technical datasheet

AZ® nLOF™ 5510

Negative Tone Photoresist for Single Layer Lift-Off

APPLICATION

AZ® nLOF™ 5510 i-line photoresist is engineered to simplify the historically complex image reversal and multi-layer lift-off lithography processes. Ideal lift-off pattern profiles are achieved using a standard expose/post expose bake/develop process flow. These photoresists are very fast and printed features are thermally stable to >200°C.

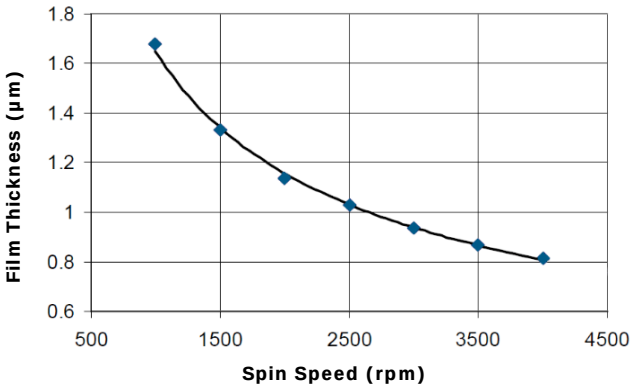
- Resolution to 0.25µm
- TMAH developer compatible
- May be processed with vertical sidewalls for RIE etching or implant layers

TYPICAL PROCESS

Soft Bake: 90ºC/60s
Rehydration Hold: None
Expose: 365nm sensitive
Post Expose Bake: 110ºC/60s*
Develop: Puddle, spray or immersion
Developer Type: MIF

* PEB is required for proper imaging

SPIN CURVE (150MM Silicon)



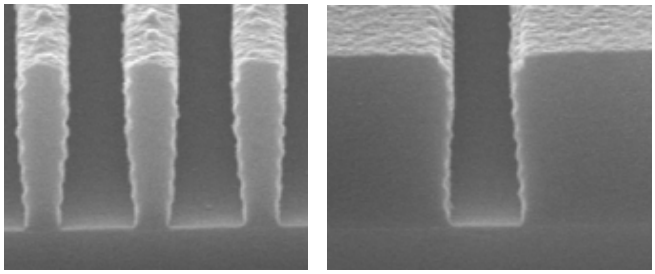
OPTICAL CONSTANTS*

Cauchy A	1.5724
Cauchy B (µm²)	0.00597
Cauchy C (µm⁴)	0.00093
n @ 633nm	1.5929
k @ 633nm	0

* Unexposed photoresist film

COMPANION PRODUCTS

Thinning/Edge Bead Removal
AZ® EBR Solvent or AZ® EBR 70/30
MIF Developers
AZ® 300MIF, AZ® 726MIF, AZ® 917MIF
Removers
AZ® 400T, AZ Remover 770



Lines at 0.30µm half pitch and 0.30µm iso trench
0.986µm thick AZ nLOF 5510
120mJ/cm² i-line Exposure
AZ 300 MIF Develop (60s)

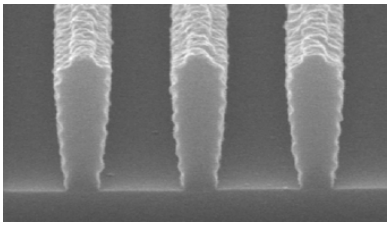
AZ® nLOF™ 5510 Photoresist

EXAMPLE PROCESS (Dense Lines in 0.986µm Film Thickness on Si)

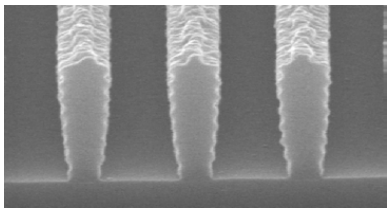
Process Step	Parameters
Prime	HMDS 140°C/60s (vapor)
Coat	0.986µm thick AZ nLOF 5510 on bare Si
Soft Bake	90C, 60 seconds, direct contact hotplate
Exposure	i-line @ 120mJ/cm²* nominal (0.60NA) ASML Stepper
Post Expose Bake	110C*, 60 seconds, direct contact hotplate
Develop	AZ 300MIF, 60s single puddle

* Pattern profiles can be modified by varying exposure dose and PEB temperature.

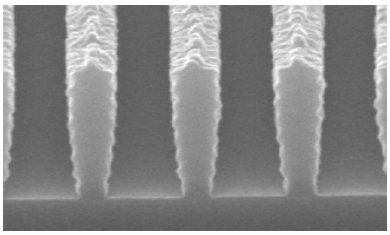
Resolution - Lines (½ pitch @120mJ/cm²)



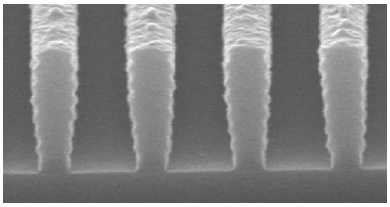
0.36µm



0.34µm

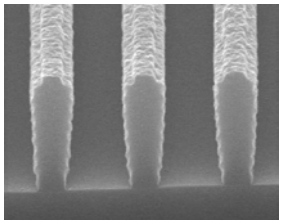


0.32µm

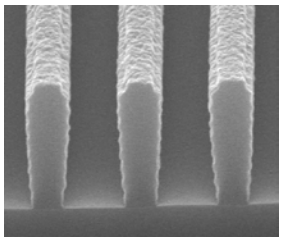


0.30µm

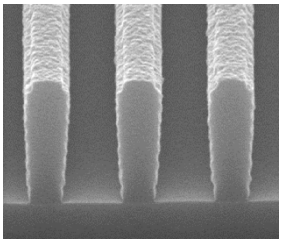
0.5µm Lines Through Dose



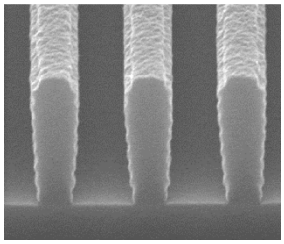
112mJ/cm²



120mJ/cm²

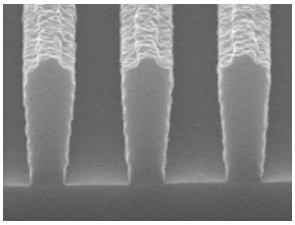


126mJ/cm²

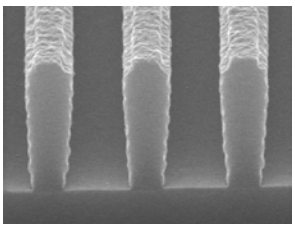


138mJ/cm²

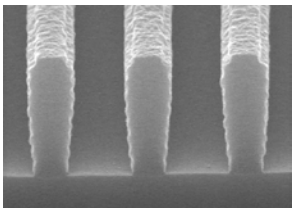
0.5µm Lines DoF @ 120mJ/cm²



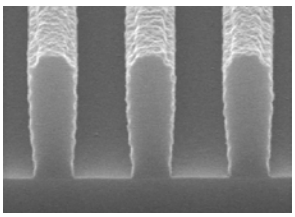
0.6µm



0.2µm



-0.2µm



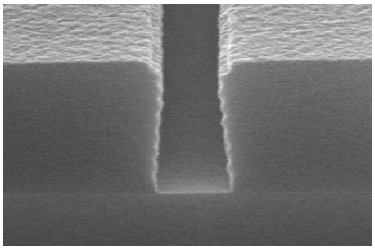
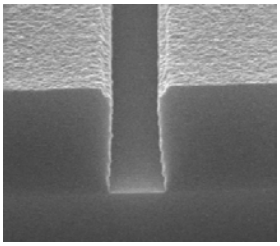
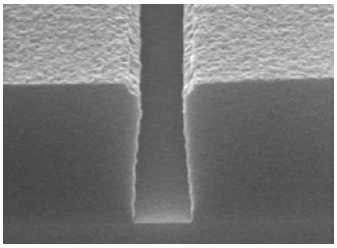
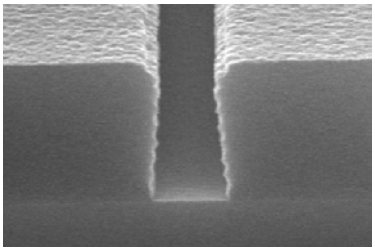
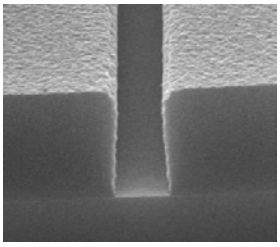
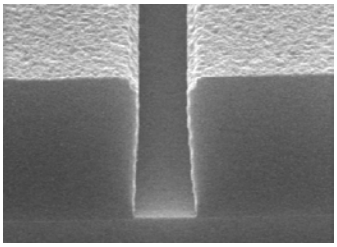
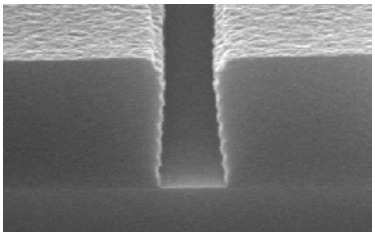
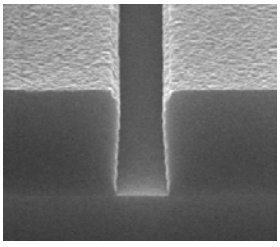
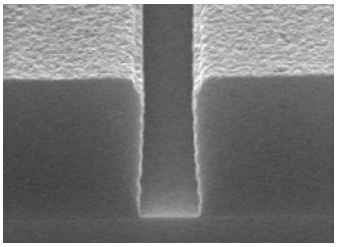
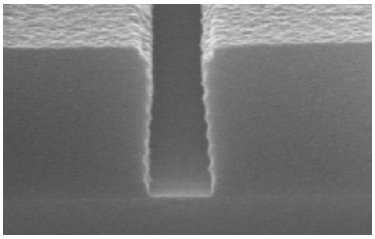
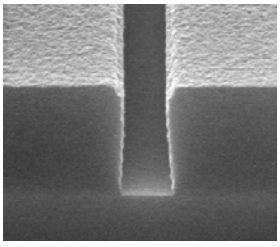
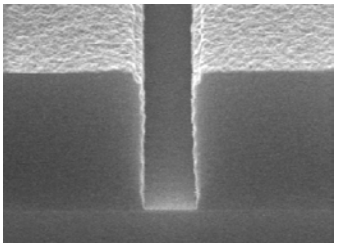
-0.8µm

AZ® nLOF™ 5510 Photoresist

EXAMPLE PROCESS (Iso Trenches in 0.986µm Film Thickness on Si)

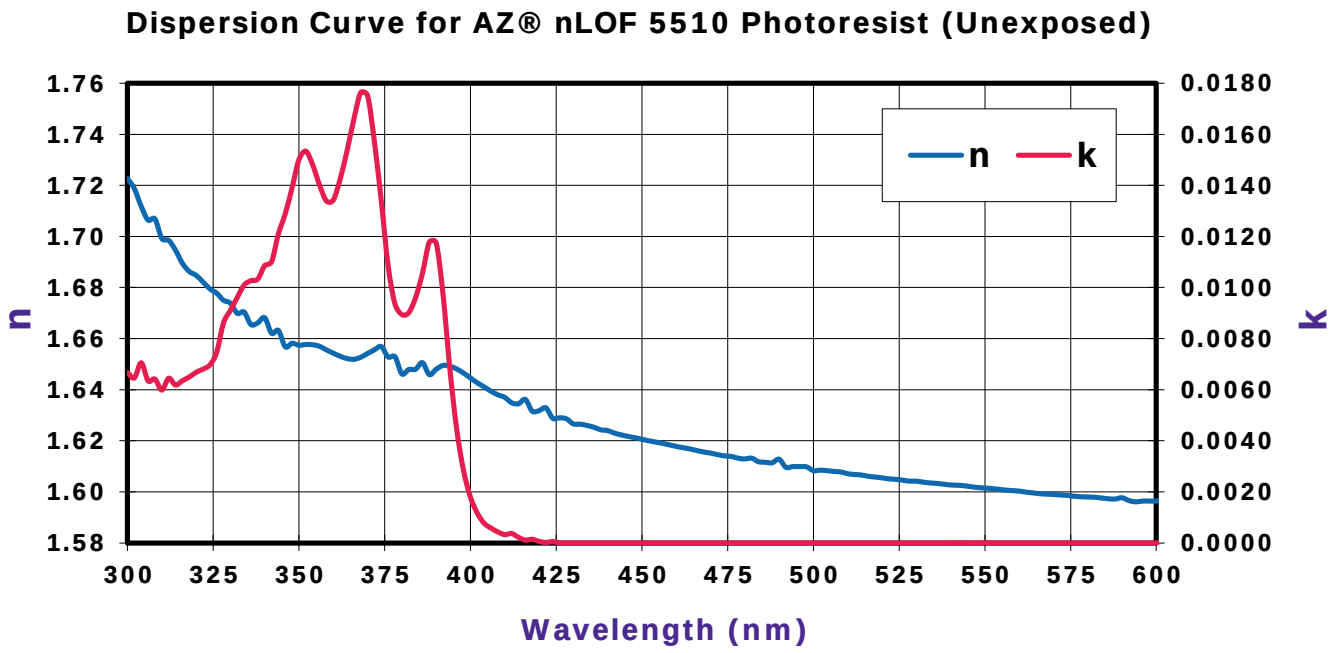
Process Step	Parameters
Prime	HMDS 140°C/60s (vapor)
Coat	0.986µm thick film AZ nLOF 5510 on bare Si
Soft Bake	90C, 60 seconds, direct contact hotplate
Exposure	i-line @ 120mJ/cm²* nominal (0.60NA) ASML Stepper
Post Expose Bake	110C*, 60 seconds, direct contact hotplate
Develop	AZ 300MIF, 60s single puddle

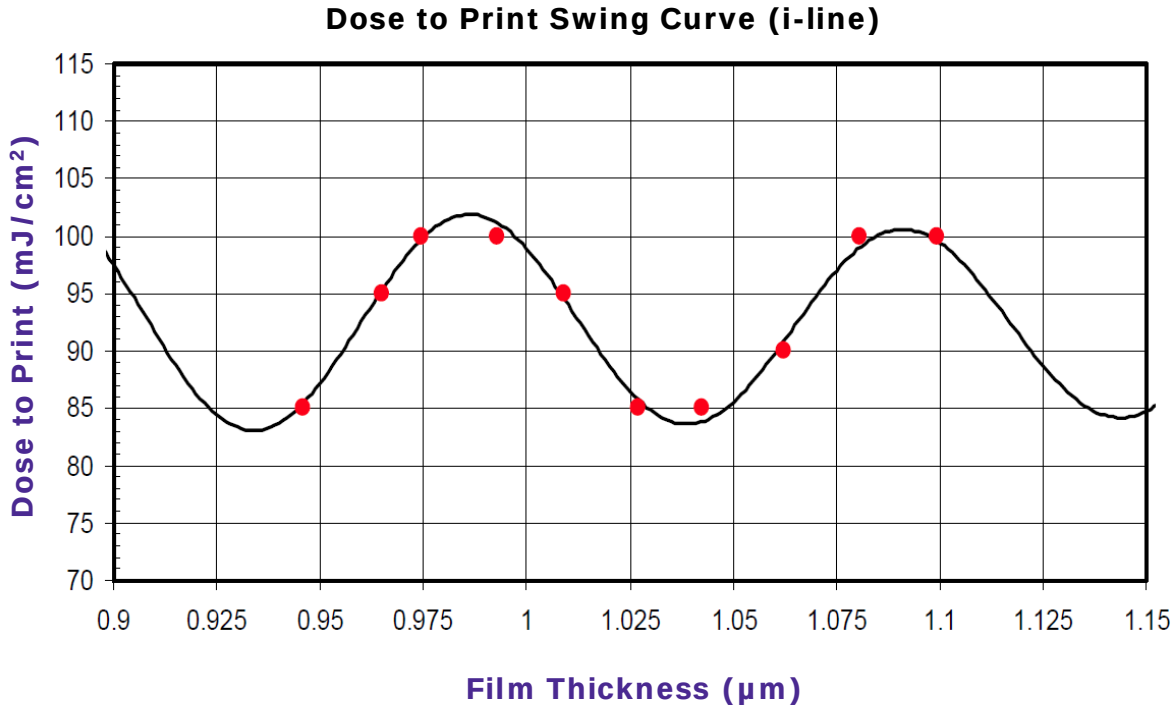
* Pattern profiles can be modified by varying exposure dose and PEB temperature.

Resolution - Trench (120mJ/cm²)	0.5µm Trench Through Dose	0.5µm Trench DoF @ 120mJ/cm²
 0.36µm	 112mJ/cm²	 0.6µm
 0.34µm	 120mJ/cm²	 0.2µm
 0.32µm	 126mJ/cm²	 -0.2µm
 0.30µm	 138mJ/cm²	 -0.8µm

AZ® nLOF™ 5510 Photoresist

OPTICAL PROPERTIES

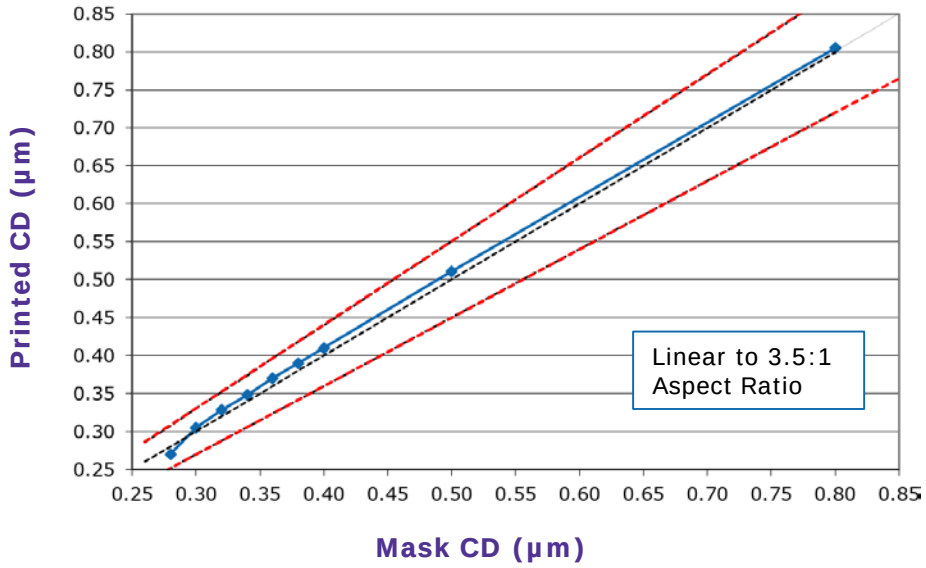




AZ® nLOF™ 5510 Photoresist

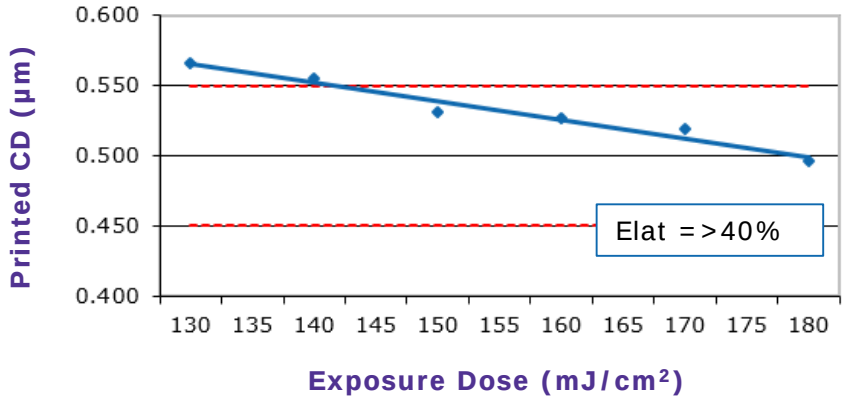
SAMPLE PROCESS WINDOWS on Si

LINEARITY (Iso Trenches) @ 180mJ/cm²



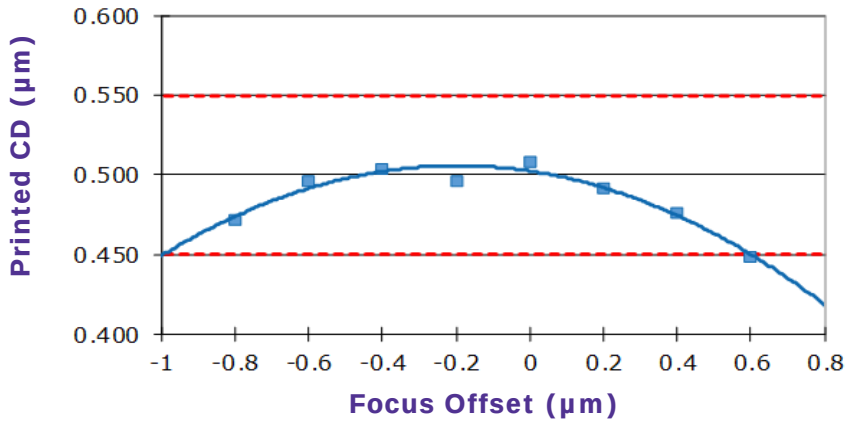
AZ nLOF 5510 @ FT=0.986µm
Soft Bake: 90C/60s
Expose: ASML Stepper @ 0.54NA
Post Expose Bake: 110C/60s
Develop: AZ 300MIF 120s

EXPOSURE LATITUDE (Iso Trenches) @ 180mJ/cm²



AZ nLOF 5510 @ FT=0.986µm
Soft Bake: 90C/60s
Expose: ASML Stepper @ 0.54NA
Post Expose Bake: 110C/60s
Develop: AZ 300MIF 120s

DEPTH of FOCUS (Iso Trenches) @ 180mJ/cm²



AZ nLOF 5510 @ FT=0.986µm
Soft Bake: 90C/60s
Expose: ASML Stepper @ 0.54NA
Post Expose Bake: 110C/60s
Develop: AZ 300MIF 120s

AZ® nLOF™ 5510 Photoresist

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 nLOF 5510. 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 nLOF 5510 should be in the 90-100C range. Delays between soft bake and exposure should be minimized for optimum performance.

EXPOSURE

AZ nLOF 5510 requires exposure energy at the 365nm wavelength.

POST EXPOSE BAKE

A PEB is required for proper imaging of AZ nLOF 5510. PEB temperatures and times may be application specific. As a general rule, PEB temperatures should be in the 105 to 115C range. As with any chemically amplified photoresist, CD's in nLOF 5510 will exhibit some dependency on PEB temperature.

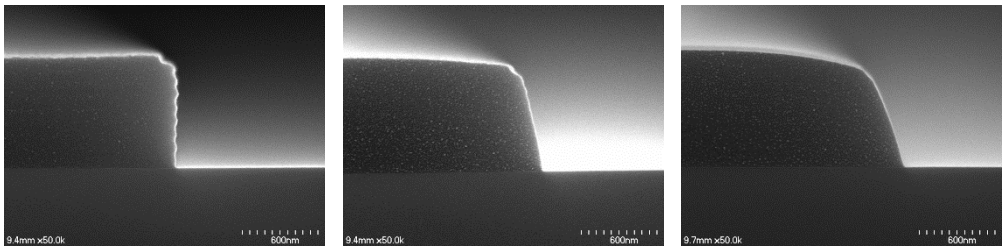
DEVELOPING

AZ nLOF 5510 photoresist is compatible with industry standard 0.26N (2.38%) TMAH developers. AZ 300MIF is recommended.

HARD BAKE

Hard baking (post develop bake) improves adhesion in wet etch or plating applications and improves pattern stability in dry etch or deposition chambers. AZ nLOF 5510 is extremely thermally stable and may be hard baked at temperatures up to 150C.

HARD BAKE STABILITY FOR LARGE PADS IN AZ nLOF 5510 (0.986µm Film Thickness)



No Hard Bake | 150C Hard Bake | 160C Hard Bake

STRIPPING

AZ nLOF 5510 photoresist is compatible with industry standard solvent based removers. AZ 400T or AZ Remover 770 is recommended.

AZ® nLOF™ 5510 Photoresist

COMPATIBLE MATERIALS

AZ nLOF 5510 photoresist 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 nLOF 5510 photoresist 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 nLOF 5510 photoresist 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 nLOF 5510 is compatible with drain lines handling similar organic solvent based materials.

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