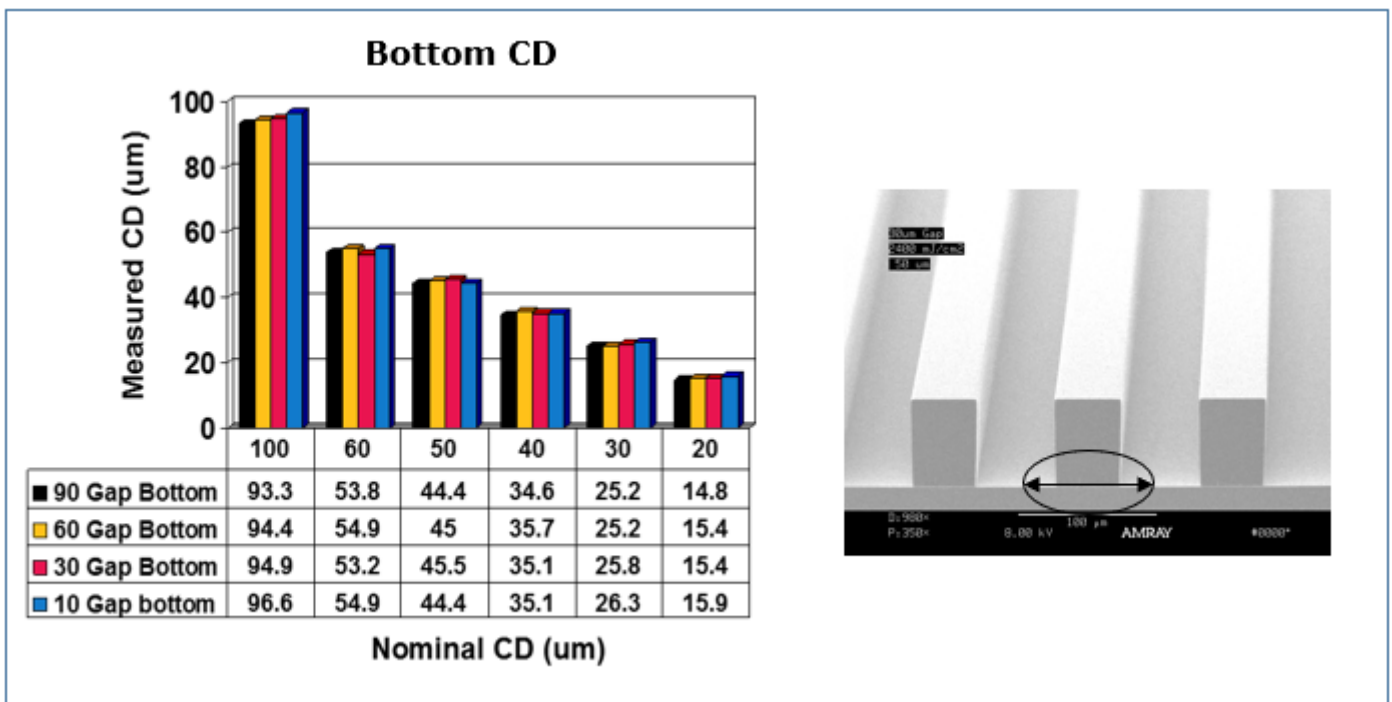
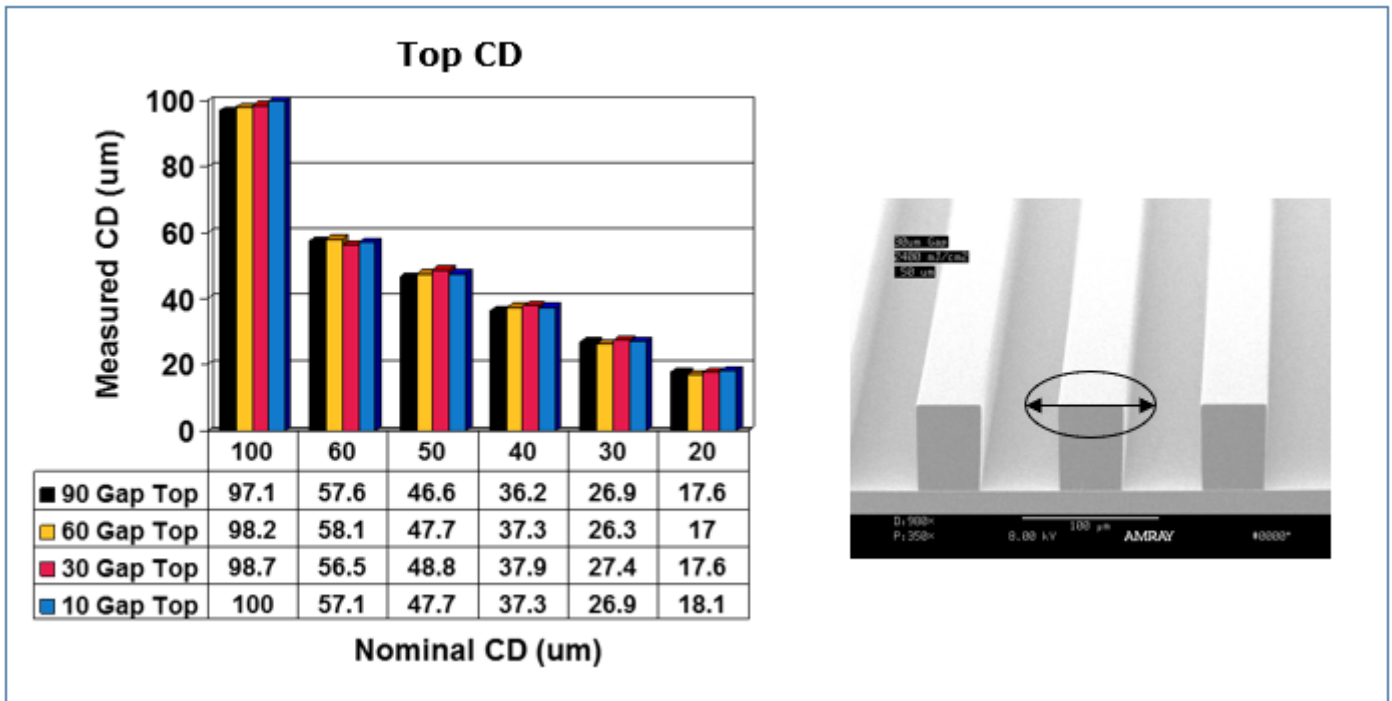


Gold pad post photoresist strip  
 Width: 40µm  
 Height: 35µm



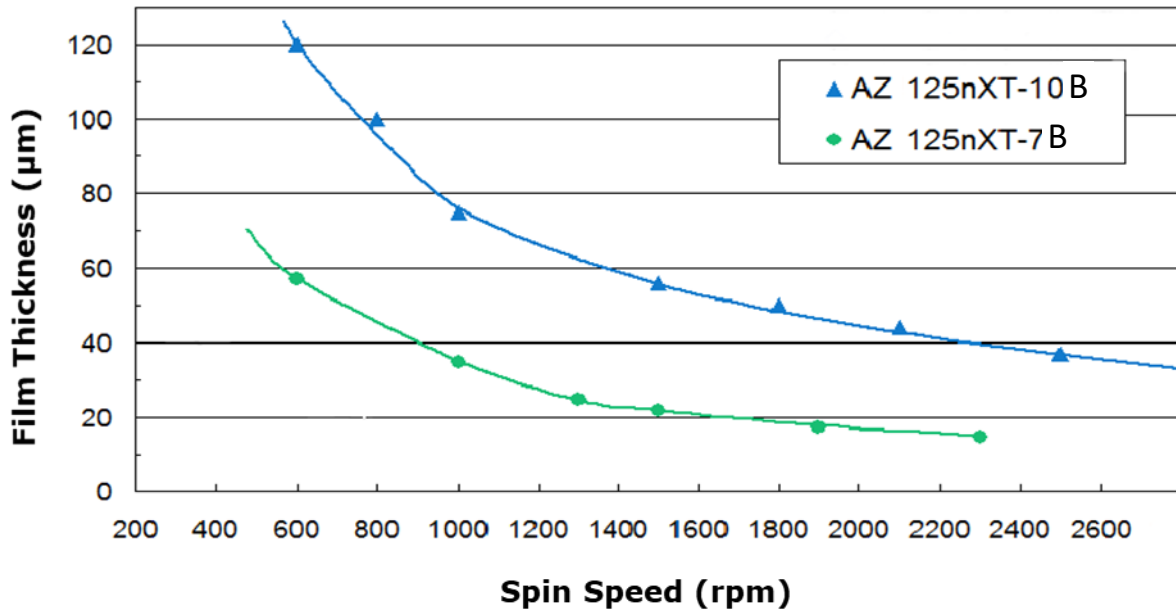


**TOP AND BOTTOM CD DEPENDENCY ON PROXIMITY GAP FOR PROJECTION ALIGNERS**  
 (PHOTORESIST FILM THICKNESS = 60µM)



## COATING GUIDELINES

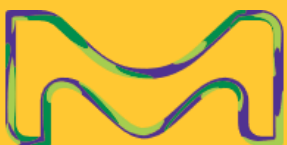
Unlike thin photoresist processing where the liquid material can simply be spun to equilibrium using a spin curve as a speed reference, achieving target thickness and coating uniformity with high viscosity photoresists requires careful optimization of both the spin speed and the spin time. Due to the slow drying characteristics of thick resists like AZ 125nXT, films will continue to thin with extended spin times. The below spin curves and example coating sequence may be used as general guidelines for coating films of 30 $\mu$ m thickness and above.



## EXAMPLE COATING SEQUENCE

(ADJUST HIGHLIGHTED PARAMETERS FOR TARGET COAT THICKNESS)

Step	Time (s)	Speed (rpm)	Acc (rpm/s)	Function
1	5	1000	1000	Start, acclimate wafer temperature
2	15	30	1000	Dispense photoresist
3	5	300	1000	Spread photoresist
4	1.2	1000	1000	Snap spin for edge coverage
5	12	From Curve	1000	Set film thickness
6	15	400	1000	Backside rinse
7	20	400	1000	Backside dry
8	0.6	1000	2000	Flatten edge bead (speed is wafer size dependent)



## PROCESS CONSIDERATIONS

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### SUBSTRATE PREPARATION

Substrates must be clean, dry, and free of organic residues. Oxide forming substrates (Si, etc.) should be HMDS primed prior to coating AZ 125nXT. Contact your product representative for detailed information on pre-treating with HMDS.

### COATING

Refer to the coating guidelines section of this publication to assist in achieving target film thickness and coat uniformity. Note that AZ 125nXT films will be soft after spin coat and will remain slightly tacky after soft bake. Direct or vacuum contact lithography is not recommended. Keep spin times as short as possible.

### SOFT BAKE

Soft bake times and temperatures may be application specific. Process optimization is recommended to ensure optimum pattern profiles and stable lithographic and adhesion performance. Soft bake temperatures for AZ 125nXT should be in the 115°-140°C range. **NO POST BAKE REHYDRATION DELAYS ARE REQUIRED.**

### EXPOSURE

AZ 125nXT is sensitive in the 365-435nm wavelength range.

### POST EXPOSE BAKE

A PEB is not required with AZ 125nXT.

### DEVELOPING

AZ 125nXT series photoresists are compatible with industry standard 0.26N (2.38%) TMAH developers. AZ 300MIF in puddle mode is recommended.

### HARD BAKE

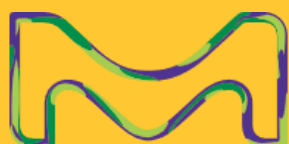
Hard baking (post develop bake) is generally not required with AZ 125nXT. However, hard baking may improve pattern stability in aggressive dry etch processes. Hard bake temperatures should be in the 130°-140°C range.

### STRIPPING

AZ 125nXT Series resists are compatible with industry standard solvent based removers. AZ 400T at 75°C for 20-25 minutes with agitation is recommended.

### COMPATIBLE MATERIALS

AZ 125nXT Series materials are compatible with all commercially available lithography processing equipment. Compatible materials of construction include glass, quartz, PTFE, PFA, stainless steel, HDPE, polypropylene, and ceramic.



## **HANDLING/DISPOSAL**

AZ 125nXT Series materials contain PGMEA (1-Methoxy-2-propanol acetate). Refer to the current version of the MSDS and to local regulations for up to date information on safe handling and proper disposal. Wear solvent resistant gloves, protective clothing, and eye/face protection.

AZ 125nXT is compatible with drain lines handling similar organic solvent based materials.

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