

# technical datasheet

## AZ<sup>®</sup> 40XT-11D Photoresist

### Chemically Amplified Thick Photoresist

#### APPLICATION

Thick positive tone chemically amplified photoresist featuring aspect ratios and photospeed not possible with conventional DNQ type materials. These photoresists expose and develop very quickly for improved equipment productivity and reduced chemical usage.

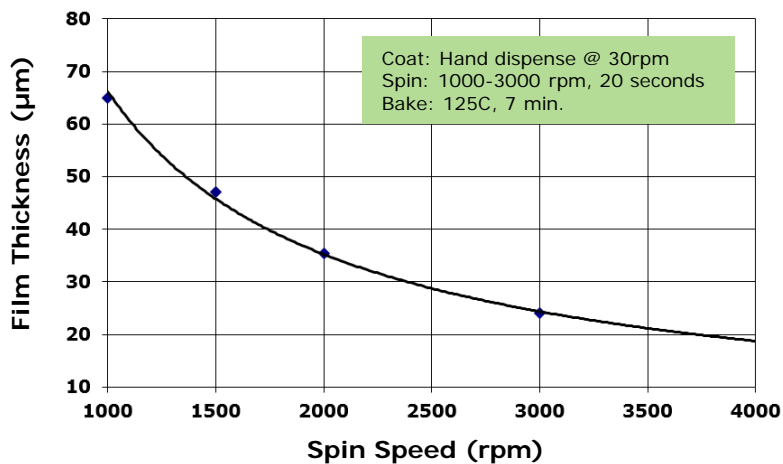
- Excellent environmental stability
- No post bake rehydration delays required
- Single coat thicknesses from 20 to >60µm
- Excellent for Through Silicon Via (TSV), plating, and RIE etch applications.

#### TYPICAL PROCESS

Soft Bake: 125°C (ramped)  
 Rehydration Hold: None  
 Expose: 365nm sensitive  
 Post Expose Bake\*: 105°C/120s  
 Develop: Puddle, spray or immersion  
 Developer Type: MIF

\* PEB is required for proper imaging

#### SPIN CURVE (200mm Silicon)



#### OPTICAL CONSTANTS\*

Cauchy A	1.560
Cauchy B (µm <sup>2</sup> )	0.007
Cauchy C (µm <sup>4</sup> )	0.0006
n @ 633nm	1.5851
k @ 633nm	0

\* Unexposed photoresist film

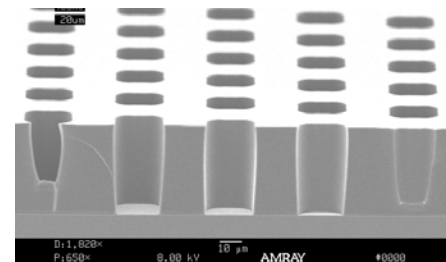
#### COMPANION PRODUCTS

Thinning/Edge Bead Removal

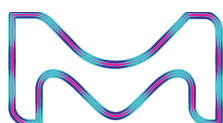
AZ<sup>®</sup> EBR Solvent or AZ<sup>®</sup> EBR 70/30

MIF Developers

AZ<sup>®</sup> 300MIF



20µm holes in 40µm thick AZ 40XT  
 400mJ/cm<sup>2</sup> Exposure  
 AZ 300 MIF Develop (240s)

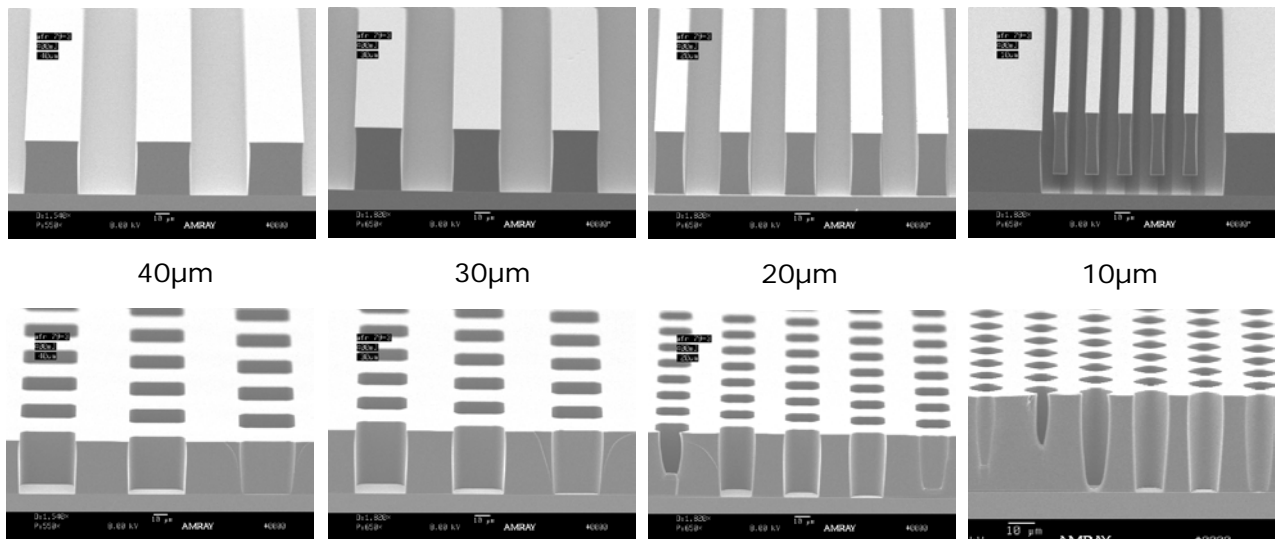


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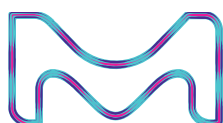
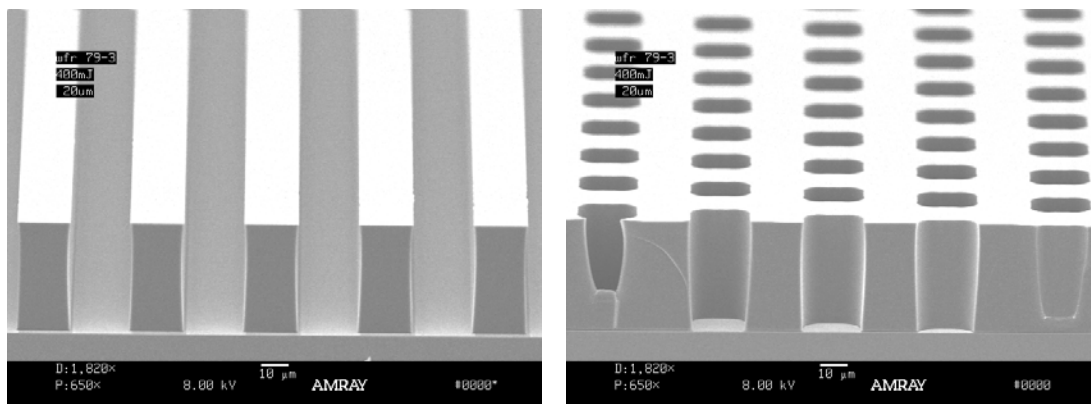
## REFERENCE PROCESS (40µm Film Thickness on 200mm Si)

Process Step	Parameters
Prime	HMDS 140°C/60s (vapor)
Coat	Dynamic dispense at 30rpm, 40µm thick film on bare Si
Soft Bake	125C proximity: 120s @1.27mm, 120s @ 0.63mm, 180s contact
Post Bake Delay	None
Expose	Suss MA-200 aligner, 20µm proximity gap, 400mJ/cm <sup>2</sup> nominal
Post Expose Bake	105C proximity: 10s @ 1.3mm, 10s @ 0.6mm, 80s contact
Develop	AZ 300MIF, 4 x 60 second puddles

## Line and Hole Resolution (1:1 pitch) @ 400mJ/cm<sup>2</sup>

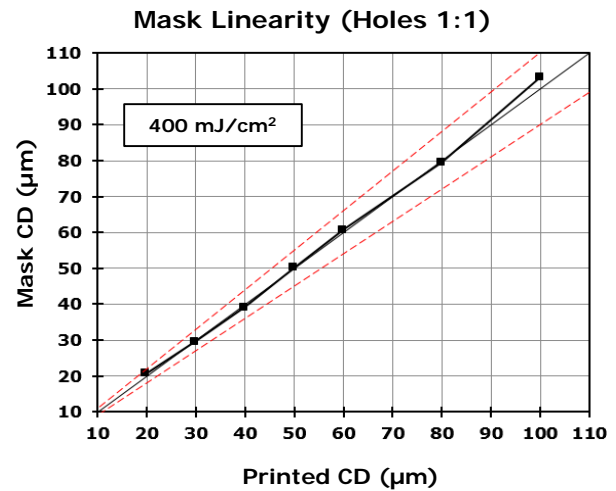
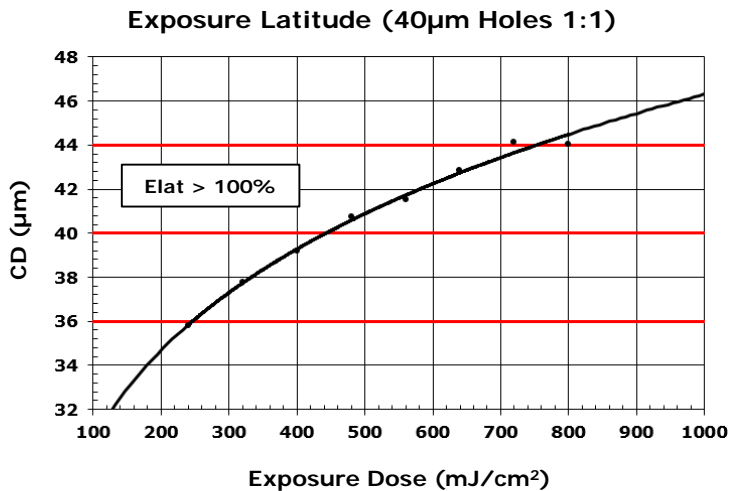
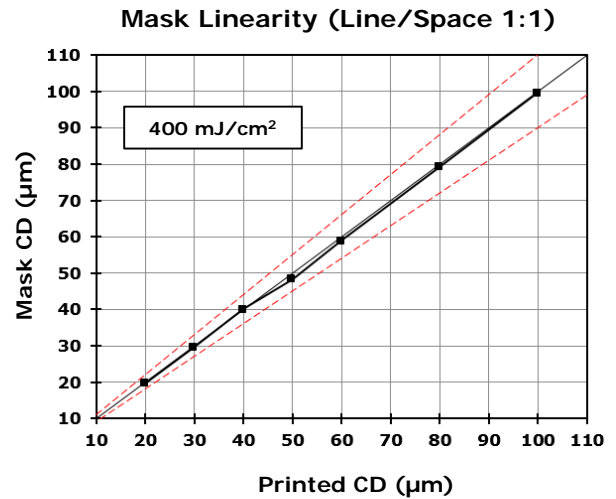
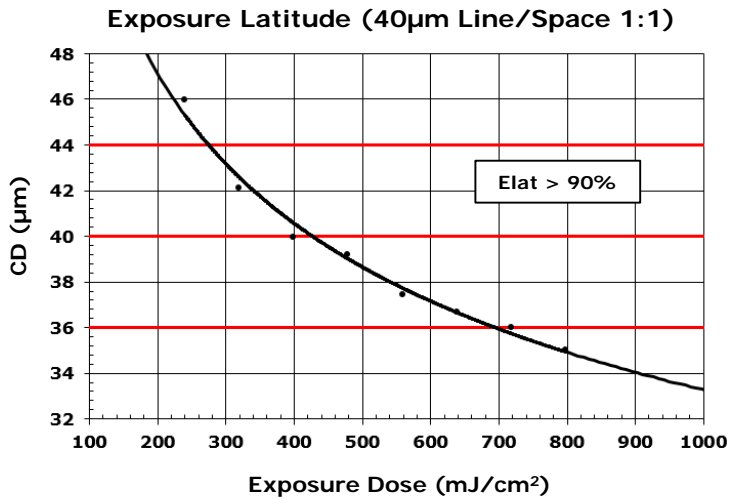


## Pattern Profile Detail (20µm Lines and Holes)

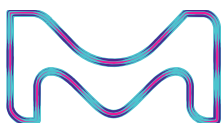


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PROCESS WINDOWS (40 $\mu$ m film thickness on Si)



Coated thickness: 40 $\mu$ m on Si  
Soft Bake: 125C ramped proximity  
Expose: Suss MA-200, 20 $\mu$ m proximity gap  
Post Expose Bake: 105C ramped proximity  
Develop: AZ 300MIF 4x60s puddles

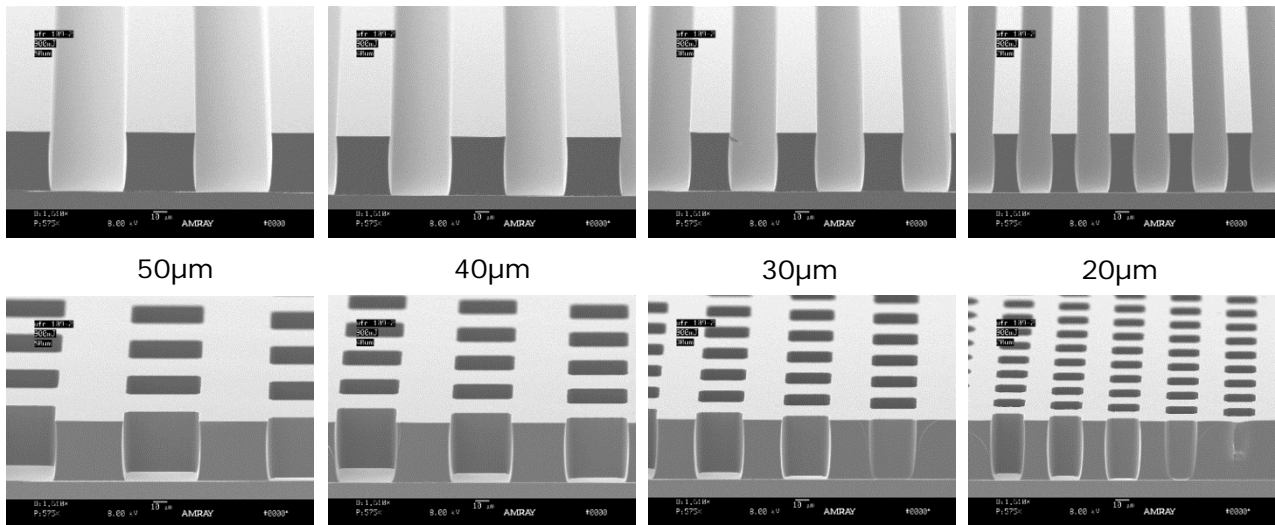


# AZ<sup>®</sup> 40XT-11D Photoresist

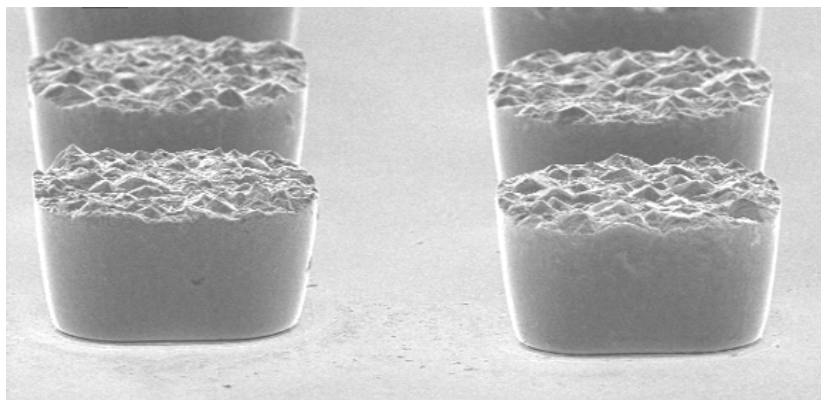
## REFERENCE PROCESS (40µm Film Thickness on 200mm Cu)

Process Step	Parameters
Coat	Dynamic dispense at 30rpm, 40µm thick film on Cu
Soft Bake	125C proximity: 120s @ 1.27mm, 120s @ 0.63mm, 180s contact
Post Bake Delay	None
Expose	Suss MA-200 aligner, 20µm proximity gap, 900mJ/cm <sup>2</sup> nominal
Post Expose Bake	105C proximity: 10s @ 1.3mm, 10s @ 0.6mm, 80s contact
Develop	AZ 300MIF, 3 x 40 second puddles

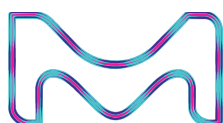
## Line and Hole Resolution (1:1 pitch) @ 900mJ/cm<sup>2</sup>



## 20µm Studs Post Cu Plate and Strip

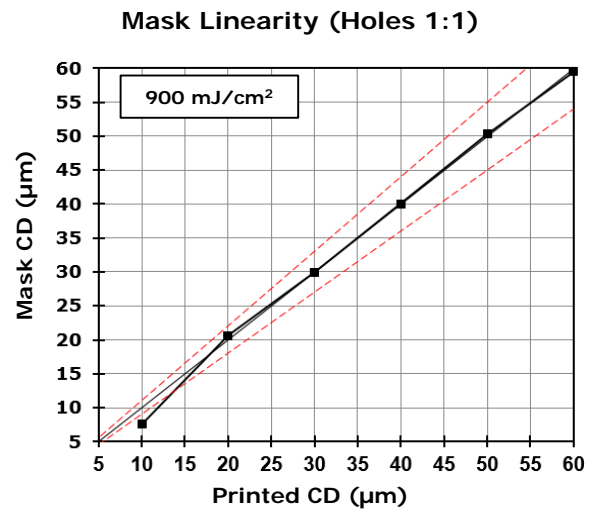
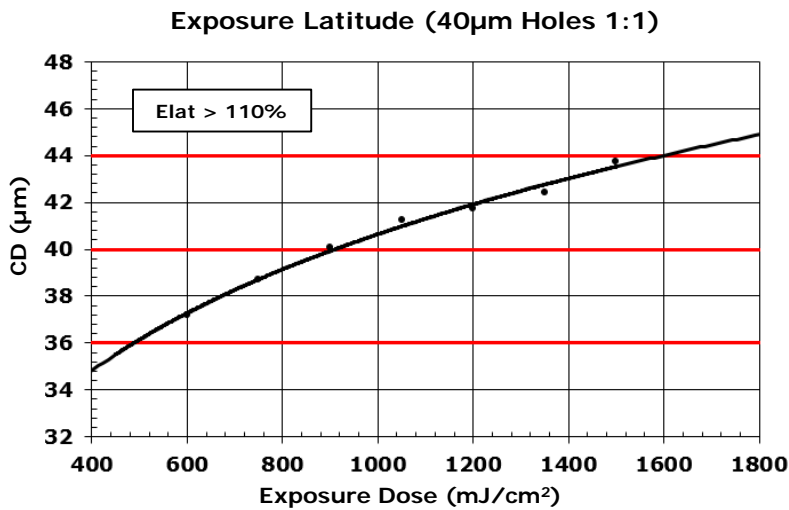
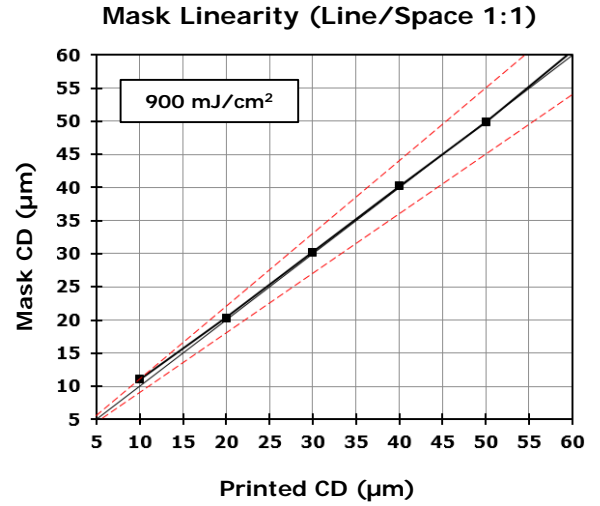
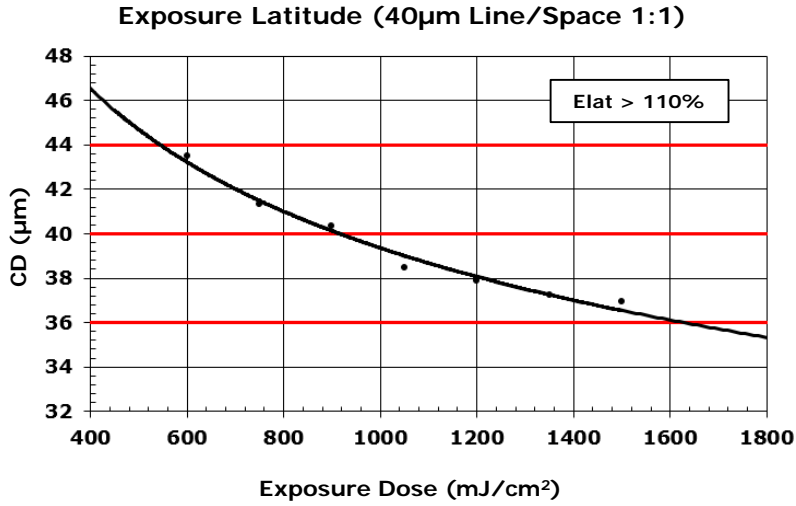


Resist Thickness: 40µm  
 Hard Bake: 80°C/5 minutes  
 Plate Time: 50 minutes  
 Current Density: 1.5 ASD  
 Strip: AZ 400T @ 55°C/10 minutes



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PROCESS WINDOWS (40µm film thickness on Cu)



Coated thickness: 40µm on Cu  
 Soft Bake: 125C ramped proximity  
 Expose: Suss MA-200, 20µm proximity gap  
 Post Expose Bake: 105C ramped proximity  
 Develop: AZ 300MIF 3x40s puddles

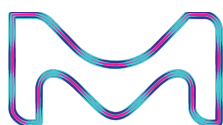
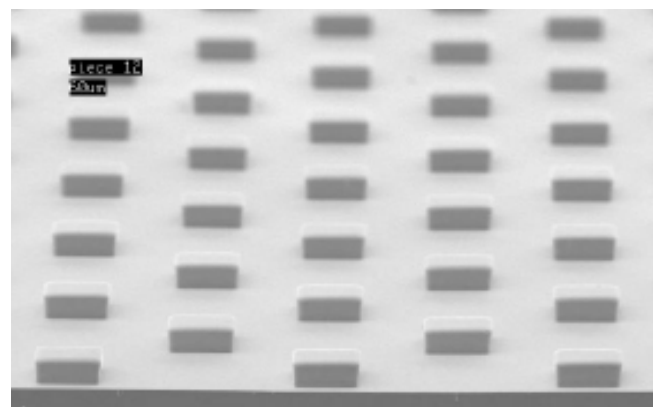
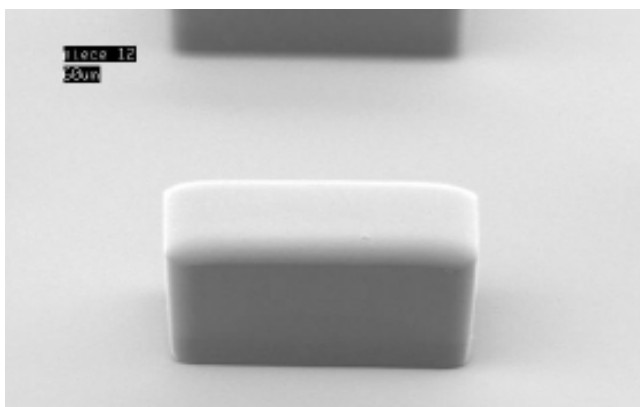
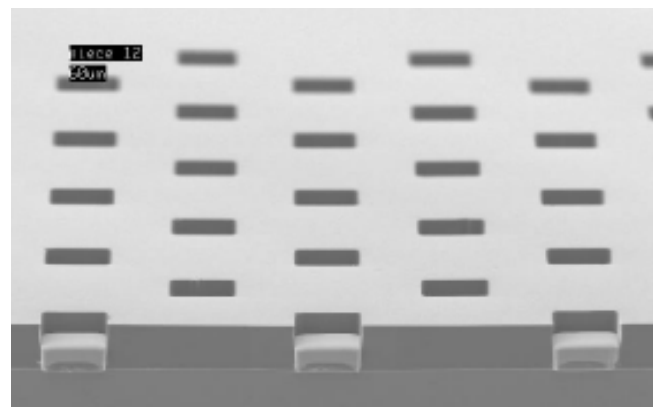
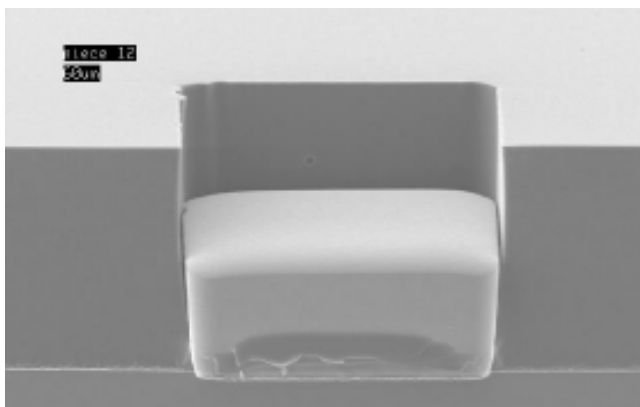


# AZ<sup>®</sup> 40XT-11D Photoresist

## HIGH SPEED Cu PLATING PERFORMANCE

Process Step	Parameters
Coat	Dynamic dispense at 30rpm, 45µm thick film on Cu
Soft Bake	125C proximity: 120s @ 1.27mm, 120s @ 0.63mm, 180s contact
Post Bake Delay	None
Expose	Suss MA-200 aligner, 20µm proximity gap, 1000mJ/cm <sup>2</sup> nominal
Post Expose Bake	105C proximity: 10s @ 1.3mm, 10s @ 0.6mm, 80s contact
Develop	AZ 300MIF, 3 x 45 second puddles
Plating Solution	Enthone Microfab <sup>®</sup> 1000 Cu
Current Density	300mA/cm <sup>2</sup>
Plating Rate	6µm/min.
Strip	AZ 400T @ 70°C/5 min.

## 60µm Pads Before and After Photoresist Strip



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## 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 40XT. Contact your AZ product representative for detailed information on pre-treating with HMDS.

### 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 40XT should be in the 115-125C range. Ramped temperature or plate proximity is required to prevent bubbling of the film due to rapid solvent evaporation.

### COATING

As with all ultra-high viscosity materials, careful optimization of nozzle height, dispense rate, dispense volume, and spin parameters is necessary to prevent bubble/voids in the final film. To hand coat AZ 40XT, transfer a small amount of material into a small beaker with an integrated pour spout and wait for any bubbles to dissipate. Apply the photoresist by pouring directly from the beaker in close proximity to the wafer surface. Use of a pipette or dropper is not recommended. Final film thickness will be determined by the combination of spin speed and spin time. Refer to the example spin curve data for more information.

### EXPOSURE

AZ 40XT requires exposure energy at the 365nm wavelength.

### POST EXPOSE BAKE

A PEB is required for proper imaging of AZ 40XT. PEB temperatures and times may be application specific. As a general rule, PEB temperatures should be in the 100 to 110C range.

### DEVELOPING

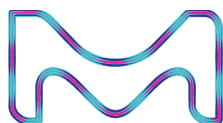
AZ 40XT photoresist is compatible with industry standard 0.26N (2.38%) TMAH developers. AZ 300MIF is recommended.

### HARD BAKE

Hard baking (post develop bake) may improve adhesion in wet etch applications and improves pattern stability in dry etch processes. Hard Baking is typically not required for plating applications. Hard bake temperatures should be in the 80 to 85C range to ensure minimal thermal distortion of the pattern.

### STRIPPING

AZ 40XT photoresist is compatible with industry standard solvent based removers. AZ 400T is recommended.





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## COMPATIBLE MATERIALS

AZ 40XT is 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 40XT is a combustible liquid. 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 40XT contains 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 40XT is compatible with drain lines handling similar organic solvent based materials.

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