MERCK

technical datasheet

AZ® 125nXT Series

Photopolymer Negative Tone Photoresists

APPLICATION

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

THICKNESS GRADES

Grade	Viscosity (cSt)	Film Thickness Range (µm)
AZ 125nXT-7A	1035	~18-35µm
AZ 125nXT-10A	5000	~35-120µm

COMPANION PRODUCTS

Thinning/Edge Bead Removal
AZ® EBR Solvent or AZ® EBR 70/30

MIF Developers
AZ® 300MIF

Removers
AZ® 400T

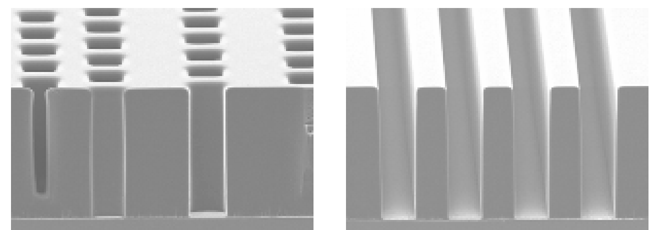
TYPICAL PROCESS

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

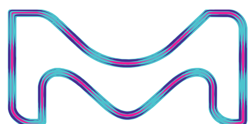
OPTICAL CONSTANTS*

Cauchy A	1.5206
Cauchy B (μm^2)	0.008114
Cauchy C (μm^4)	-0.000217
n @ 633nm	1.539
k @ 633nm	0.00

* Unexposed photoresist film



15µm holes and 15µm lines in 70µm thick AZ 125nXT
Cu substrate, 1800mJ/cm2 broadband exposure
AZ 300 MIF Develop (120s)



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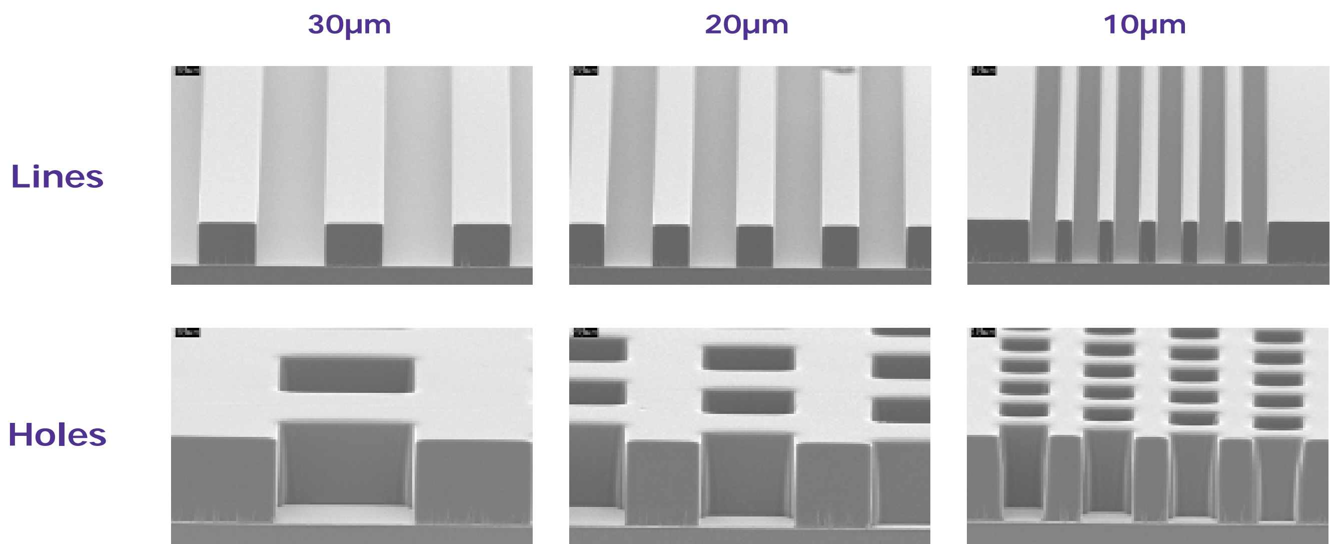
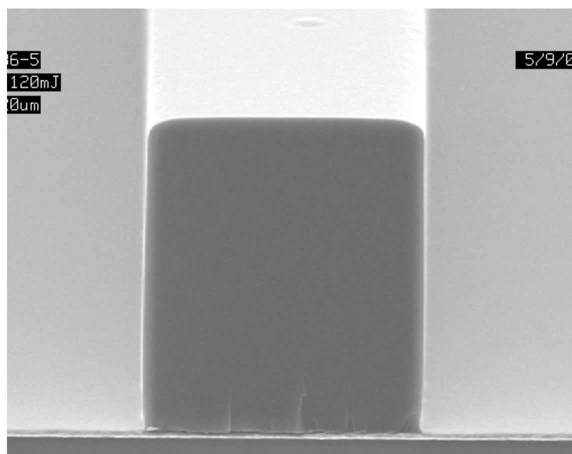
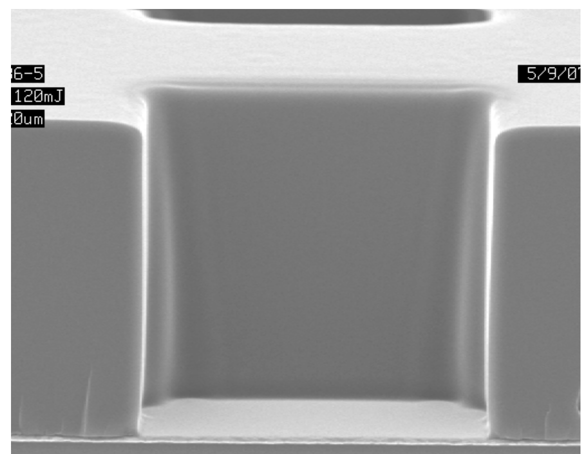
EXAMPLE PROCESS (AZ 125nXT-7A @ 20µm Film Thickness on Cu)

Process Step	Parameters
Coat	125nXT-7A @ 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^2, ghi mode
Post Expose Bake	None
Develop	AZ 300MIF, 2 x 25 second puddles

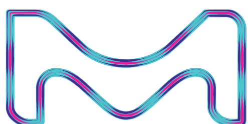




20µm Line



20µm Square Hole



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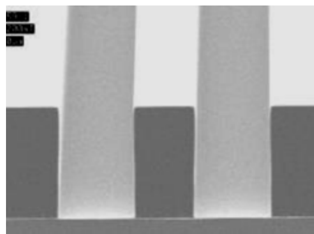
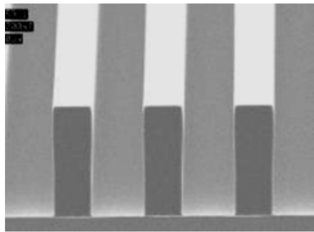
EXAMPLE PROCESS (125nXT-10A @ 50µm Film Thickness on Cu)

Process Step	Parameters
Coat	Dispense 30rpm, Spread 300rpm/5s, Spin 2400rpm/1.4s, Dry 2300 rpm/8s
Soft Bake	130C, 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

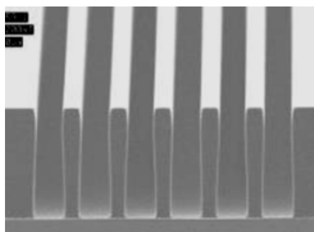
RESOLUTION-Lines



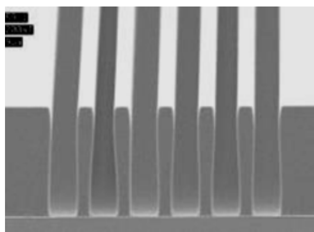
30µm



20µm

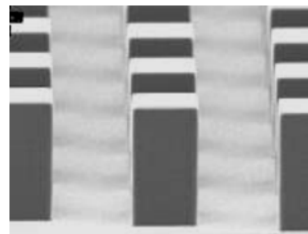


10µm

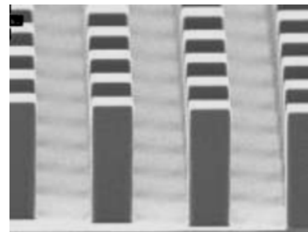


9µm

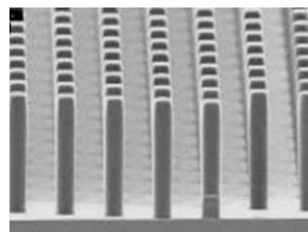
RESOLUTION-Posts



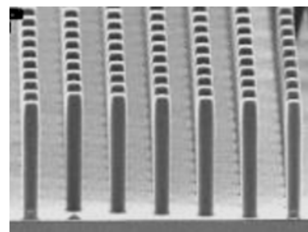
30µm



20µm

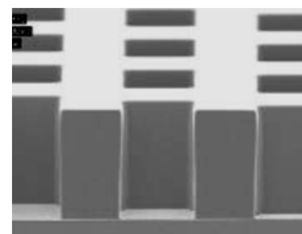


10µm

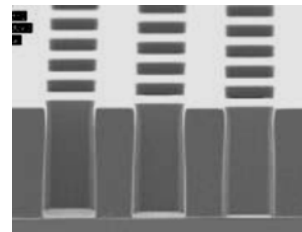


9µm

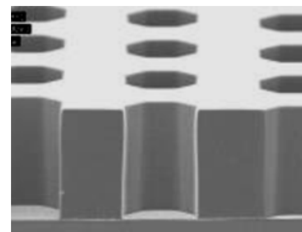
RESOLUTION-Holes



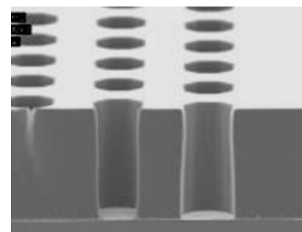
30µm (square)



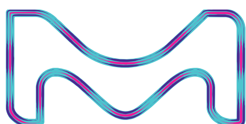
20µm (square)



30µm (round)



20µm (round)



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EXAMPLE PROCESS (125nXT-10A @70µm Film Thickness on Si and Cu)

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

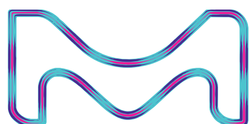
25µm 20µm 15µm

Lines on Si

Holes on Si

Lines on Cu

Holes on Cu

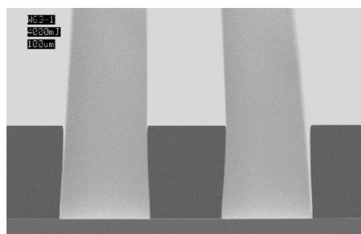


AZ® 125nXT Series

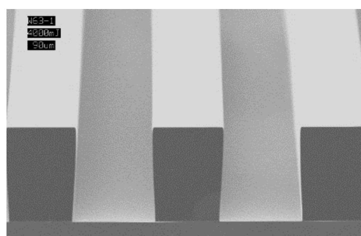
EXAMPLE PROCESS (125nXT-10A @120μm Film Thickness on Cu)

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

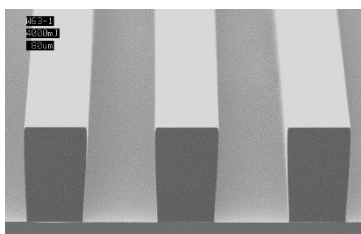
RESOLUTION-Lines



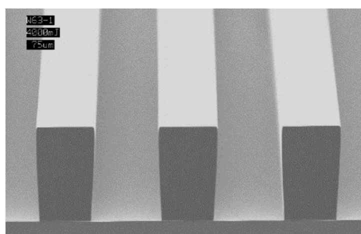
100μm



90μm

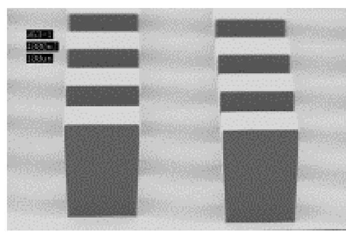


80μm

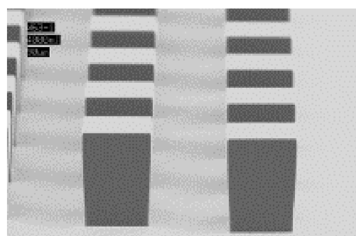


75μm

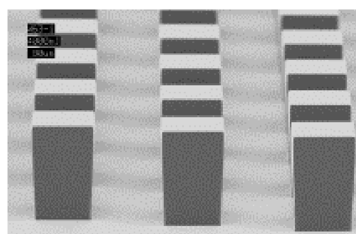
RESOLUTION-Posts



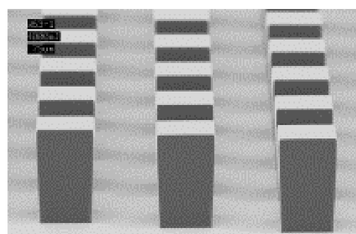
100μm



90μm

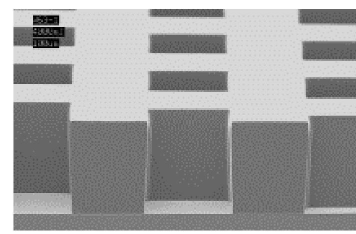


80μm

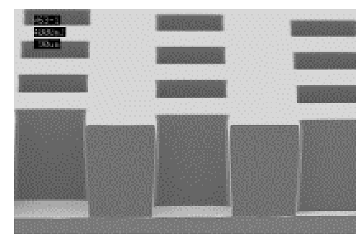


75μm

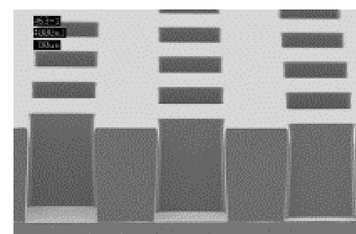
RESOLUTION-Holes

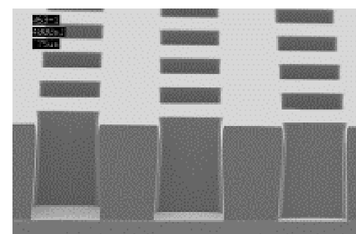


100μm

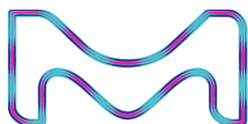


90μm





75μm



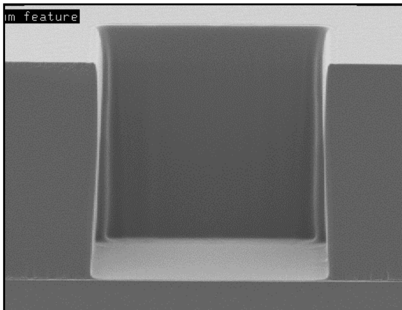
AZ® 125nXT Series

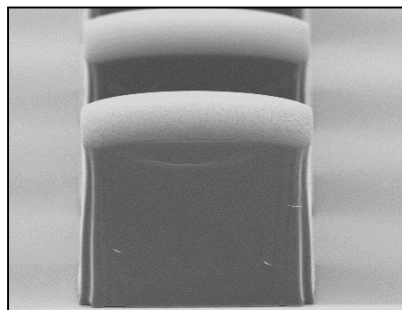
TYPICAL ELECTROPLATING RESULTS (Cu)

Process Step	Parameters
Coat	25, 50, 60, and 100µm thick AZ 125nXT-10A on Cu substrate
Descum	O_2 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.

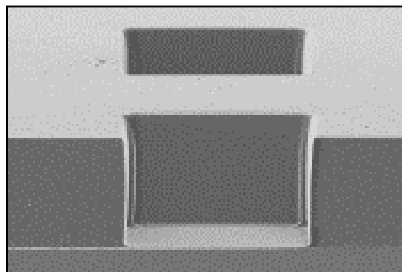
Photoresist Pattern

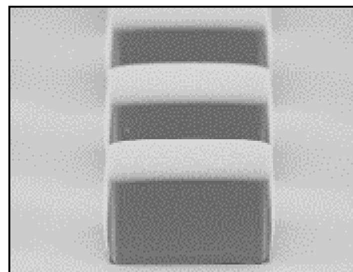
Post Plate and Strip



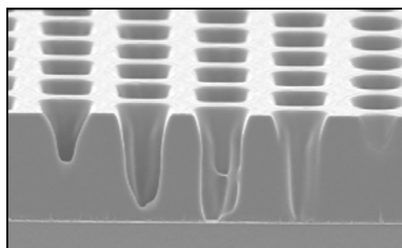


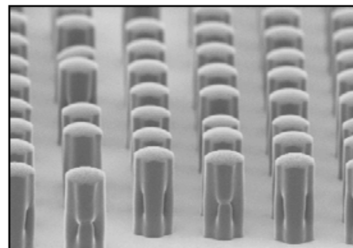
Mask CD: 75µm square holes, 1:1 pitch
Coated resist thickness: 100µm
Strip: AZ 400T @ 75C



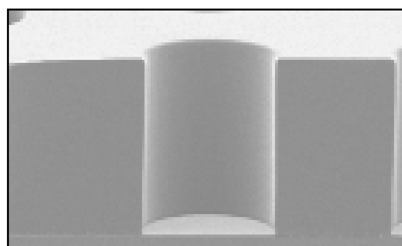


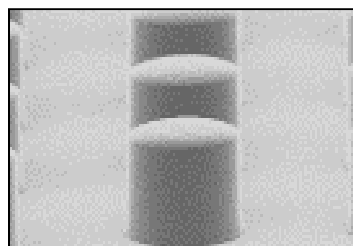
Mask CD: 75µm square holes, 1:1 pitch
Coated resist thickness: 50µm
Strip: AZ 400T @ 75C



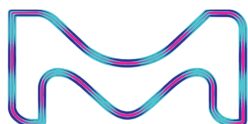


Mask CD: 8µm square holes 1:1 pitch
Coated resist thickness: 25µm
Strip: AZ 400T @ 75C





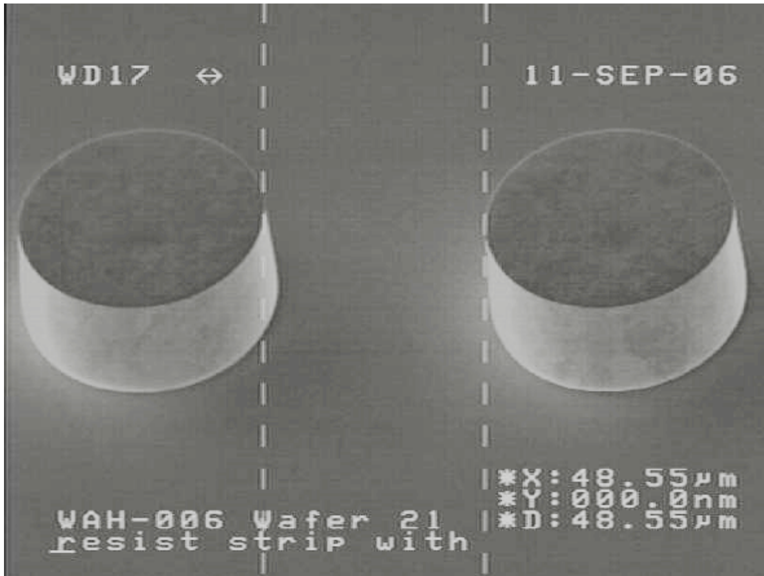
Mask CD: 50µm round holes 1:1 pitch
Coated resist thickness: 60µm
Strip: AZ 400T @ 75C



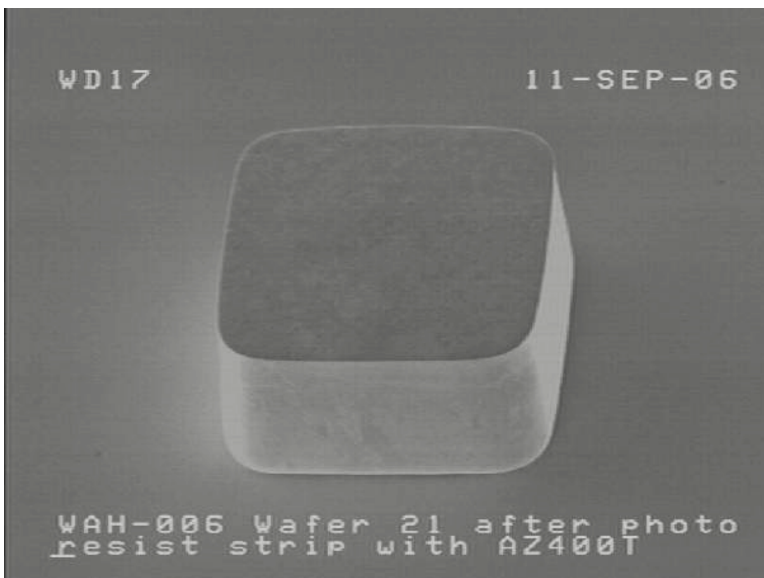
AZ® 125nXT Series

TYPICAL ELECTROPLATING RESULTS (Au)

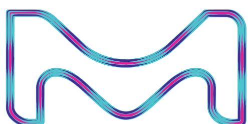
Process Step	Parameters
Coat	40µm thick AZ 125nXT-10A on Au seed
Gold Plating	Enthone 309 (sulfite plating solution), 40C
Photoresist Strip	AZ 400T @ 75C



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



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



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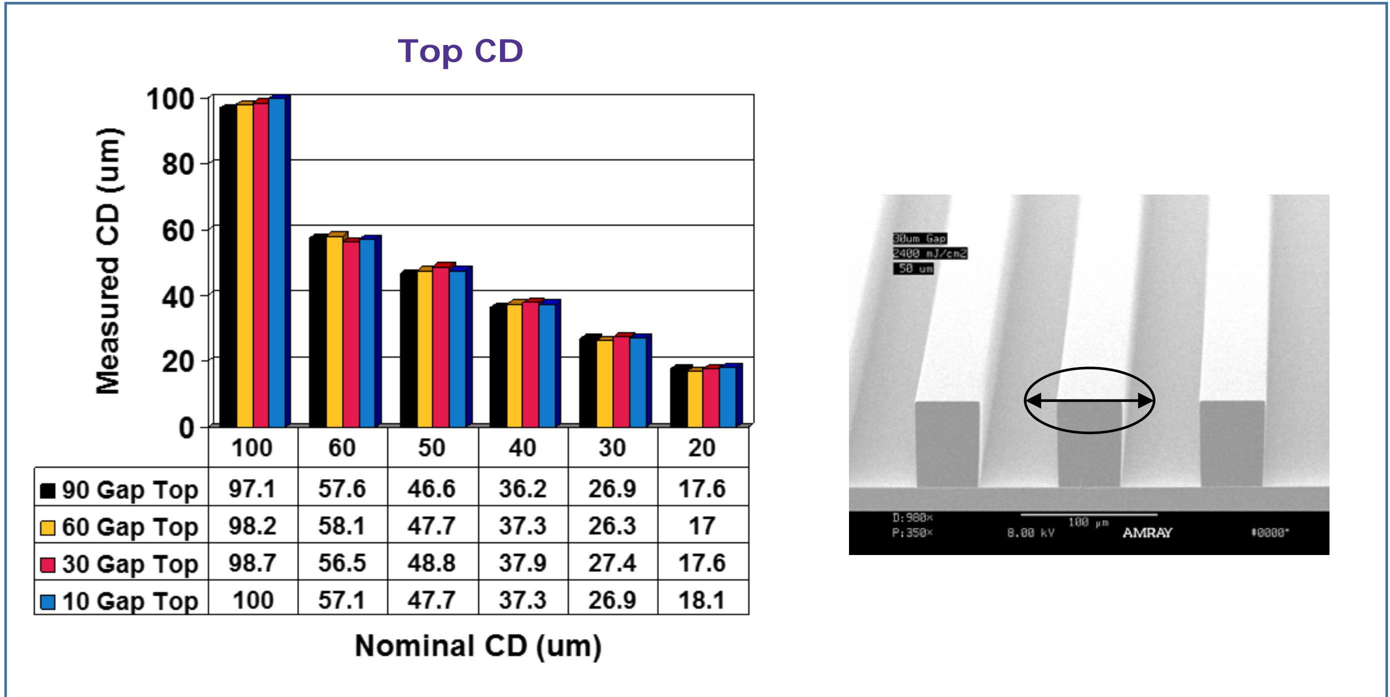
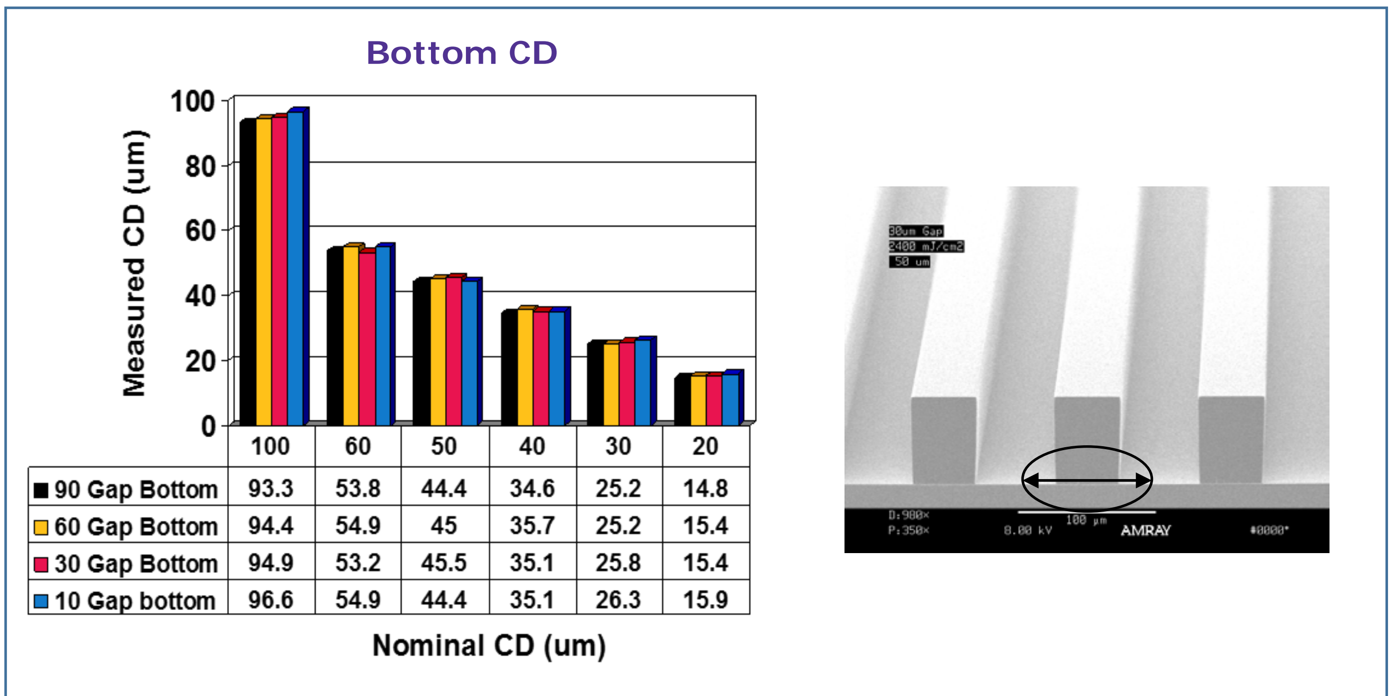
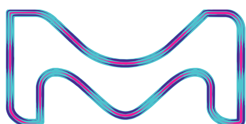
TOP AND BOTTOM CD DEPENDENCY on PROXIMITY GAP for PROJECTION ALIGNERS
(Photoresist film thickness = 60µm)



	100	60	50	40	30	20
90 Gap Top	97.1	57.6	46.6	36.2	26.9	17.6
60 Gap Top	98.2	58.1	47.7	37.3	26.3	17
30 Gap Top	98.7	56.5	48.8	37.9	27.4	17.6
10 Gap Top	100	57.1	47.7	37.3	26.9	18.1



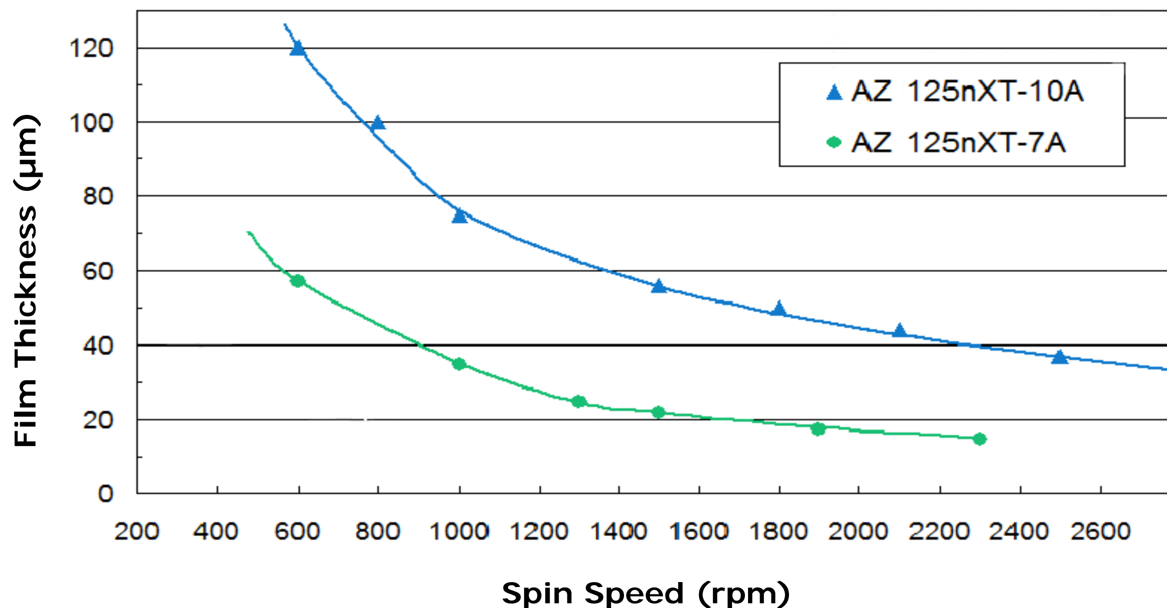
	100	60	50	40	30	20
90 Gap Bottom	93.3	53.8	44.4	34.6	25.2	14.8
60 Gap Bottom	94.4	54.9	45	35.7	25.2	15.4
30 Gap Bottom	94.9	53.2	45.5	35.1	25.8	15.4
10 Gap bottom	96.6	54.9	44.4	35.1	26.3	15.9



AZ® 125nXT Series

COATING GUIDELINES

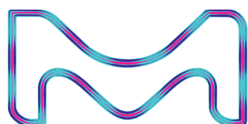
Unlike thin photoresist processing where the liquid material can simply be spun to equilibrium using a spin curve as a speed reference, achieving target thickness and coating uniformity with high viscosity photoresists requires careful optimization of both the spin speed and the spin time. Due to the 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 30µm 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)



AZ® 125nXT Series

PROCESS CONSIDERATIONS

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 AZ 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. Over-spinning of 125nXT may create a surface inhibition layer that can prevent development of the exposed pattern.

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 115-140C 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

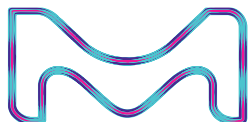
AZ 125nXT series photoresists are compatible with industry standard 0.26N (2.38%) TMAH developers. AZ 300MIF in puddle mode is recommended.

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.



AZ® 125nXT Series

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.

STORAGE

AZ 125nXT Series materials are combustible liquids. Store in sealed original containers in a well ventilated, dry area away from heat, light, oxidizers, reducers, and sources of ignition. Recommended storage temperature is 30°-55°F.

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.

North America:
EMD Performance Materials
70 Meister Avenue
Somerville, NJ USA 08876
(908) 429-3500

Germany:
Merck Performance Materials
(Germany) GmbH
Wiesbaden, Germany
+49 611 962 4031

Korea:
Merck Performance Materials
(Korea) Ltd.
Seoul, Korea
+82 2 2056 1316

Singapore:
Merck Performance Materials
Pte. Ltd.
Jurong East, Singapore
+65 68900629

Taiwan:
Merck Performance Materials
Co. Ltd.
Hsinchu, Taiwan
+886 3 5970885#375

Japan:
Merck Performance Materials
G. K.
Tokyo, Japan
+81 3 5453 5062

China:
Merck Electronic Materials
Shanghai, China
+86 (21) 2083 2362

www.emd-performance-materials.com

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