technical datasheet

AZ® 10XT Series

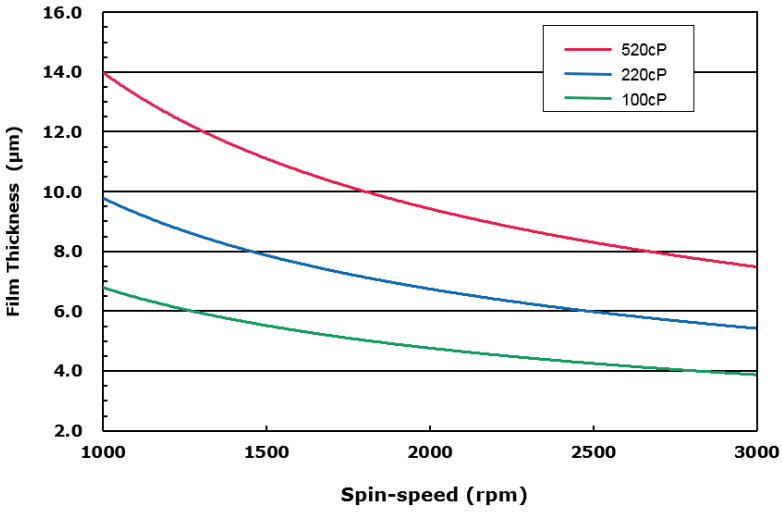
Thick Positive Tone Photoresists

APPLICATION

Thick positive tone photoresists for plating applications featuring improved sidewall profiles, aspect ratios, and photospeed vs. typical thick DNQ type materials.

- MIF and IN developer compatible
- No post exposure bake required
- Single coat thicknesses from 4.0 to >20µm

SPIN CURVES (200MM Silicon)



COMPANION PRODUCTS

Thinning/Edge Bead Removal

AZ® EBR Solvent or AZ® EBR 70/30

Developers

AZ® 400K Series, AZ® 300MIF, AZ® 435MIF

Removers

AZ® 300T, AZ® 400T

TYPICAL PROCESS

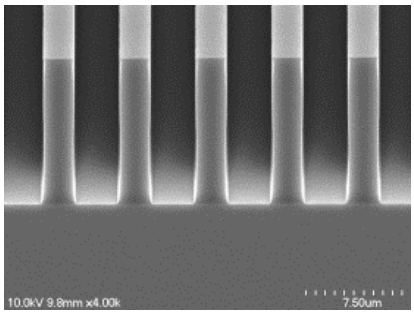
Soft Bake: 110ºC/120s*
Rehydration Hold: 30 min.
Expose: 365nm-435nm sensitive
Post Expose Bake: Optional
Develop: Puddle, spray or immersion
Developer Type: IN or MIF

* SB time is film thickness dependent

OPTICAL CONSTANTS*

Cauchy A	1.5995
Cauchy B (µm^2)	0.009958
Cauchy C (µm^4)	7.16e-04
n @ 633nm	1.6288
k @ 633nm	0.00015

* Unexposed photoresist film



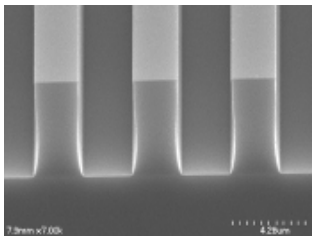
3.0µm lines in 12µm thick AZ 10XT
Ultratech 1500 Exposure
AZ 400K 1:4 MIF Develop (260s spray)

AZ® 10XT Series

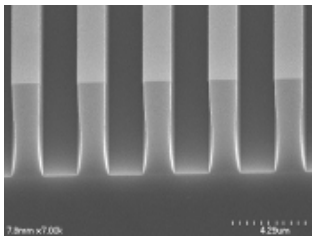
REFERENCE PROCESS (Dense Lines in 6µm Film Thickness on Si)

Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on bare Si
Soft Bake	110C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 380mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

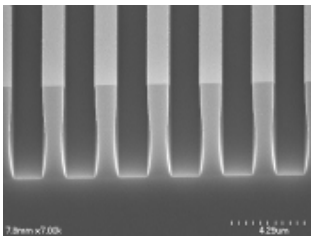
Linearity @ 380mJ/cm^2



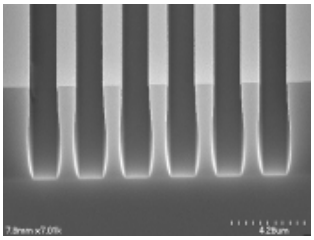
3.0µm



2.0µm

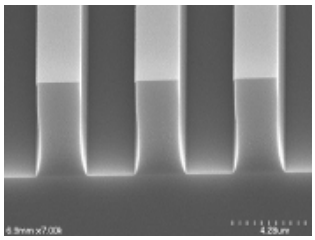


1.6µm

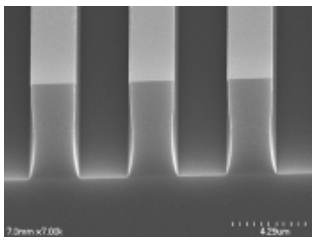


1.4µm

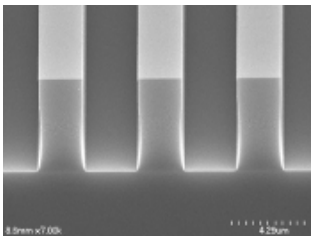
3.0µm Lines Through Dose



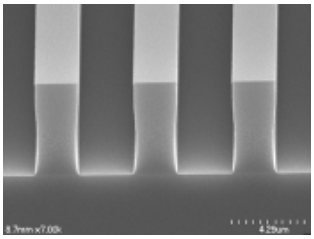
335 mJ/cm^2



365 mJ/cm^2

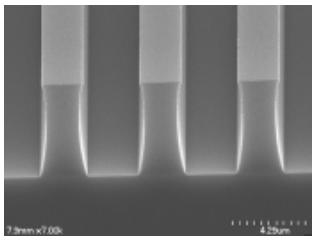


395 mJ/cm^2

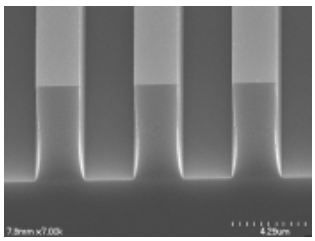


425 mJ/cm^2

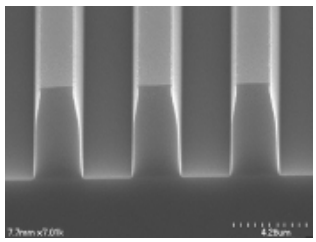
3.0µm Lines DoF @ 380mJ/cm^2



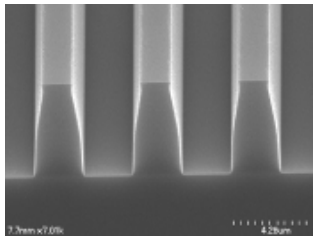
-1.5µm



0.0µm



1.0µm

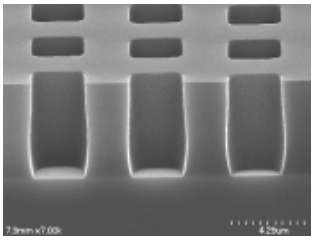
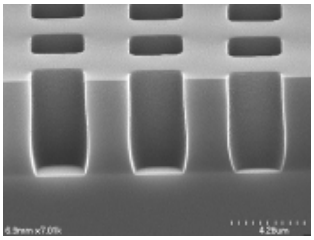
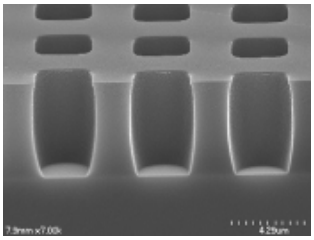
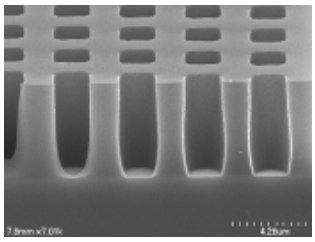
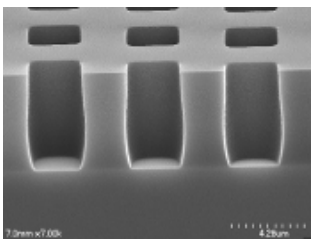
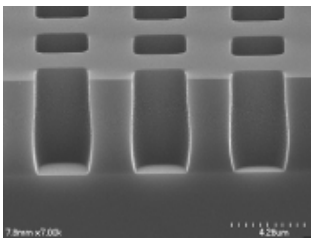
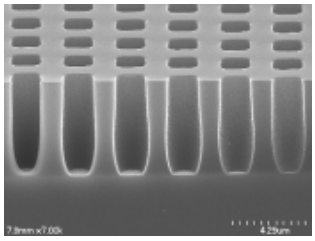
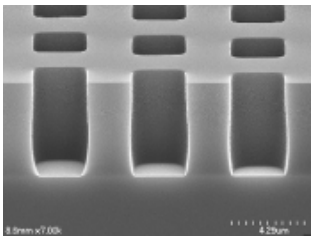
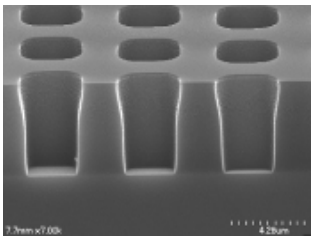
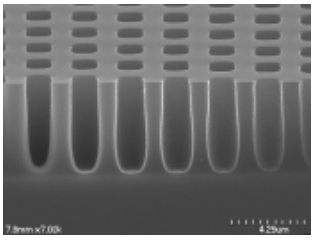
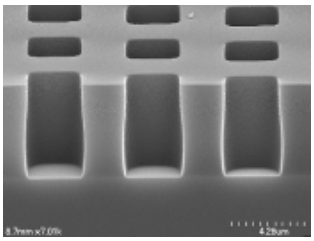
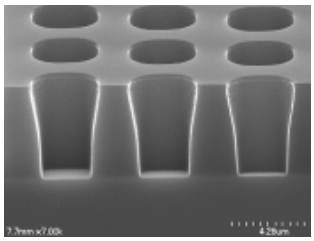


3.0µm

AZ® 10XT Series

REFERENCE PROCESS (Holes in 6.0µm Film Thickness on Si)

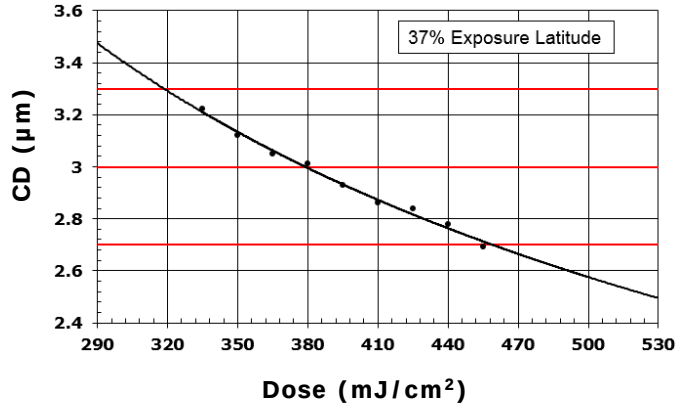
Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on bare Si
Soft Bake	110C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 380mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

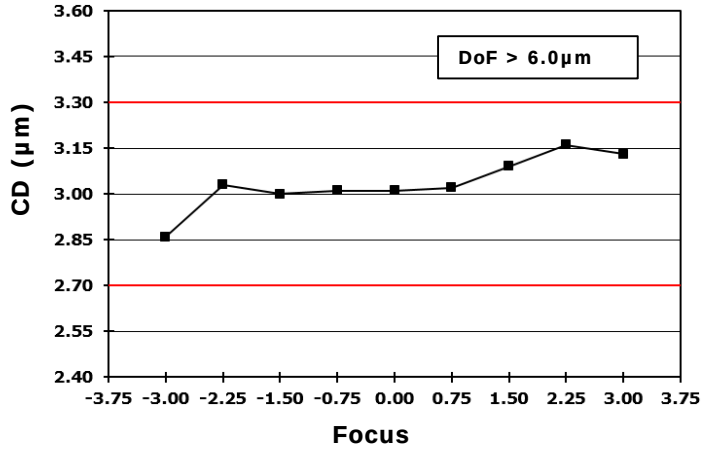
Linearity @ 380mJ/cm^2	3.0µm Holes Through Dose	3.0µm Holes DoF @ 380mJ/cm^2
 3.0µm	 335mJ/cm^2	 -1.5µm
 2.0µm	 365mJ/cm^2	 0.0µm
 1.6µm	 395mJ/cm^2	 1.5µm
 1.4µm	 425mJ/cm^2	 2.25µm

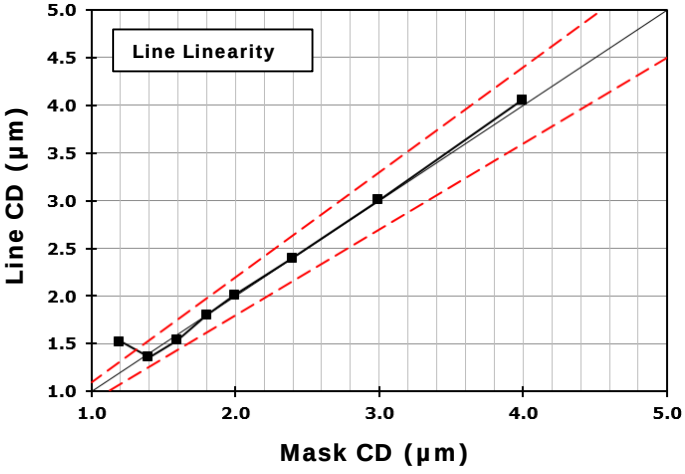
AZ® 10XT Series

PROCESS WINDOW CURVES for 6.0µm FILM THICKNESS @ 0.48NA on Si

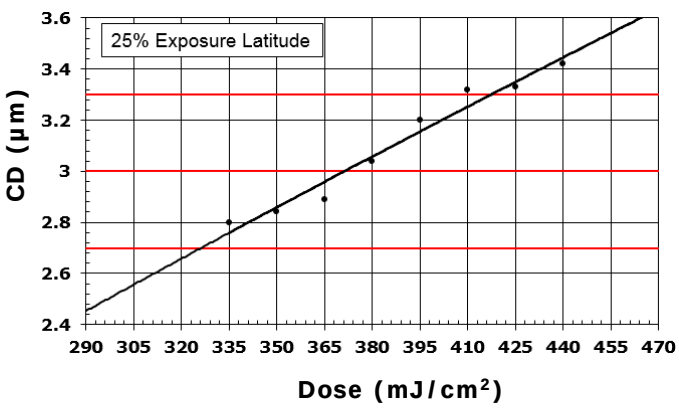
3.0µm Dense Lines on Si

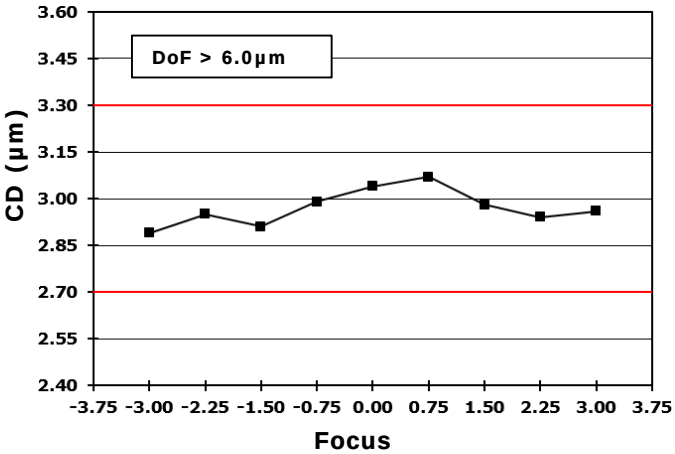


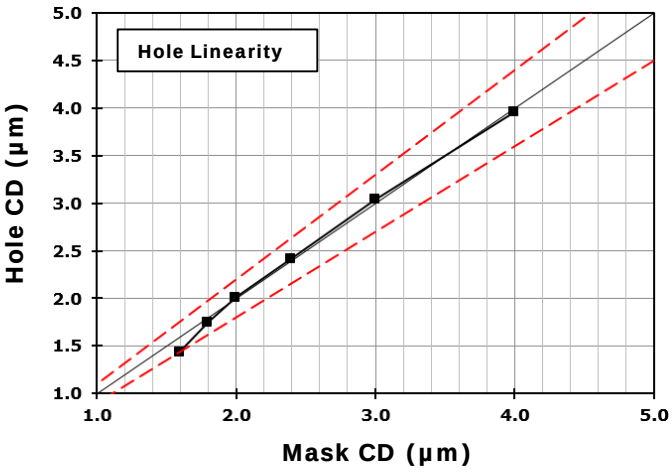




3.0µm 1:1 Holes on Si



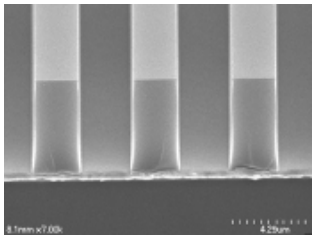
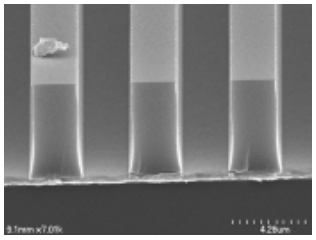
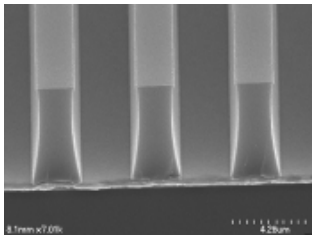
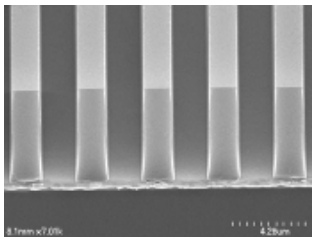
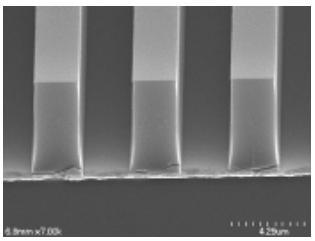
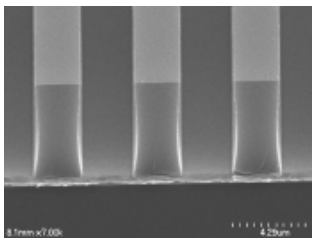
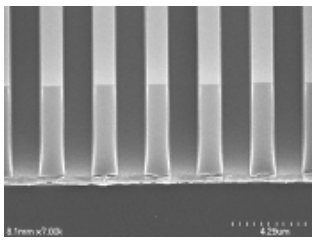
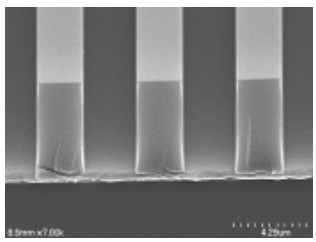
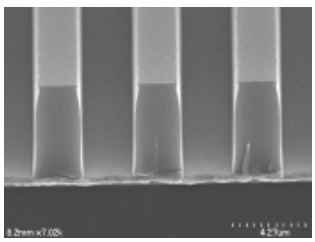
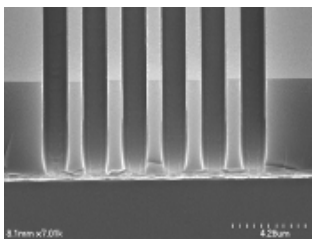
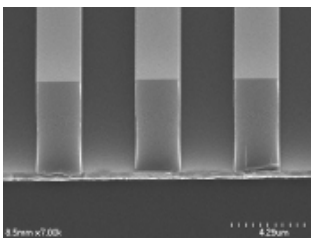
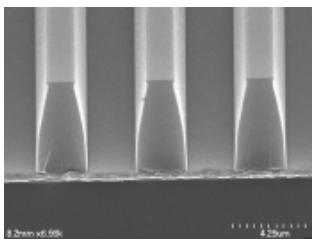




AZ® 10XT Series

REFERENCE PROCESS (Dense Lines in 6µm Film Thickness on Cu)

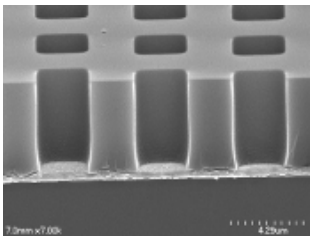
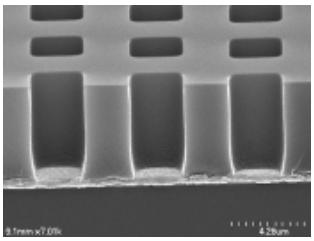
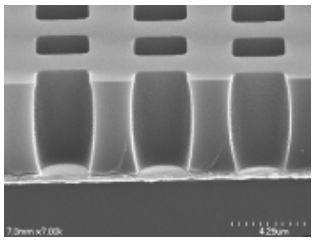
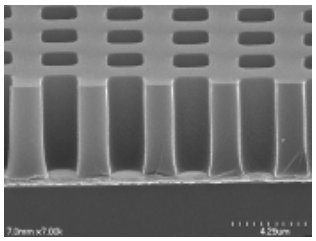
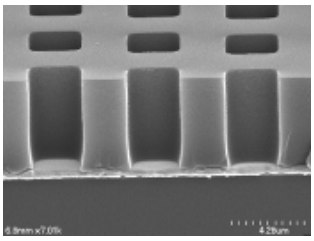
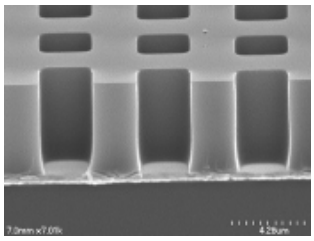
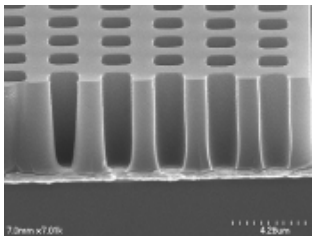
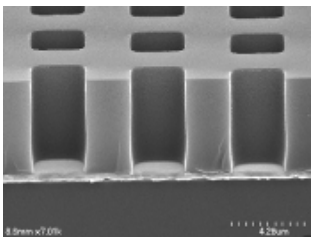
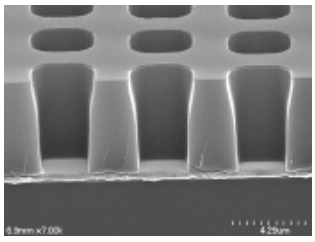
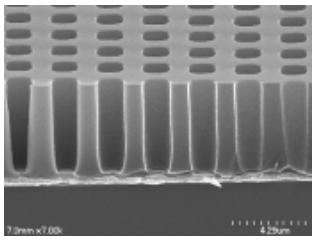
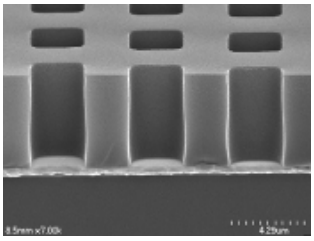
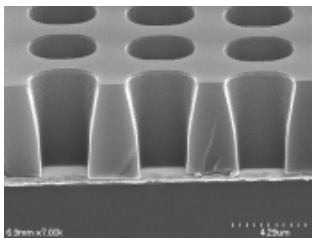
Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on Copper
Soft Bake	110C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 455mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

Linearity @ 450mJ/cm^2	3.0µm Lines Through Dose	3.0µm Lines DoF @ 450mJ/cm^2
 3.0µm	 410 mJ/cm^2	 -2.25µm
 2.0µm	 440 mJ/cm^2	 -0.75µm
 1.6µm	 470 mJ/cm^2	 0.75µm
 1.4µm	 500 mJ/cm^2	 2.25µm

AZ® 10XT Series

REFERENCE PROCESS (Holes in 6.0µm Film Thickness on Cu)

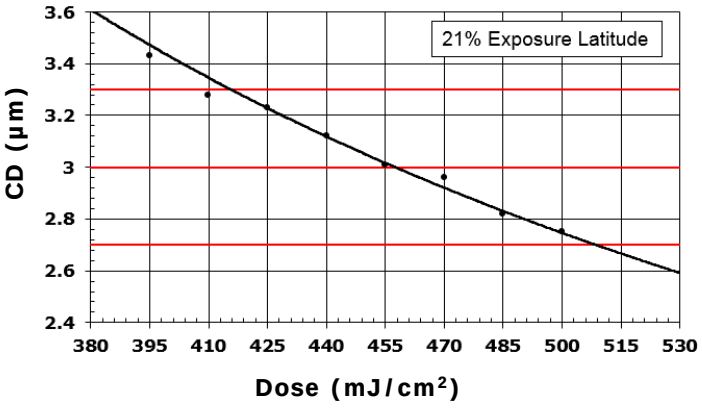
Process Step	Parameters
Coat	AZ 10XT 220cps, 6µm thick film on Copper
Soft Bake	110C, 120 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	i-line @ 445mJ/cm^2 nominal (0.48NA)
Post Expose Bake	None
Develop	AZ 400K 1:4, 420 second immersion

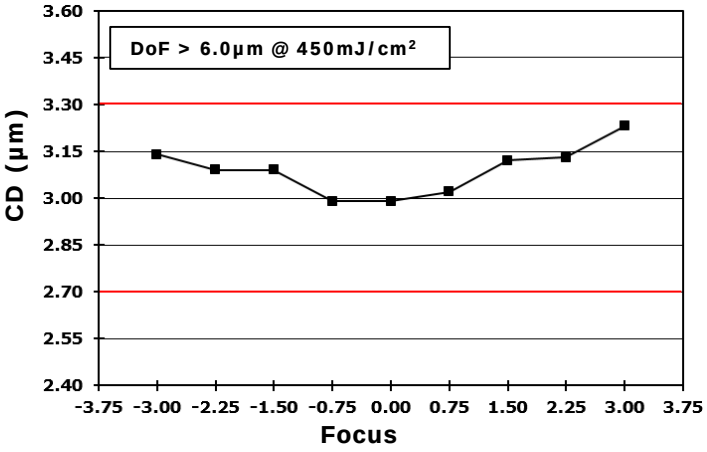
Linearity @ 440mJ/cm^2	3.0µm Holes Through Dose	3.0µm Holes DoF @ 440mJ/cm^2
 3.0µm	 410mJ/cm^2	 -1.5µm
 2.0µm	 440mJ/cm^2	 0.0µm
 1.6µm	 470mJ/cm^2	 1.5µm
 1.4µm	 500mJ/cm^2	 2.25µm

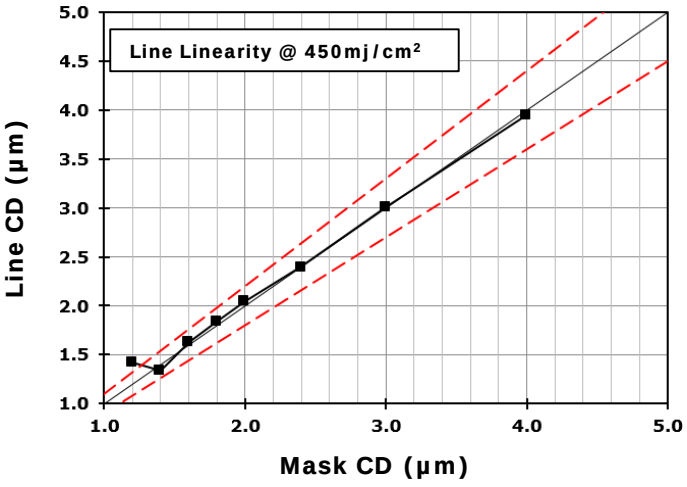
AZ® 10XT Series

PROCESS WINDOW CURVES for 6.0µm FILM THICKNESS @ 0.48NA on Cu

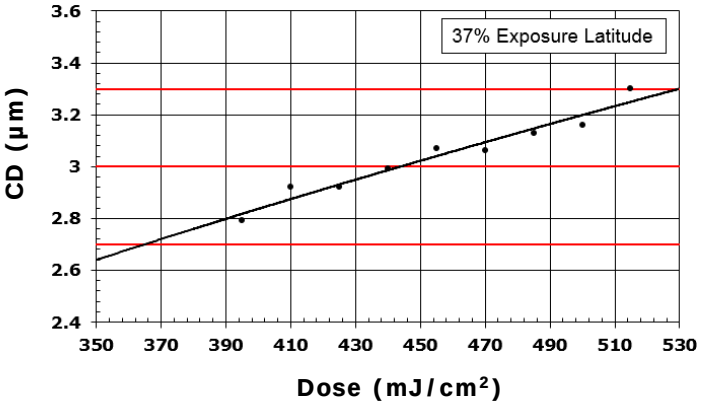
3.0µm Dense Lines on Cu

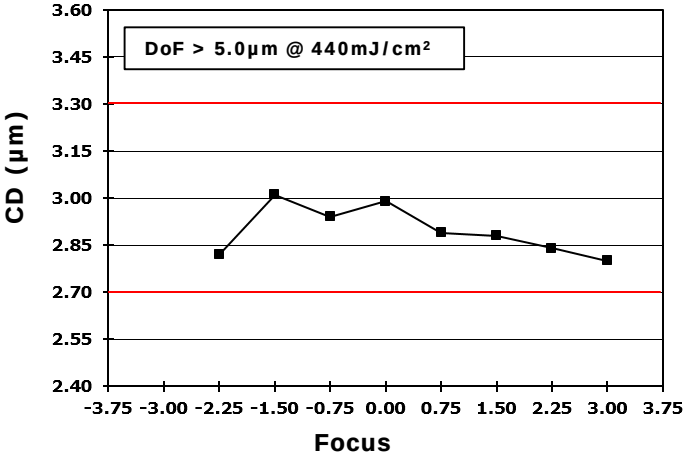


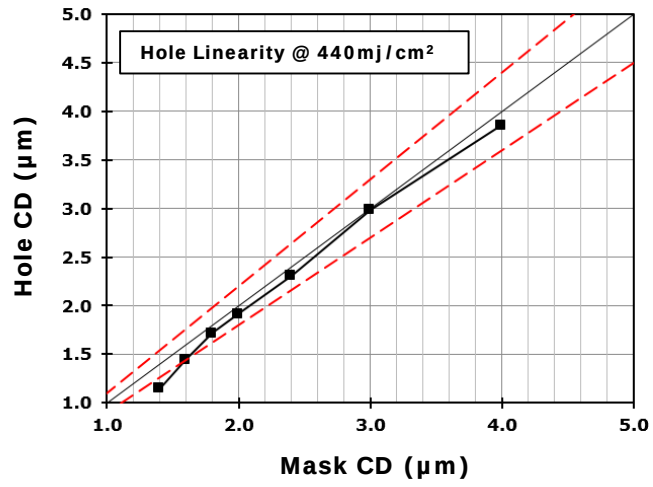




3.0µm 1:1 Holes on Cu



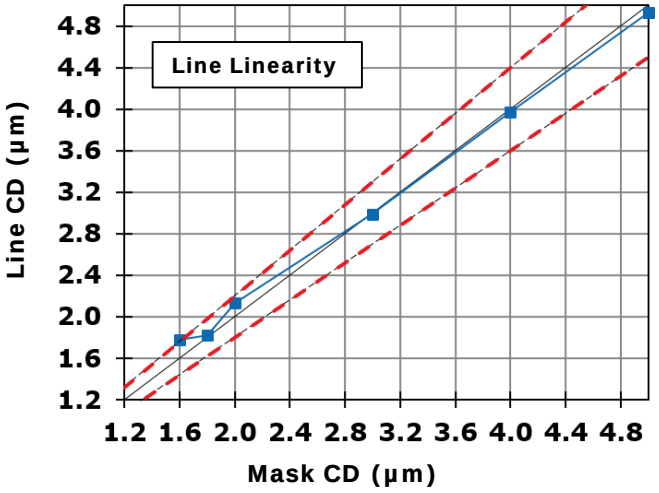


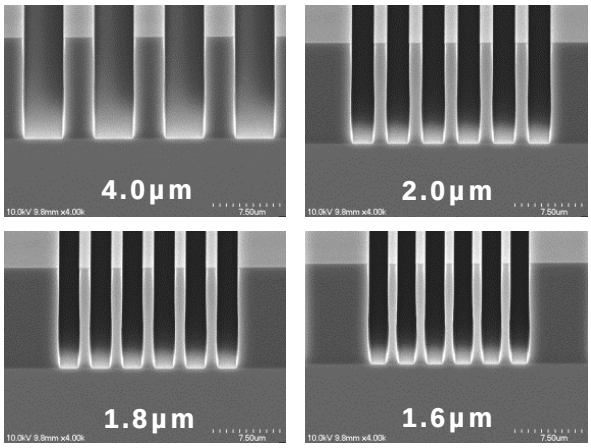


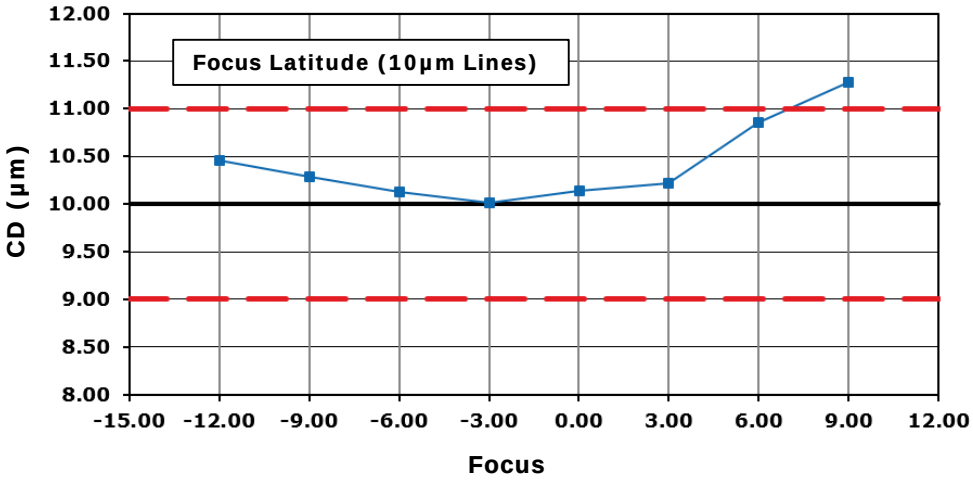
AZ® 10XT Series

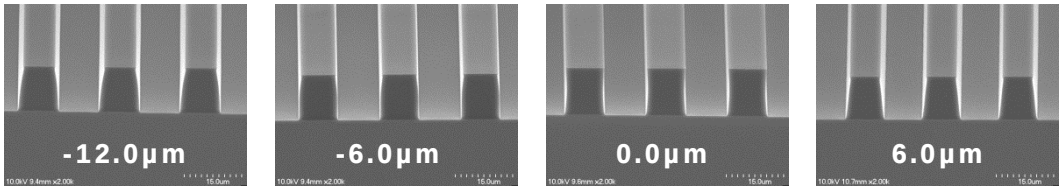
REFERENCE PROCESS (Lines in 12µm Film Thickness on Si)

Process Step	Parameters
Coat	AZ 10XT 520cps, 12µm thick film on Si
Soft Bake	110C, 180 seconds, direct contact hotplate
Post Bake Delay	30 Minutes
Expose	Ultratech 1500 g-h line stepper
Post Expose Bake	None
Develop	AZ 400K 1:4, 260 second spray





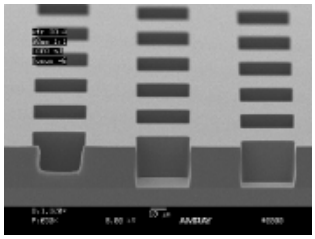




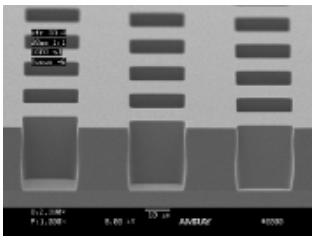
AZ® 10XT Series

REFERENCE PROCESS (24µm Film Thickness on Si)

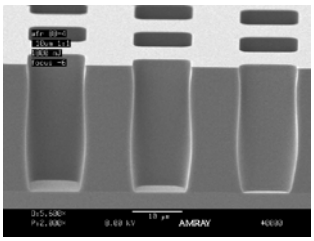
Process Step	Parameters
Coat	AZ 10XT 520cps, 2 x 12µm thick double coat
Soft Bake	110C-80s (first layer), 115C-180s (second layer)
Post Bake Delay	45 Minutes
Expose	Ultratech 1500 g-h line stepper and Suss MA200 Aligner (20µm gap)
Post Expose Bake	None
Develop	AZ 400K 1:4 and AZ 300MIF



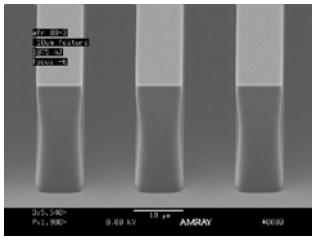
30µm Holes



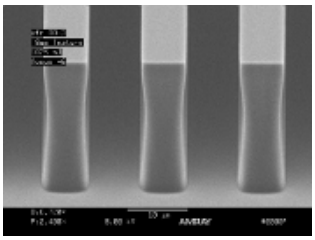
20µm Holes



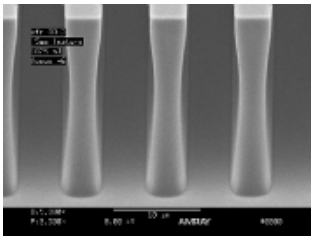
10µm Holes



10µm Lines

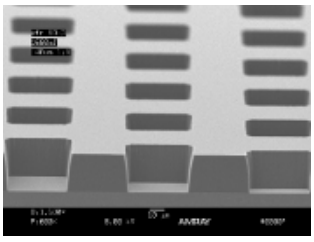


8.0µm Lines

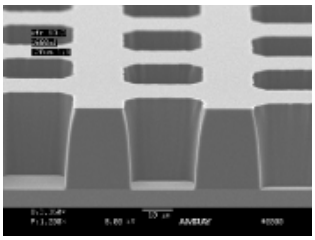


5.0µm Lines

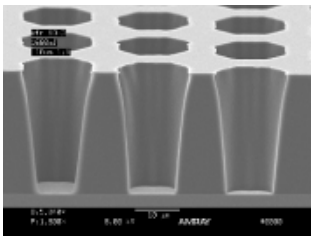
Expose: Ultratech 1500
Dose: 1875 mJ/cm²
Develop: AZ 400K 1:4 600s



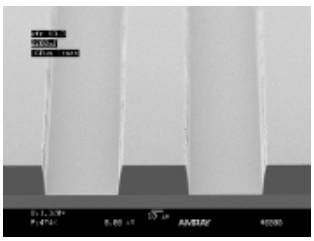
40µm Holes



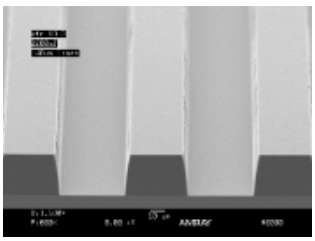
20µm Holes



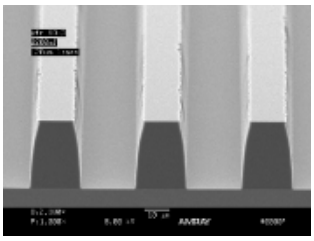
10µm Holes



60µm Lines



40µm Lines

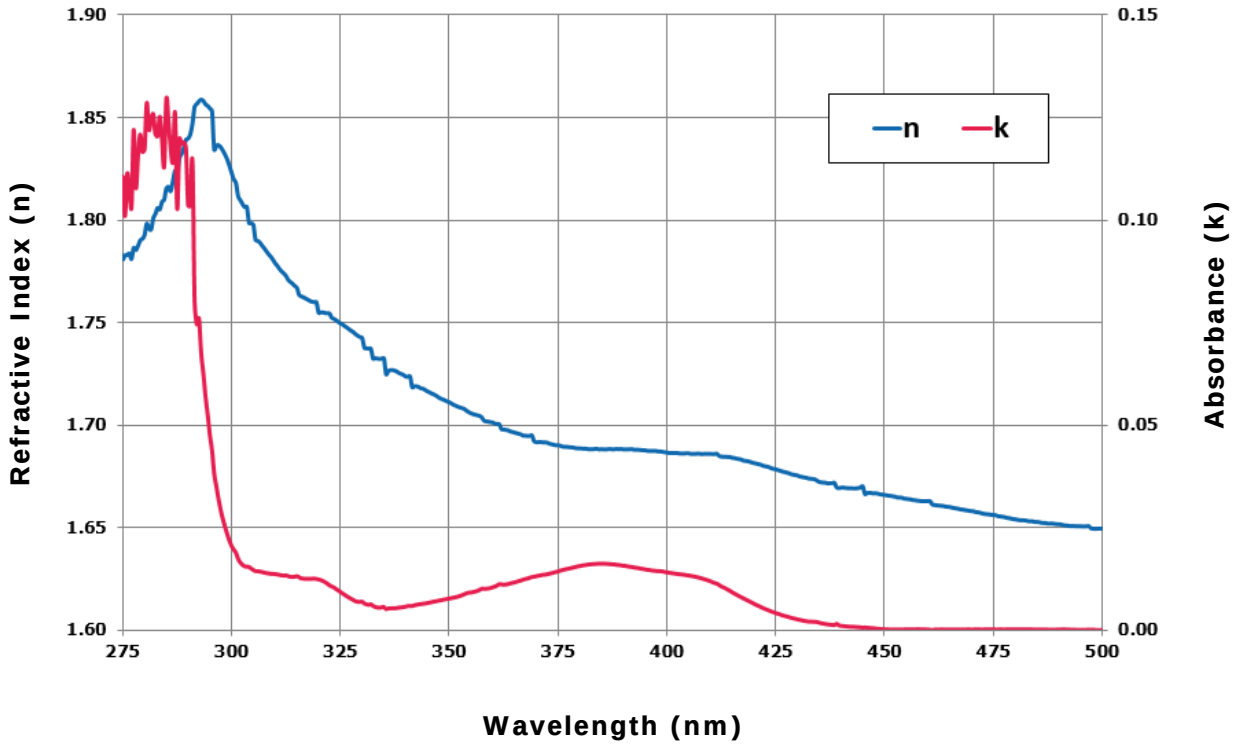


20µm Lines

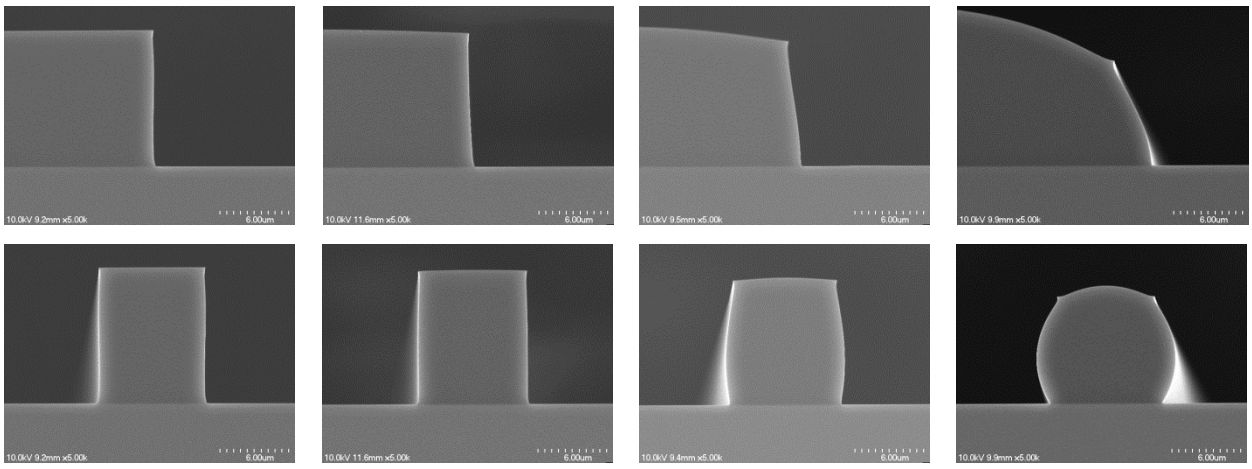
Expose: Suss MA 200
Dose: 1785 mJ/cm²
Develop: AZ 300 MIF 720s

AZ® 10XT Series

DISPERSION CHARACTERISTICS (Unexposed Film)



THERMAL FLOW CHARACTERISTICS (Large pad and 10µm Line)



No Bake | 90° C | 100° C | 110° C

AZ® 10XT 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 10XT. Contact your AZ product representative for detailed information on pre-treating with HMDS.

COATING

Refer to spin curve graphs for general guidelines on setting spin speeds to achieve the desired film thickness. Note: Spin curve graphs assume coat programs that spin 10XT films to equilibrium. Thicker coats may be achieved by reducing the spin time and allowing films to “self level”. Consult with your AZ products representative for more information on ultra-thick coating techniques.

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 10XT should be in the 95-110C range. For very thick films, ramped soft bake temperatures may be required in order to avoid bubbles formed by rapid outgassing of solvents.

FILM REHYDRATION

A rehydration delay of 30-60minutes between soft bake and exposure is required for films >5.0µm thick. Delay time required will vary with film thickness and ambient humidity.

EXPOSURE

AZ 10XT is sensitive to exposure energy in the 365-435nm wavelength range.

POST EXPOSE BAKE

A PEB is optional for AZ 10XT.

DEVELOPING

AZ 10XT series photoresists are compatible with MIF (TMAH) or inorganic developers. AZ 435MIF and AZ 400K 1:3 or AZ 400K 1:4 are recommended. Higher normality (less dilute) developers will improve photospeed but may increase CD non-uniformity and dark film loss.

HARD BAKE

Hard baking (post develop baking) improves adhesion in wet etch or plating applications and improves pattern stability in dry etch processes. Hard bake temperatures should be in the 90 to 100C range to ensure minimal thermal distortion of the pattern.

STRIPPING

AZ 10XT Series resists are compatible with industry standard solvent based removers. AZ Kwik Strip, AZ 300T, or AZ 400T is recommended.

AZ® 10XT Series

COMPATIBLE MATERIALS

AZ 10XT 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 10XT 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 10XT 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 10XT is compatible with drain lines handling similar organic solvent based materials.

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