Technical datasheet

AZ® 15nXT Series

Negative Tone i-line Photoresists

APPLICATIONS

Fast, negative tone cross linking photoresists featuring extreme thermal stability, superb dry etch resistance, and superior high energy ion implant blocking power. Excellent stability in a wide variety of plating bath chemistries.

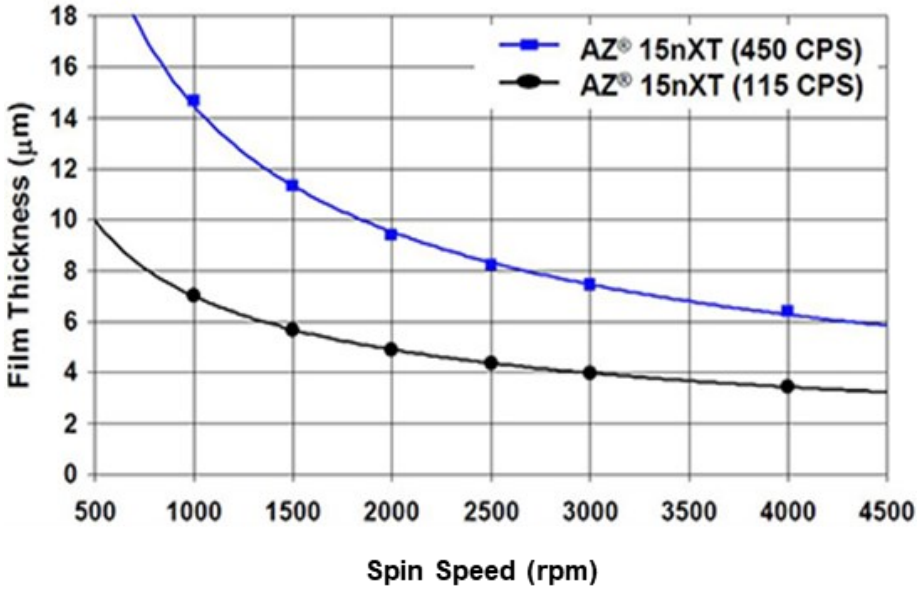
- Thermally stable to >200ºC
- Safer solvent (PGMEA)
- Single coat thicknesses from 4 to >15µm
- Excellent for Through Silicon Via (TSV) applications.

TYPICAL PROCESS

- Soft Bake: 110ºC
- Expose: 365nm sensitive
- Post Expose Bake*: 120ºC
- Develop: Puddle, spray or immersion
- Developer Type: MIF

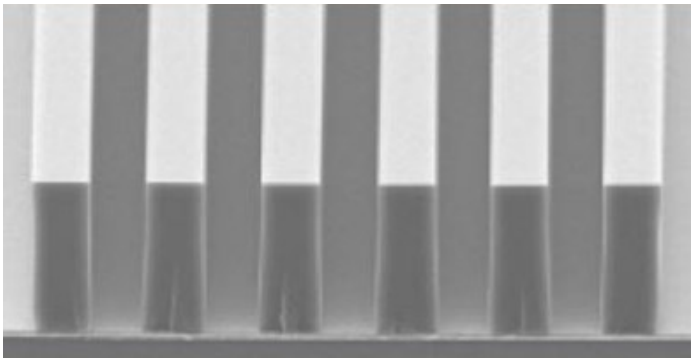
* PEB is required for proper imaging

SPIN CURVES (150MM SILICON)



OPTICAL CONSTANTS*

Cauchy A	1.5754
Cauchy B (μm^2)	0.013242
Cauchy C (μm^4)	0
n @ 633nm	1.6063
k @ 633nm	0.0034



4.0µm lines in 10µm thick AZ 15nXT
400mJ/cm^2 Exposure, AZ 300 MIF Develop

* Unexposed photoresist film

COMPANION PRODUCTS

THINNING/EDGE BEAD REMOVAL
AZ® EBR Solvent or AZ EBR 70/30

MIF DEVELOPERS
AZ 300MIF

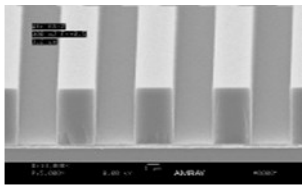
REMOVERS
AZ Remover 770

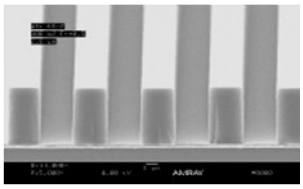
EXAMPLE PROCESS (6.0µM FILM THICKNESS ON CU)

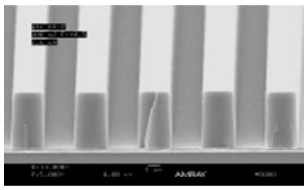
Process Step	Parameters
Coat	6.0µm thick film on Cu
Soft Bake	110°C, 120 seconds, direct contact hotplate*
Expose	i-line @ 300mJ/cm^2 nominal (ASML stepper)
Post Expose Bake	120°C, 60 seconds
Develop	AZ 300MIF, 2 x 55 second puddles

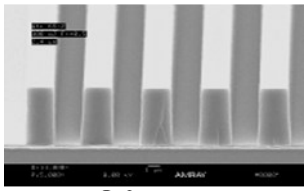
* Thicker films may require a ramped soft bake process to avoid bubble formation due to rapid outgassing of solvents. Contact your product representative for ultra-thick coat and bake processing guidelines.

LINEARITY @ 300MJ/CM^2

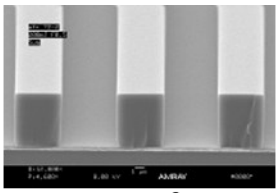

3.2µm

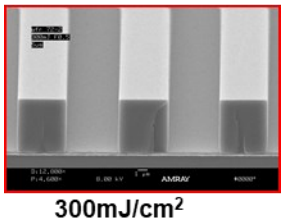

2.8µm

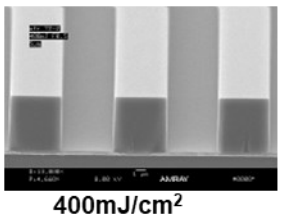

2.6µm

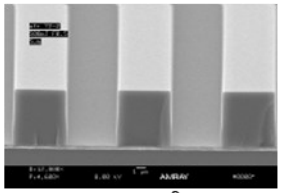

2.4µm

5µM LINES THROUGH DOSE

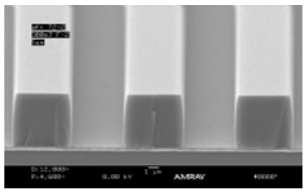

200mJ/cm^2

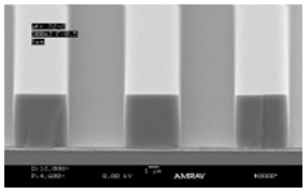

300mJ/cm^2

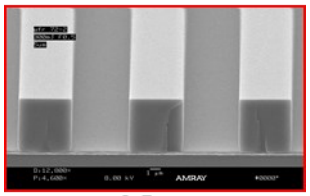

400mJ/cm^2

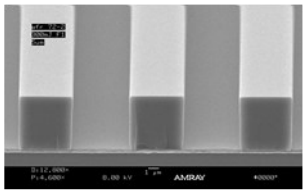

500mJ/cm^2

5µM LINES THROUGH FOCUS


-2.0 µm


-0.5 µm


+0.5 µm

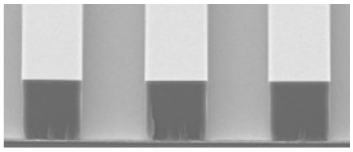

+1.0 µm

EXAMPLE PROCESS (10µM FILM THICKNESS ON CU)

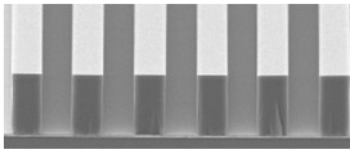
Process Step	Parameters
Coat	10µm thick film on Cu
Soft Bake	110°C, 180 seconds, direct contact hotplate*
Expose	i-line @ 400mJ/cm^2 nominal (ASML stepper)
Post Expose Bake	120°C, 60 seconds
Develop	AZ 300MIF, 3 x 50 second puddles

* Thicker films may require a ramped soft bake process to avoid bubble formation due to rapid outgassing of solvents. Contact your product representative for ultra-thick coat and bake processing guidelines.

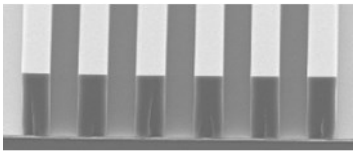
LINEARITY (400MJ/CM^2)



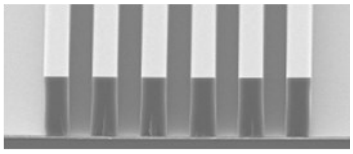
10µm



5µm

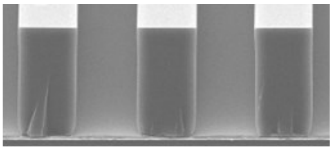


4.5µm

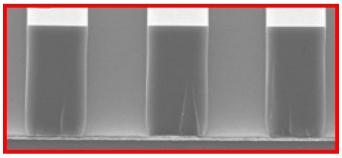


4.0µm

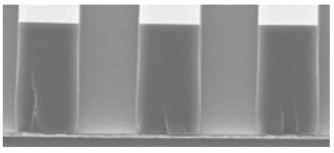
5µM LINES THROUGH DOSE



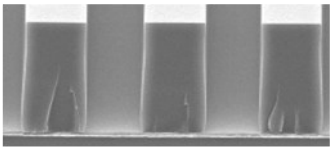
350mJ/cm^2



400mJ/cm^2

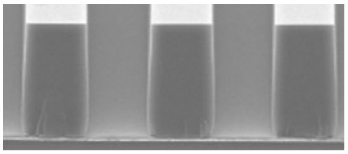


450mJ/cm^2

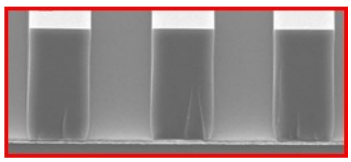


500mJ/cm^2

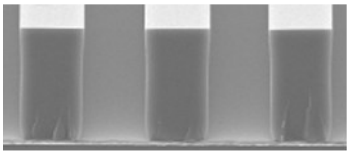
5µM LINES THROUGH FOCUS



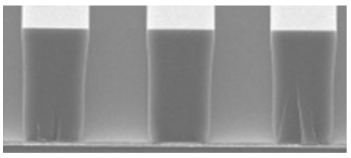
0.0 µm



1.0 µm



1.5 µm

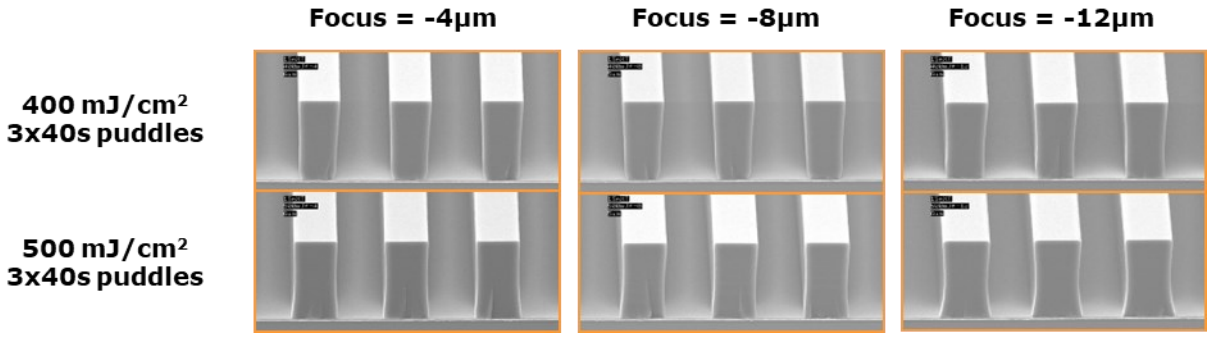


2.5 µm

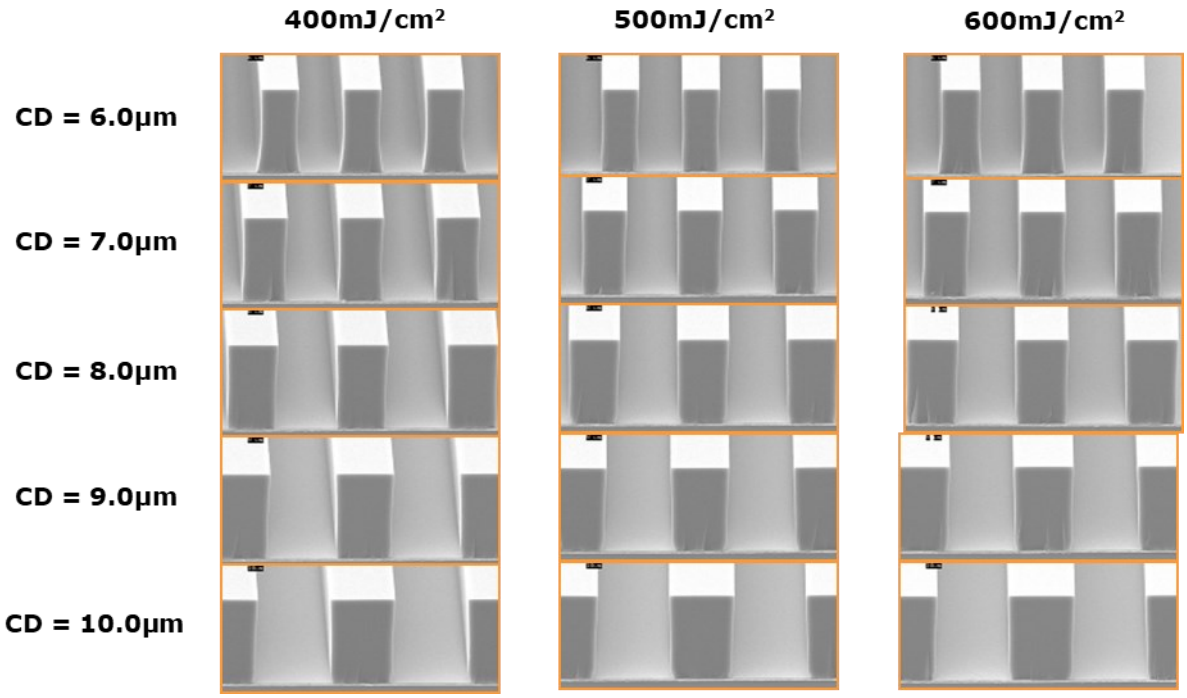
EXAMPLE PROCESS (14µM FILM THICKNESS ON CU)

Process Step	Parameters
Coat	14.0µm thick film on Cu substrate
Soft Bake	120°C, 180 seconds, direct contact hotplate
Expose	i-line @ 400-600mJ/cm^2 (Ultratech ACS 300 stepper)
Post Expose Bake	120°C, 60 seconds
Develop	AZ 300MIF, 3 x 40s puddles

6.0 µM DENSE LINES

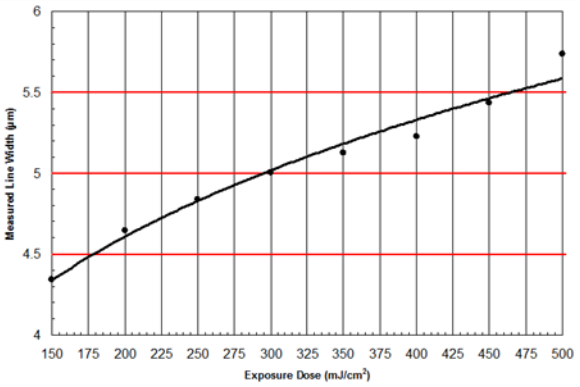


DENSE LINES @ FOCUS = -8µM

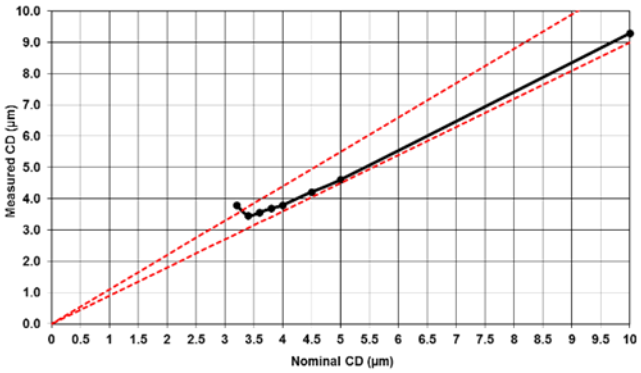


CHARACTERISTIC PROCESS CURVES

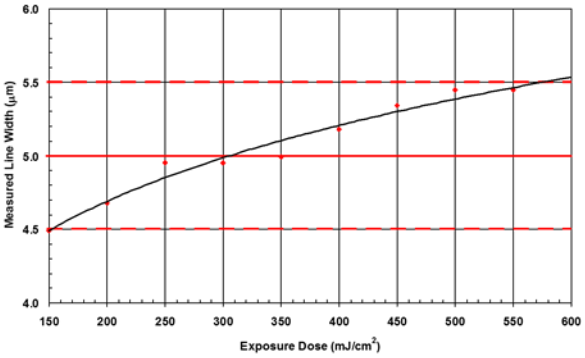
Exposure Latitude for 5.0µm lines
AZ 15nXT at FT = 10µm



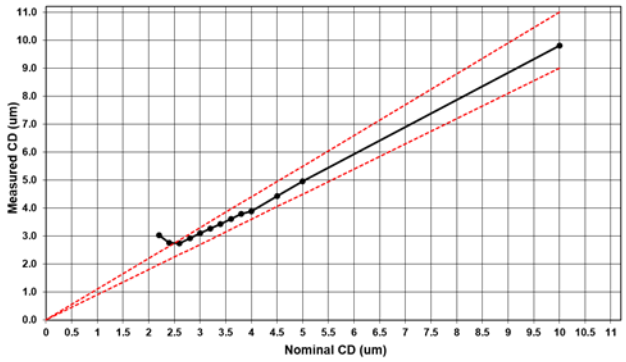
Linearity @ 300mj/cm^2
AZ 15nXT at FT = 10µm



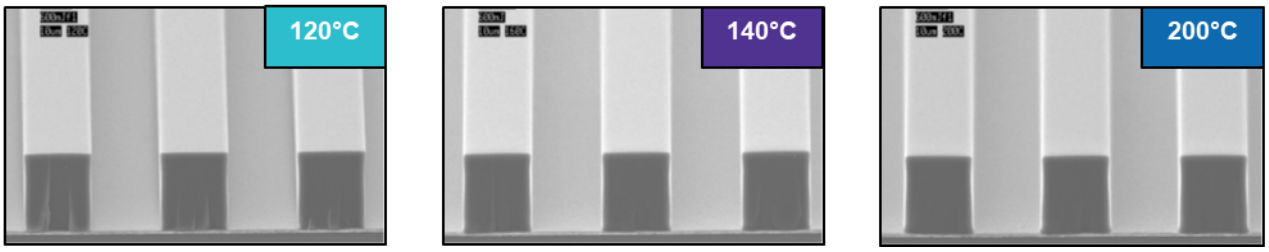
Exposure Latitude for 5.0µm lines
AZ 15nXT at FT = 6.0µm



Linearity @ 300mj/cm^2
AZ 15nXT at FT = 6µm



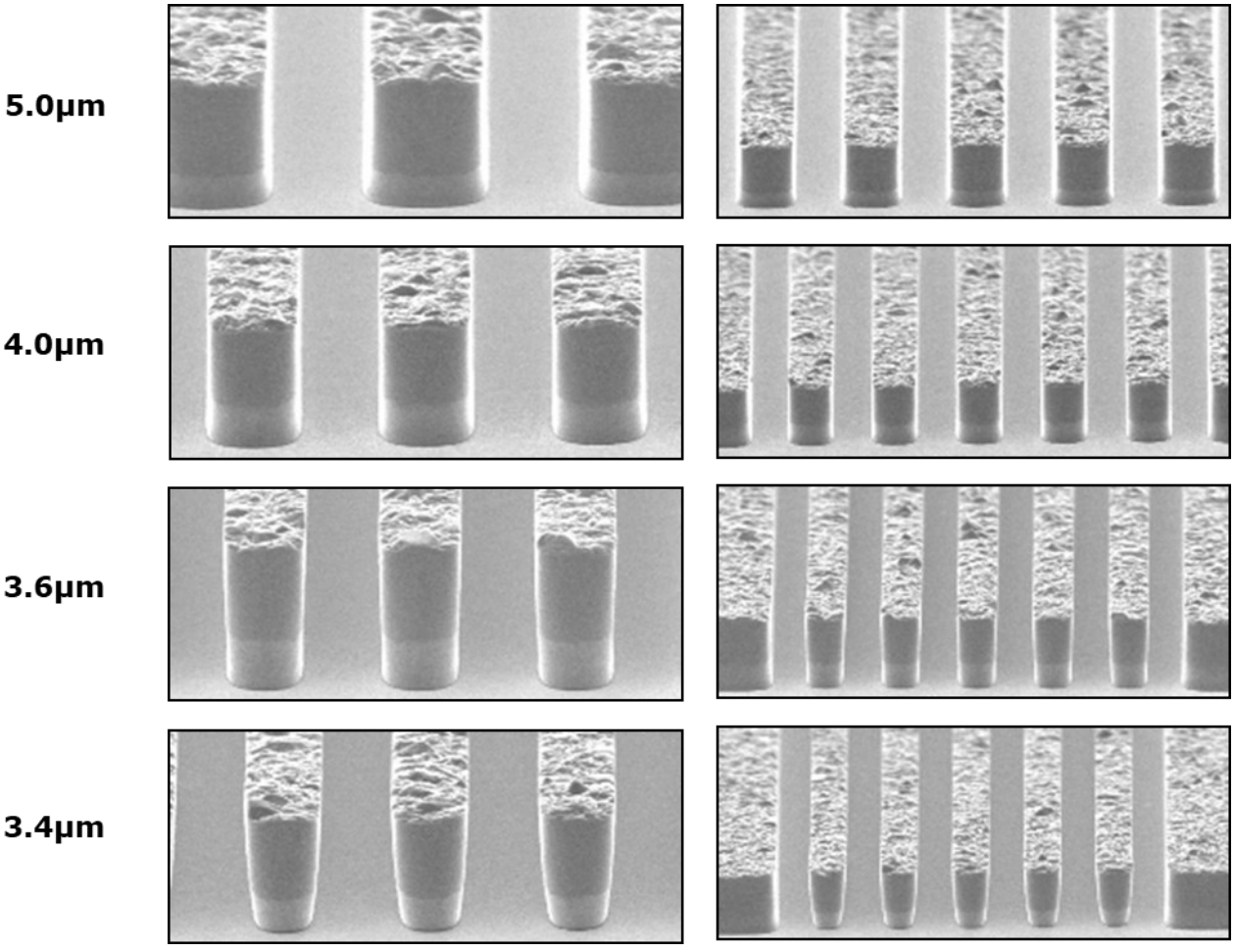
Thermal Stability of AZ 15nXT
(Pattern profile vs. Hard bake temperature: 10µm)



EXAMPLE PLATING PROCESS (NI/CU LINES IN 10µM THICK AZ 15NXT)

Process Parameter	Ni (Enthone Microfab Ni-100)	Cu (Enthone Microfab Cu 200)
Electrical Density	3.2 ASD	3.2 ASD
Plating Current	0.103A	0.103A
Stirring Rate	120 rpm	120 rpm
Temperature	50°C	25°C (room temp.)
Plating Time	3 min 12 sec	4 min 48 sec

RESULTS (DENSE LINES, POST PHOTORESIST STRIP)



PROCESS CONSIDERATIONS

SUBSTRATE PREPARATION
Substrates must be clean, dry, and free of organic residues. Oxide forming substrates (Si, etc.) should be primed with hexamethyldisilazane (HMDS) prior to coating AZ 15nXT. Contact your 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 stable lithographic and adhesion performance. Soft bake temperatures for AZ 15nXT should be in the 100°-115°C range. Temperatures towards the high end of this range will improve adhesion to metals.

EDGE BEAD REMOVAL
Edge beads in AZ 15nXT may be removed with standard thinning/EBR solvents (PGMEA, etc.). AZ EBR 70/30 is recommended for fast clean removal of edge beads.

FILM REHYDRATION
AZ 15nXT requires no rehydration hold between soft bake and exposure.

EXPOSURE
AZ 15nXT is optimized for the 365nm (i-line) exposure wavelength. Exposure systems must emit 365nm radiation for proper imaging.

POST EXPOSE BAKE
A PEB is required to complete the imaging reaction in AZ 15nXT. Refer to the example process recipes for recommended PEB temperature and time.

DEVELOPING
AZ 15nXT should be developed with metal ion free (MIF) developers only. AZ 300MIF Developer is recommended.

HARD BAKE
Hard baking (post develop bake) improves adhesion in wet etch or plating applications and improves pattern stability in dry etch processes. AZ 15nXT can be hard baked at temperatures as high as 200°C without pattern deformation.

COMPATIBLE MATERIALS
AZ 15nXT 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 15nXT Series materials are flammable liquids containing 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 15nXT is compatible with drain lines handling similar organic solvent based materials.

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