

Technical datasheet

AZ[®] nLOF[™] 5510 Series

Negative Tone Photoresists 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.

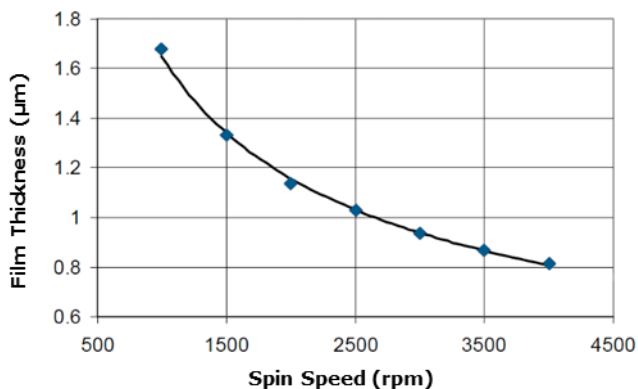
- Resolution to 0.25µm
- TMAH developer compatible
- May be processed with vertical sidewalls for RIE etching or implant layers

TYPICAL PROCESS

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

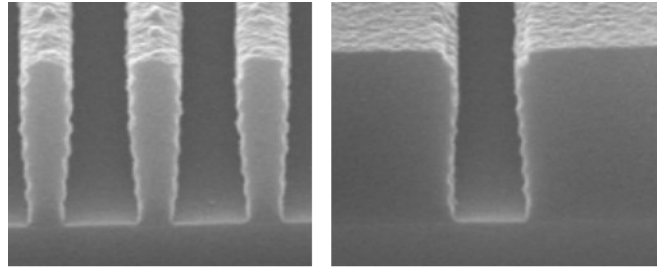
* PEB is required for proper imaging

SPIN CURVES (150mm Silicon)



OPTICAL CONSTANTS*

Cauchy A	1.5724
Cauchy B (μm^2)	0.00597
Cauchy C (μm^4)	0.00093
n @ 633nm	1.5929
k @ 633nm	0



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

* Unexposed photoresist film

COMPANION PRODUCTS

THINNING/EDGE BEAD REMOVAL

AZ EBR Solvent or AZ EBR 70/30

MIF DEVELOPERS

AZ 300MIF, 726MIF, AZ 917MIF

REMOVERS

AZ 400T, AZ Remover 770

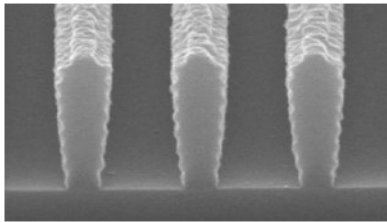


EXAMPLE PROCESS (Dense Lines in 0.986µm Film Thickness on Si)

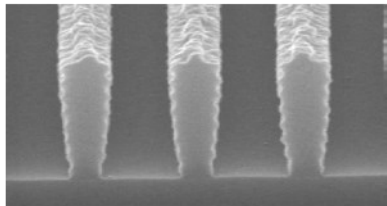
Process Step	Parameters
Prime	HMDS 140°C/60s (vapor)
Coat	0.986µm thick AZ nLOF 5510 on bare Si
Soft Bake	90°C, 60 seconds, direct contact hotplate
Exposure	i-line @ 120mJ/cm ² * nominal (0.60NA) ASML Stepper
Post Expose Bake	110°C*, 60 seconds, direct contact hotplate
Develop	AZ 300MIF, 60s single puddle

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

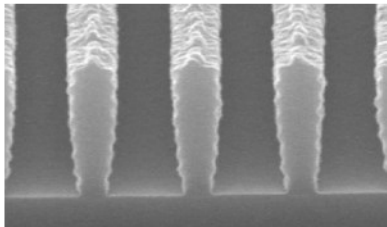
Resolution - Lines (½ pitch @120mJ/cm²)



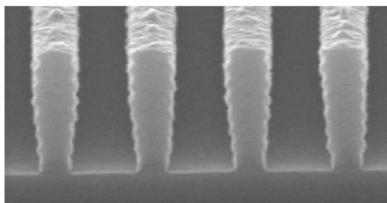
0.36µm



0.34µm

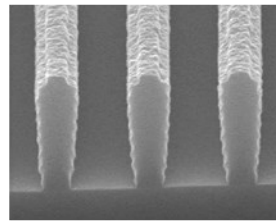


0.32µm

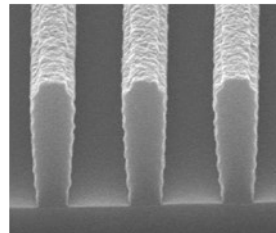


0.30µm

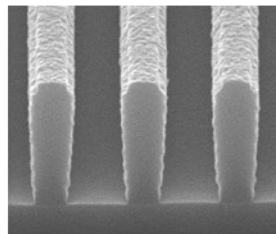
0.5µm Lines Through Dose



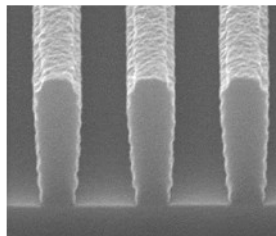
112mJ/cm²



120mJ/cm²

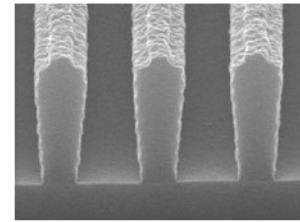


126mJ/cm²

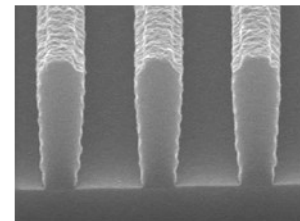


138mJ/cm²

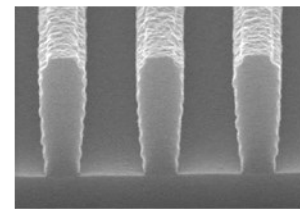
0.5µm Lines DoF @ 120mJ/cm²



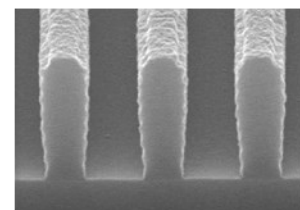
0.6µm



0.2µm



-0.2µm



-0.8µm

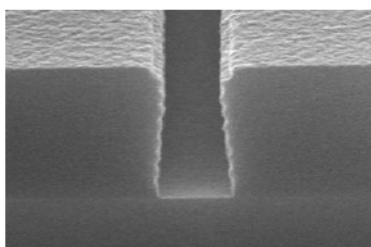


EXAMPLE PROCESS (Iso Trenches in 0.986 μm Film Thickness on Si)

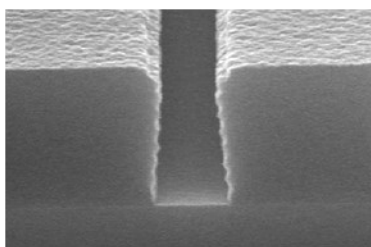
Process Step	Parameters
Prime	HMDS 140°C/60s (vapor)
Coat	0.986 μm thick film AZ nLOF 5510 on bare Si
Soft Bake	90°C, 60 seconds, direct contact hotplate
Exposure	i-line @ 120mJ/cm ² * nominal (0.60NA) ASML Stepper
Post Expose Bake	110°C*, 60 seconds, direct contact hotplate
Develop	AZ 300MIF, 60s single puddle

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

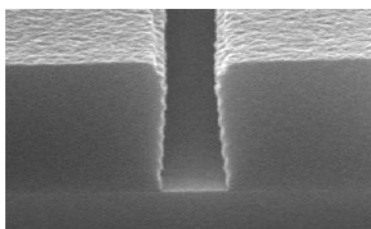
Resolution - Trench (120mJ/cm²)



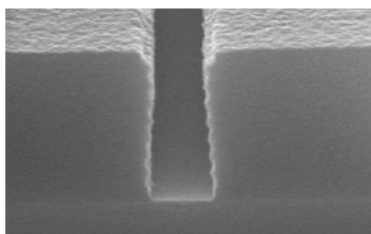
0.36 μm



0.34 μm

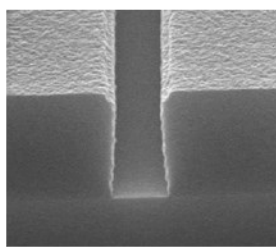


0.32 μm

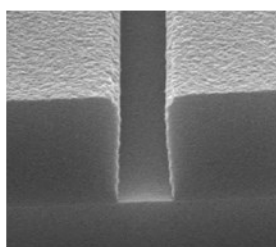


0.30 μm

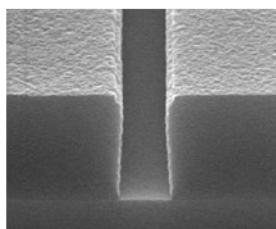
0.5 μm Trench Through Dose



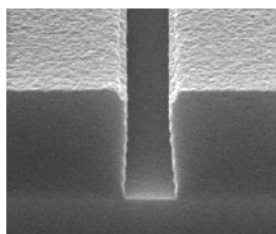
112mJ/cm²



120mJ/cm²

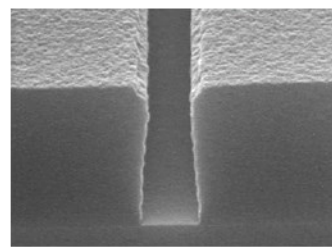


126mJ/cm²

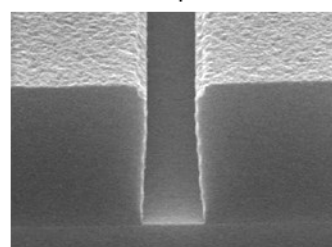


138mJ/cm²

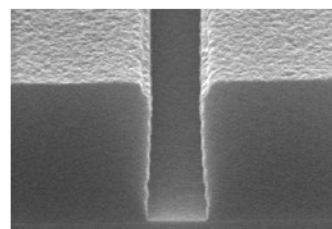
0.5 μm Trench DoF @ 120mJ/cm²



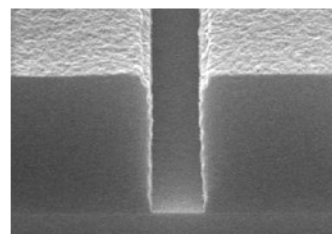
0.6 μm



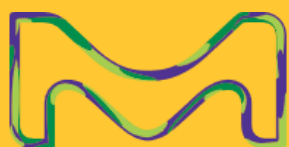
0.2 μm



-0.2 μm

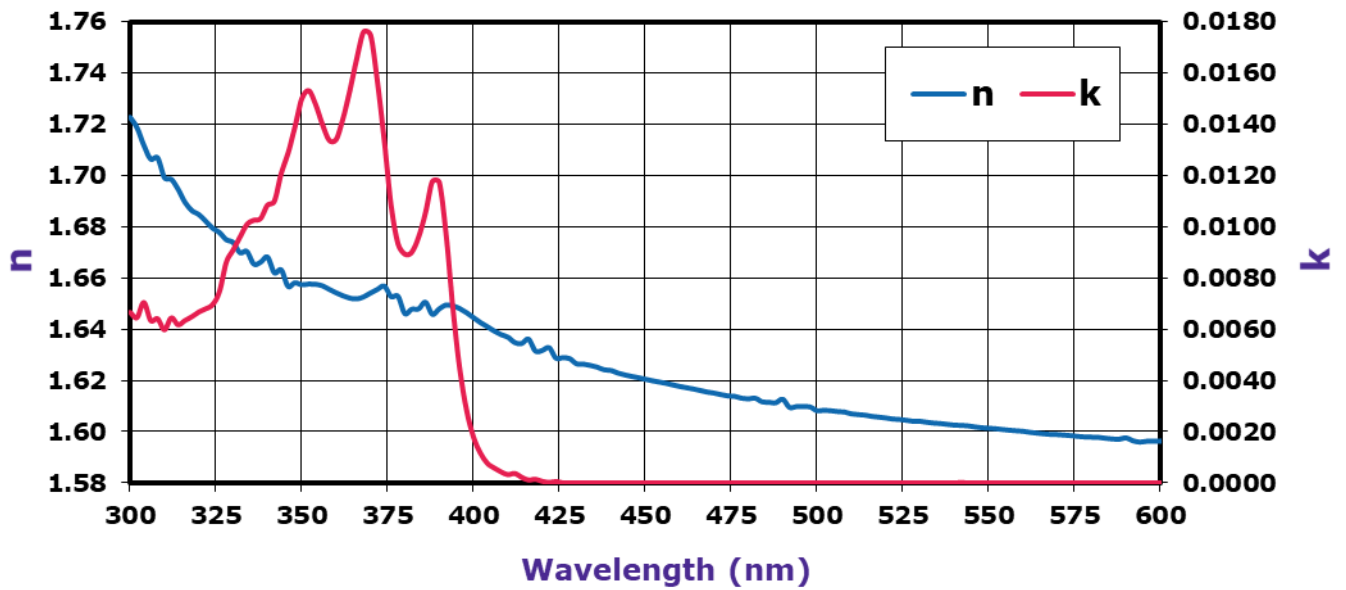


-0.8 μm

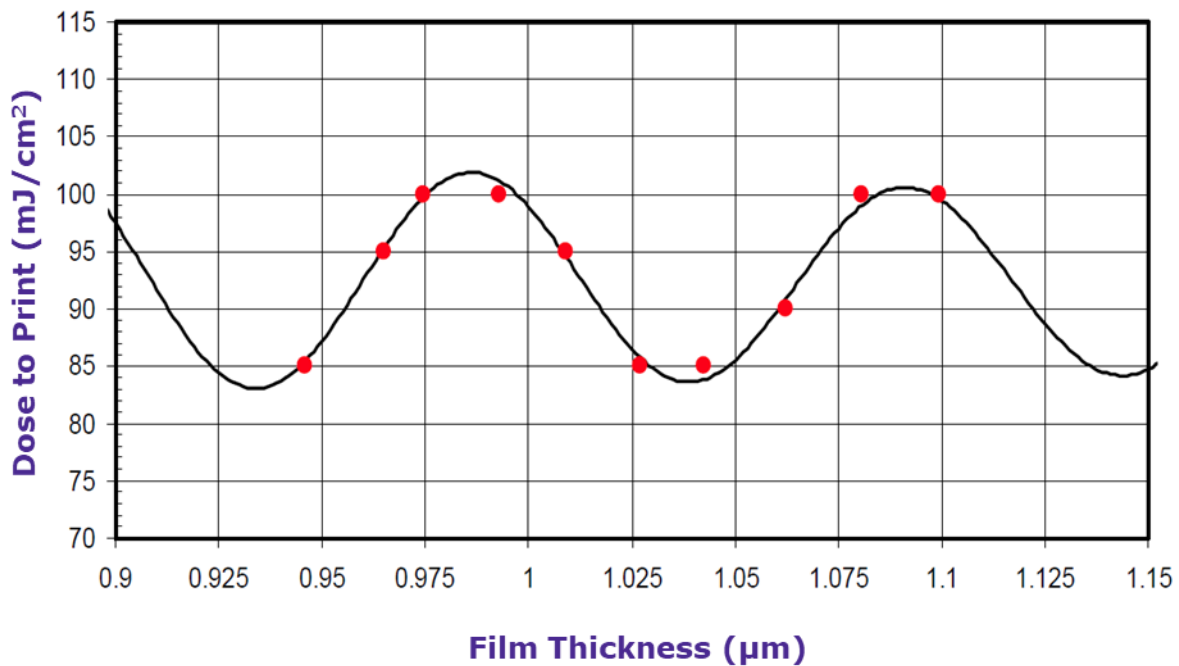


OPTICAL PROPERTIES

Dispersion Curve for AZ® nLOF 5510 Photoresist (Unexposed)

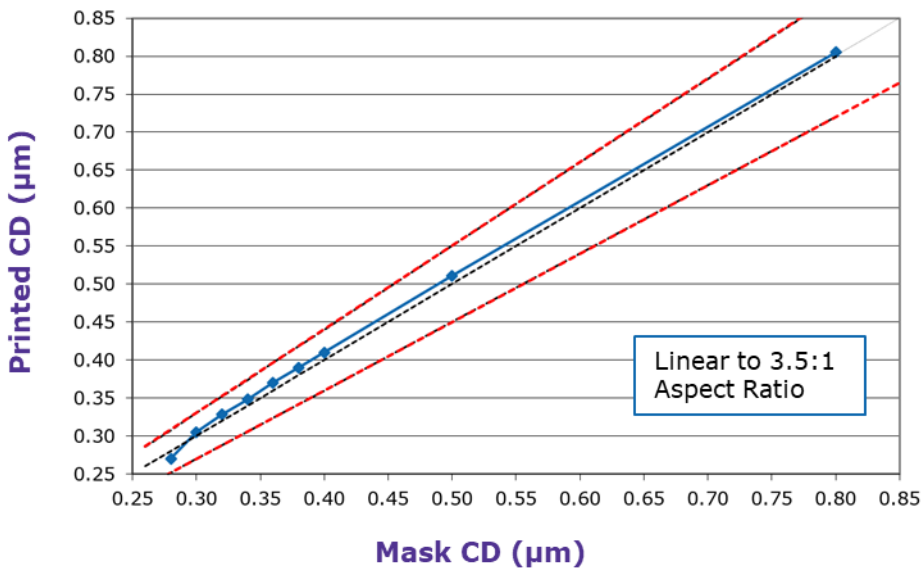


Dose to Print Swing Curve (i-line)



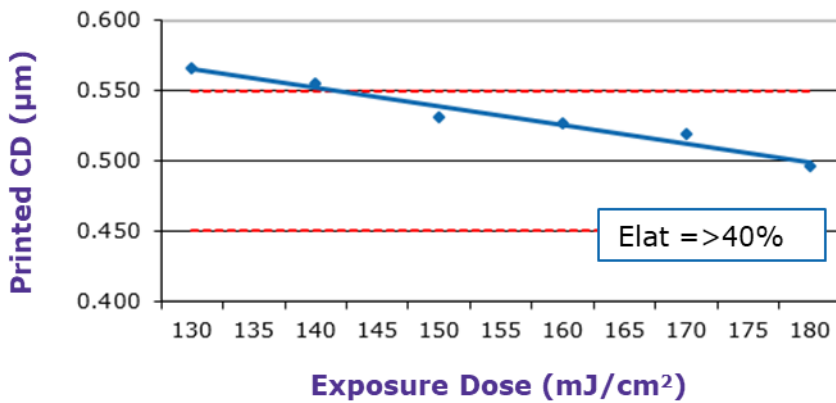
SAMPLE PROCESS Windows on Si

LINEARITY (Iso Trenches) @ 180mJ/cm²



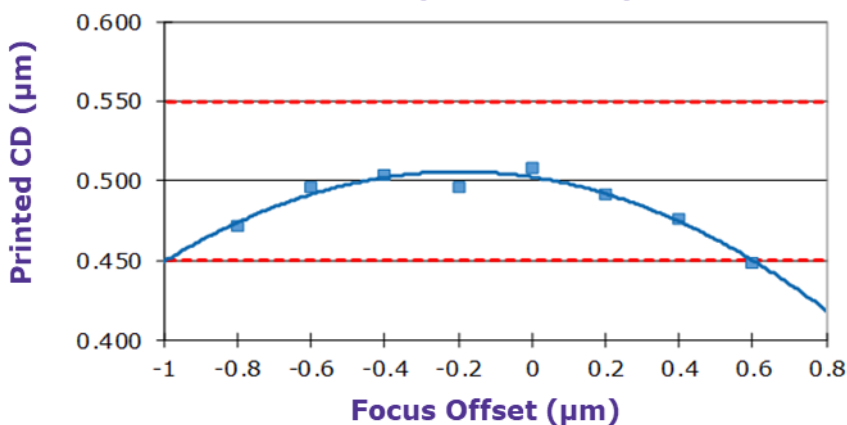
AZ® nLOF™ 5510 @ FT=0.986 μm
Soft Bake: 90C/60s
Expose: ASML Stepper @ 0.54NA
Post Expose Bake: 110C/60s
Develop: AZ® 300MIF 120s

EXPOSURE LATITUDE (Iso Trenches) @ 180mJ/cm²



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



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 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°-100°C 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 115°C range. As with any chemically amplified photoresist, CD's in nLOF™ 5510 will exhibit some dependency on PEB temperature.

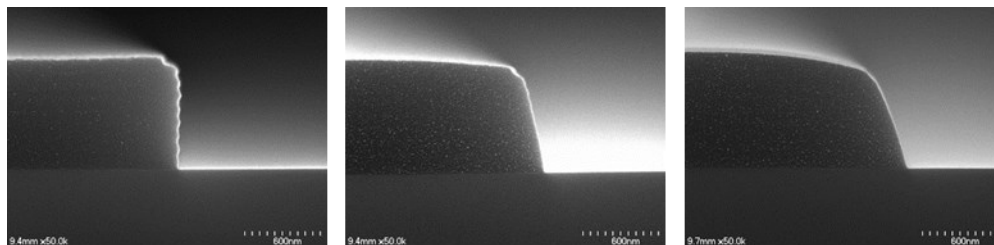
DEVELOPING

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 150°C.

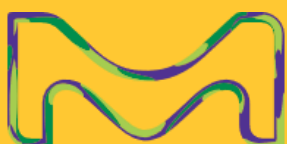
HARD BAKE STABILITY for Large Pads in AZ nLOF™ 5510 (0.986µm Film Thickness)



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.

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.

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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