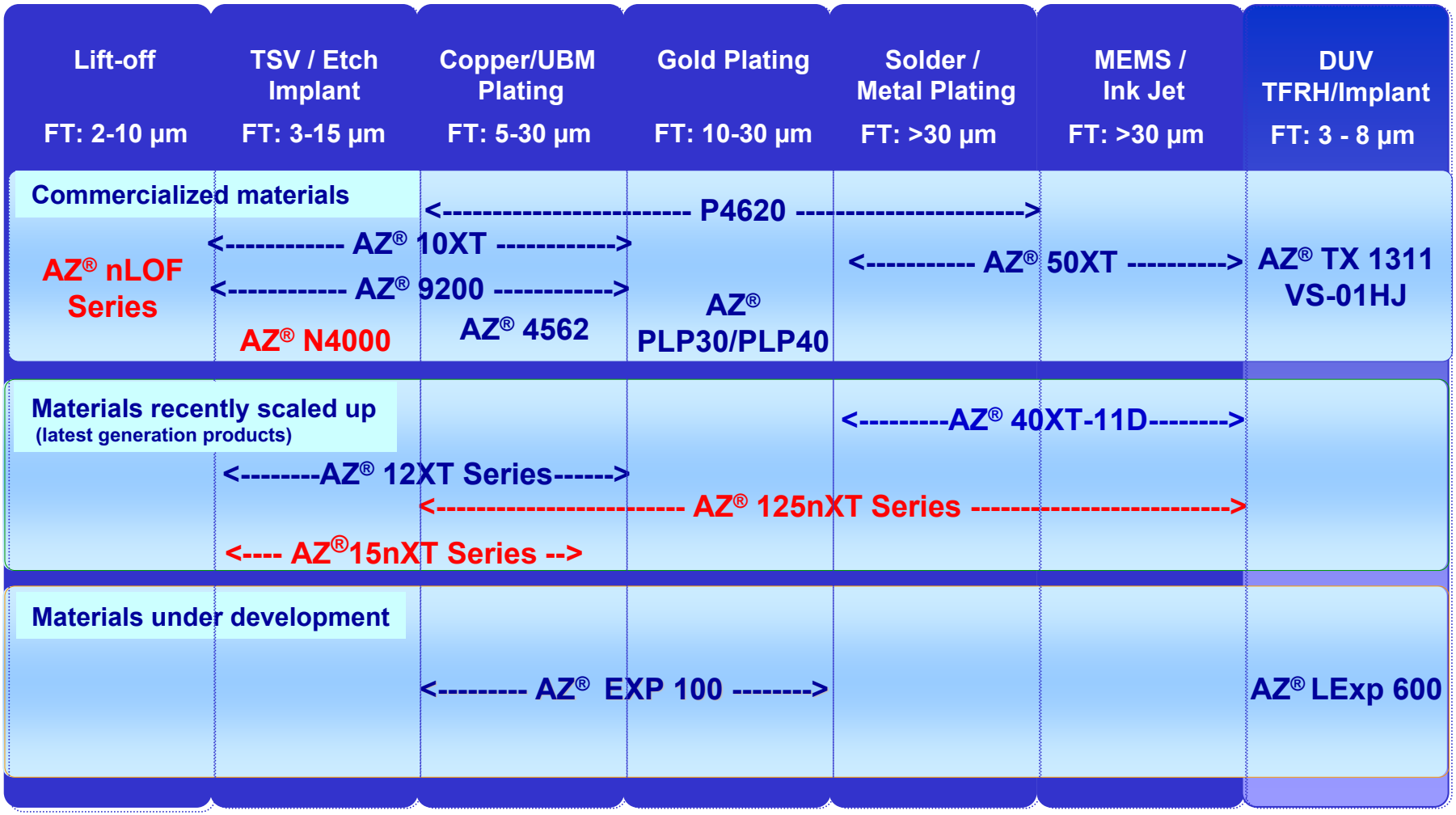
AZ Electronic Materials

AZ® 40XT-11D Photoresist

Thick Positive Chemically Amplified Photoresist Lithographic Performance at 40µm

AZ's Thick Film Photoresist Roadmap



Red=Neg, Blue =Pos; nLOF, N4000, 15nXT, 12XT, 40XT = chemically amplified; 125nXT = photopolymer; 10XT, 9200, P4620, PLP, 50XT = DNQ

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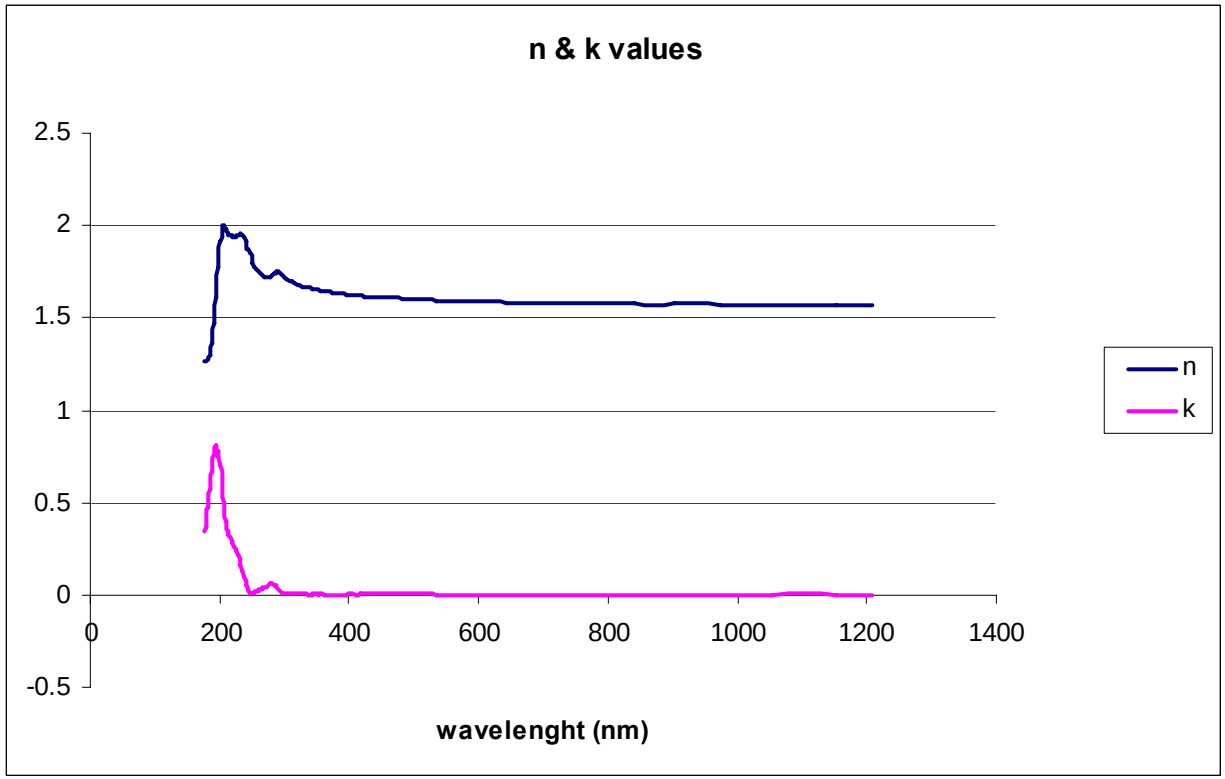
Thick Photoresist Product Summary

Thick Film Product	Platform	λ	FT Range (um)	Maximum Single coat	Aspect Ratio	Application	Developer Compatibility
P4000 Series	DNQ	g-h	2 - 55	25	2:1	Solder, Cu, Au	**400K** / TMAH
4500 Series	DNQ	g-h	2 - 55	25	2:1	Solder, Cu, Au	**400K** / TMAH
9200 Series	DNQ	***g-h*** -i	3 - 50	25	3:1	Solder, Cu, Au	**400K** / TMAH
10XT	DNQ	***g-h*** -i	4 - 50	25	3:1	Solder, Cu, Au	**400K** / TMAH
50XT	DNQ	g-h	15 - 65	65	3:1	Solder, Cu, Etch	400K
PLP-30	DNQ	g-h	6 - 25	25	2:1	Au, Cu	303N
PLP-40	DNQ	g-h	20 - 30	30	2:1	Au, Cu	303N
12XT Series	CA	g-h-***i***	5 - 20	20	4:1	Si, Cu, Au, TSV	TMAH
40XT Series	CA	g-h-***i***	20 - 100	60	4:1	Etch, Solder, Cu	**TMAH** / 400K
125nXT Series	PP	g-h-***i***	20 - 120	120	6:1	Cu, Au, Solder	**TMAH** / 303N
15nXT Series	CA	g-h-***i***	5 - 20	20	3:1	Cu, TSV Etch	TMAH
TX 1311	CA	DUV	3 - 5	5	15:1	Cu, NiFe, Si	TMAH

- **Platform: DNQ = Novolak, CA = Chemically Amplified, PP = Photopolymer**
- **Wavelength: Red font indicates better performance.**
- **Developer Compatibility: Bold font indicates most compatible developer, resulting in shorter develop times and lower exposure energies.**

AZ® 40XT-11D
Photoresist Optical Parameters



Cauchy Parameters

A = 1.560
B = 0.007 μm^{-2}
C = 0.0006 μm^{-4}

n & k Values

λ = 362.04 nm: n = 1.6443 k = 0.002779
λ = 367.41 nm: n = 1.6431 k = 0.000630

AZ® 40XT-11D
Process Conditions

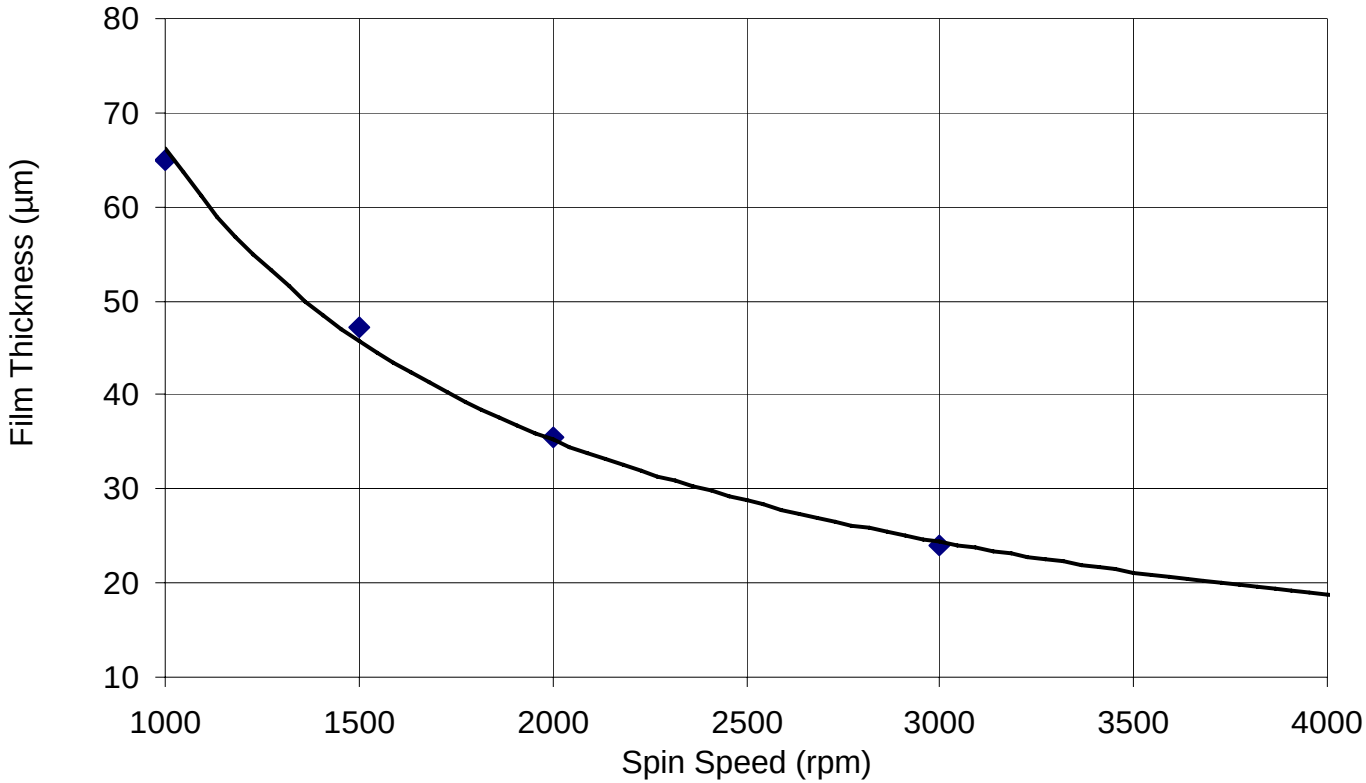
Process Conditions:

Substrate:	200 mm Silicon
Coater Tool:	Suss ACS 300 Plus Coat/ Bake
Coat Process:	Dynamic dispense on Silicon @ 30 rpm
Target FT:	40 µm
Softbake:	126°C hotplate/ 120 sec @ 1.27 mm
	126°C hotplate/ 120 sec @ 0.63 mm
	126°C hotplate/ 180 sec @ 0.00 mm
Exposure:	Suss MA200 CC Mask Aligner; 20µm proximity gap
PEB:	105°C hotplate/ 10 sec @ 1.3 mm
	105°C hotplate/ 10 sec @ 0.6 mm
	105°C hotplate/ 80 sec @ 0.0 mm
Develop:	AZ® 300 MIF/ 4x60 sec spray/puddle @ 23°C

Analysis:

Amray SEM

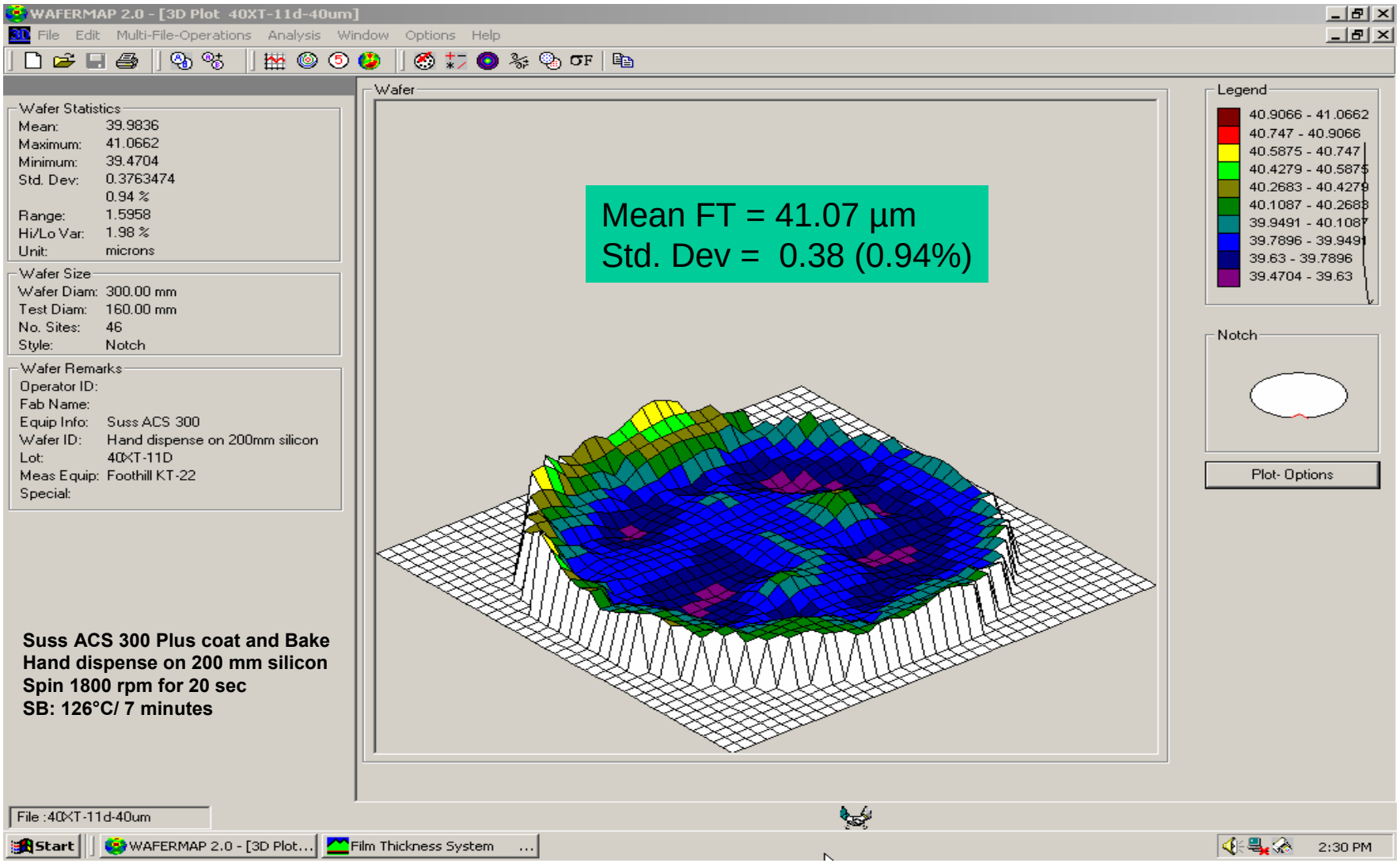
AZ® 40XT-11D Photoresist
Film Thickness vs. Spin Speed on 200 mm Silicon



Suss ACS 300 Plus coat and Bake
Hand dispense on 200 mm silicon
Spin 1000-3000 rpm for 20 sec
SB: 126°C/ 7 minutes

AZ® 40XT-11D Photoresist, FT=40 µm

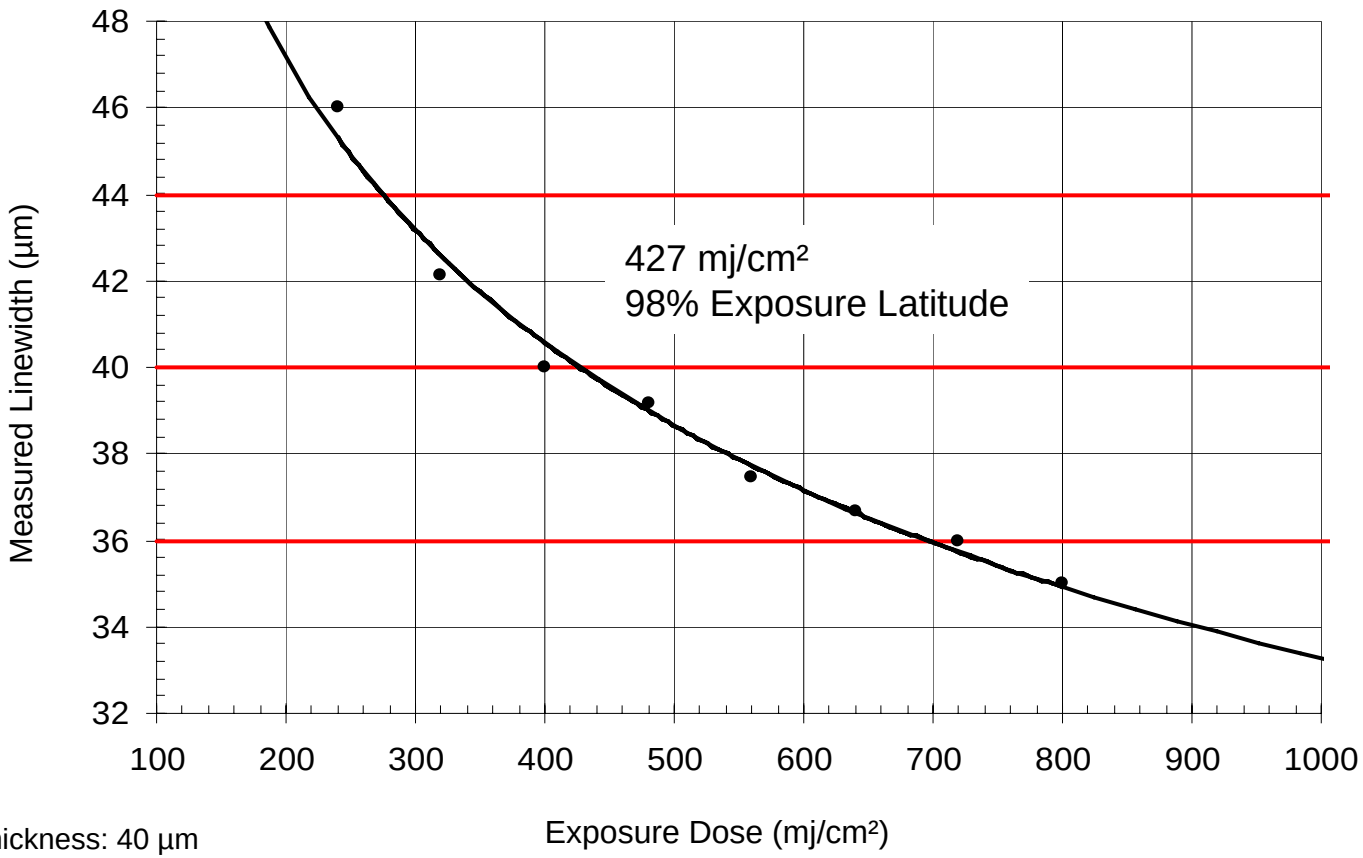
Coat uniformity on 200 mm Silicon



Suss ACS 300 Plus coat and Bake
Hand dispense on 200 mm silicon
Spin 1800 rpm for 20 sec
SB: 126°C/ 7 minutes

AZ® 40XT-11D Photoresist, FT=40 µm

40 µm L/S Exposure Latitude

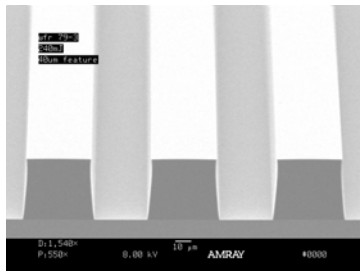


Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

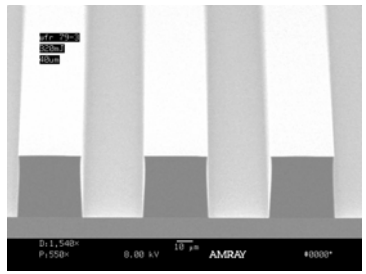
AZ® 40XT-11D Photoresist, FT=40 µm

40 µm L/S Exposure Latitude

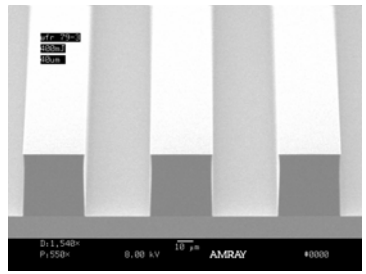
240 mJ/cm²



320 mJ/cm²

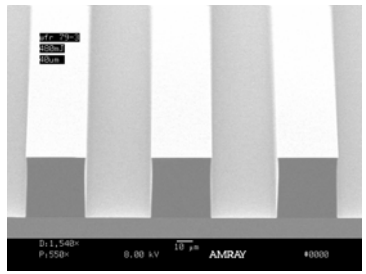


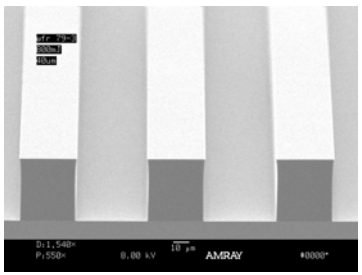
400 mJ/cm²



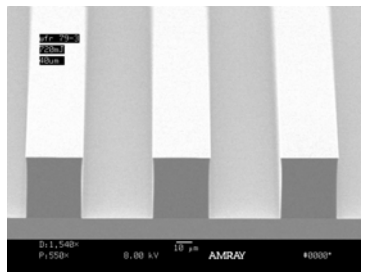
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

480 mJ/cm²

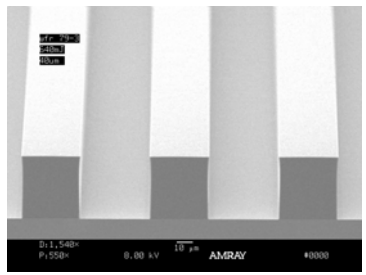




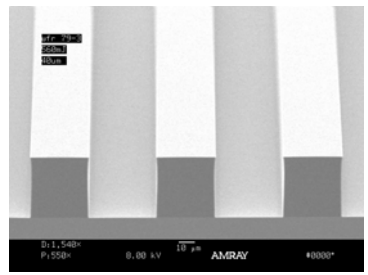
800 mJ/cm²



720 mJ/cm²



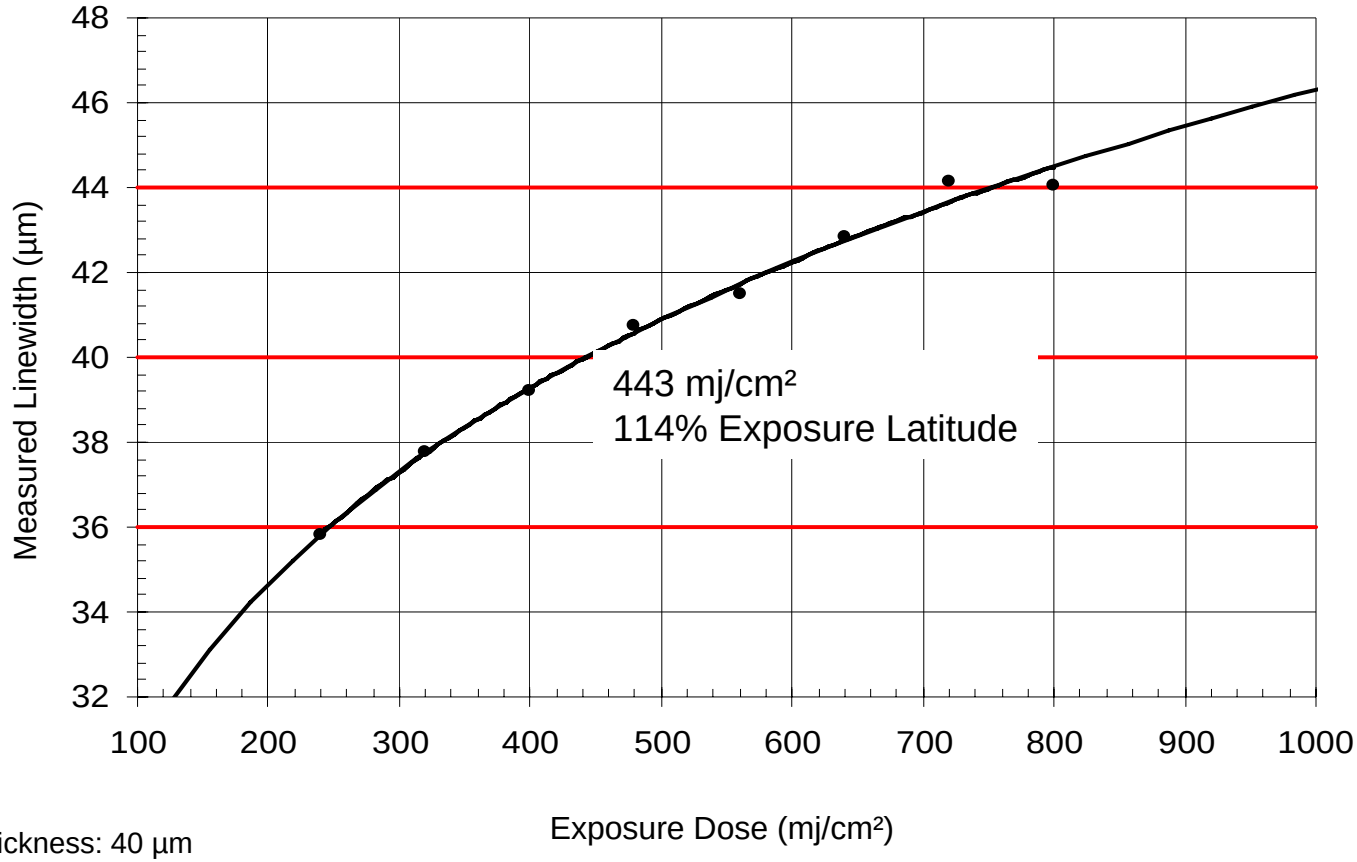
640 mJ/cm²



560 mJ/cm²

AZ® 40XT-11D Photoresist, FT=40 µm

40.0 µm Contact Holes Exposure Latitude

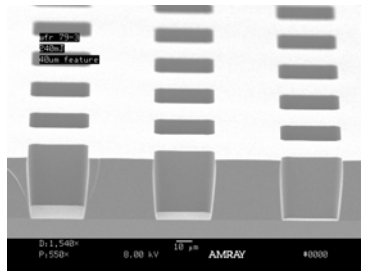


Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

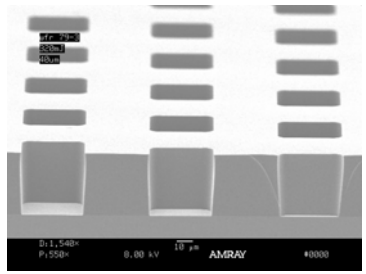
AZ® 40XT-11D Photoresist, FT=40 µm

40 µm Contact Holes (1:1 Pitch) Exposure Latitude

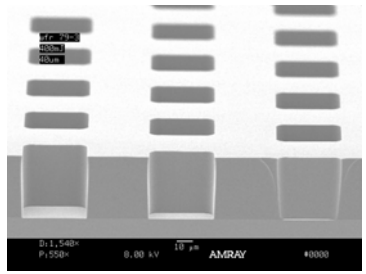
240 mJ/cm²



320 mJ/cm²

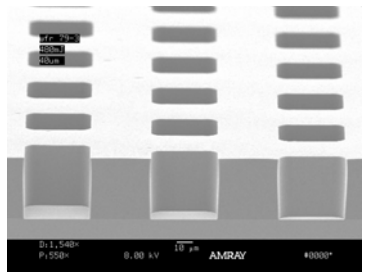


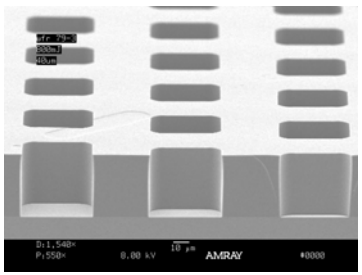
400 mJ/cm²



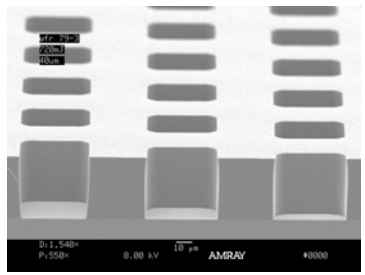
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

480 mJ/cm²

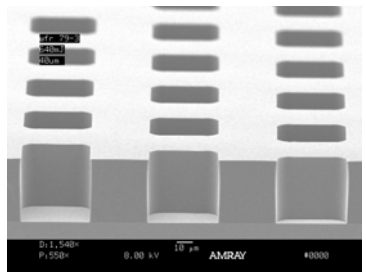




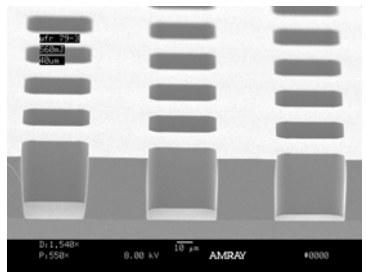
800 mJ/cm²



720 mJ/cm²



640 mJ/cm²

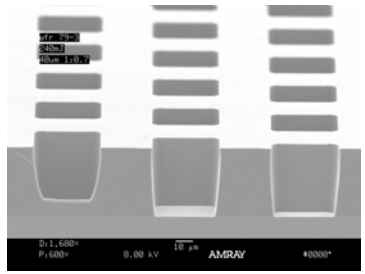


560 mJ/cm²

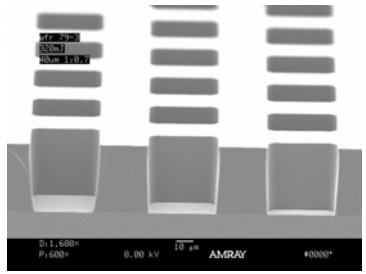
AZ® 40XT-11D Photoresist, FT=40 µm

40 µm Contact Holes (1:0.7 Pitch) Exposure Latitude

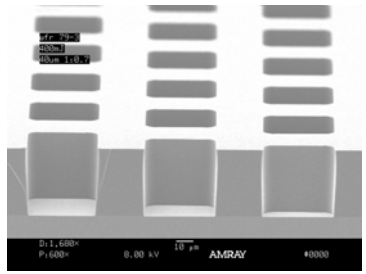
240 mJ/cm²



320 mJ/cm²

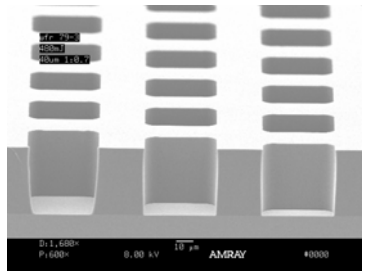


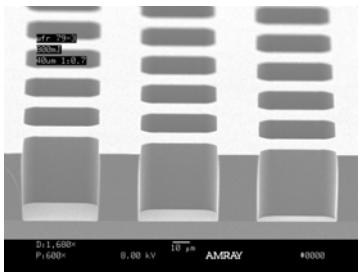
400 mJ/cm²



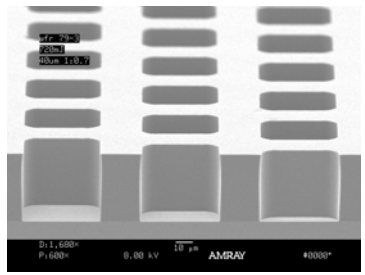
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

480 mJ/cm²

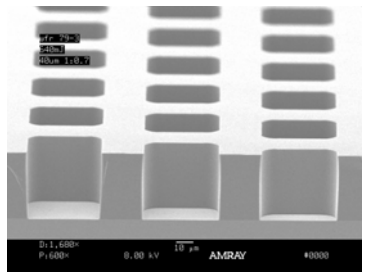




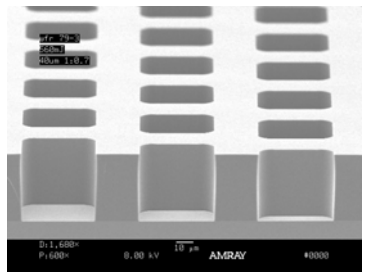
800 mJ/cm²



720 mJ/cm²



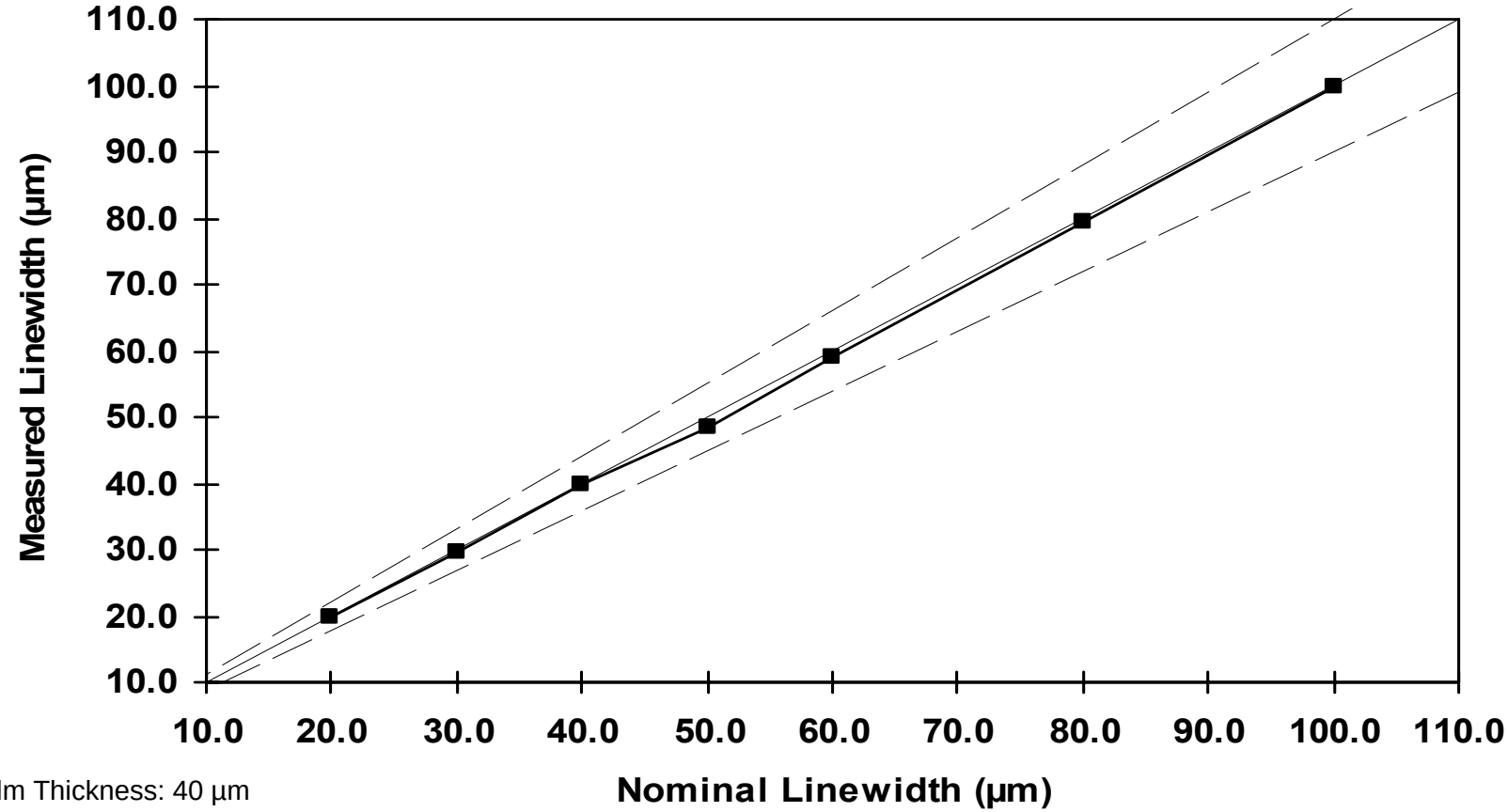
640 mJ/cm²



560 mJ/cm²

AZ® 40XT-11D Photoresist, FT=40 µm

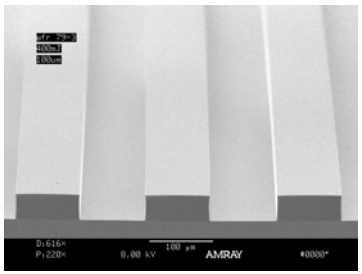
L/S Linearity @ 400 mJ/cm²



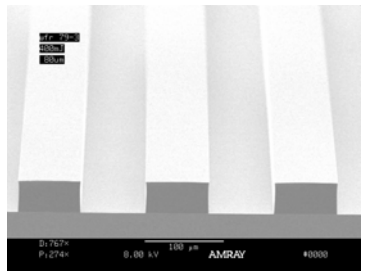
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

AZ® 40XT-11D Photoresist, FT=40 µm
L/S Linearity on Silicon @ 400 mJ/cm²

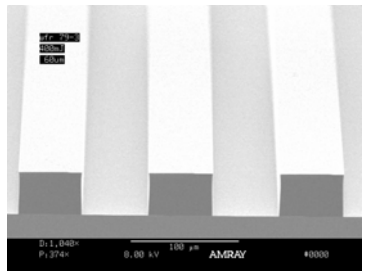
100 µm



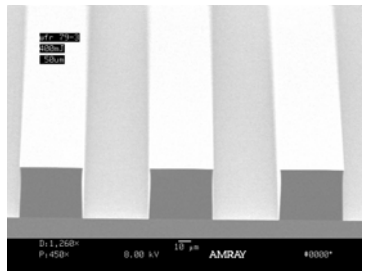
80 µm



60 µm

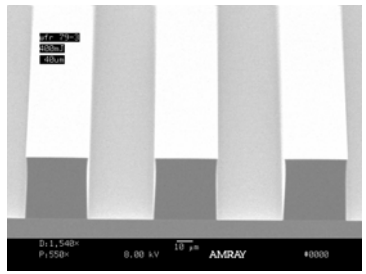


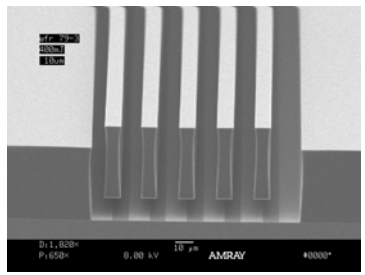
50 µm



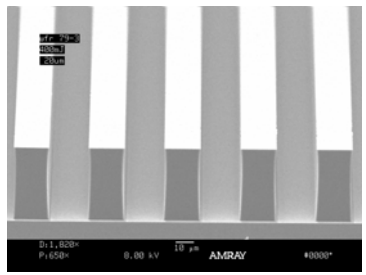
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

40 µm

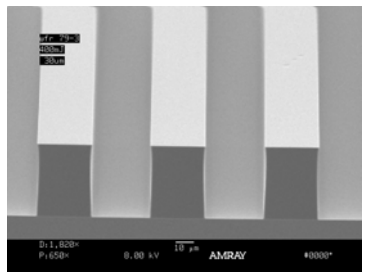




10 µm



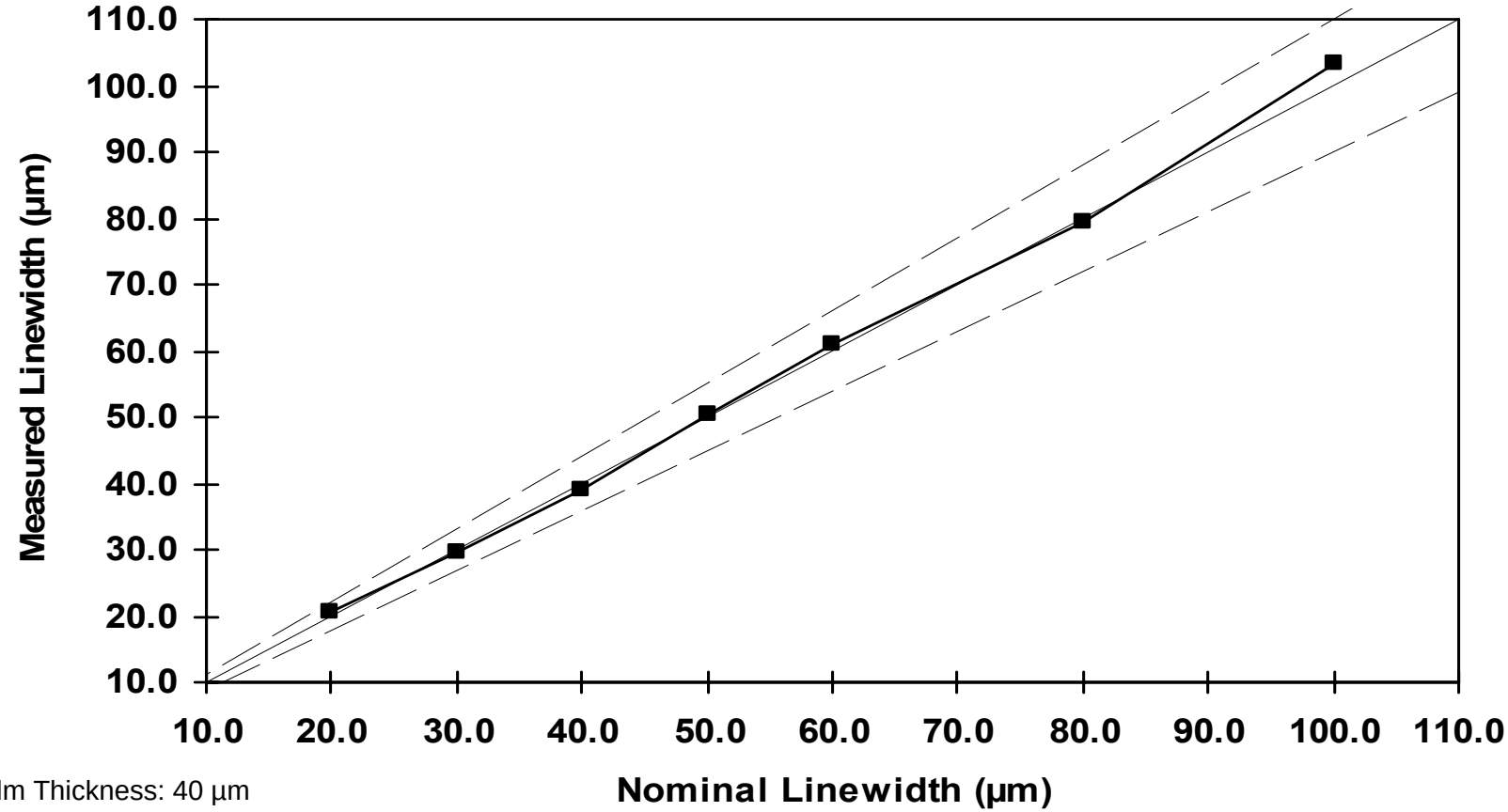
20 µm



30 µm

AZ® 40XT-11D Photoresist, FT=40 µm

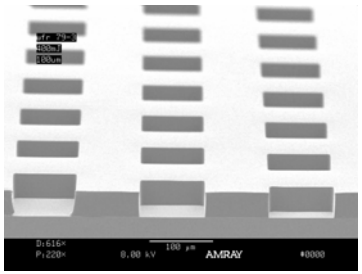
Contact Holes (1:1 Pitch) Linearity @ 400 mJ/cm²



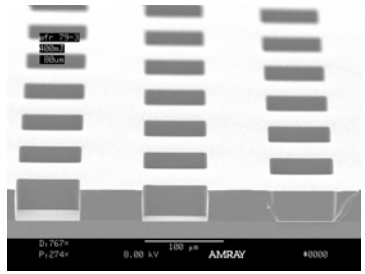
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

AZ® 40XT-11D Photoresist, FT=40 µm
Contact Holes (1:1 Pitch) Linearity @ 400 mJ/cm²

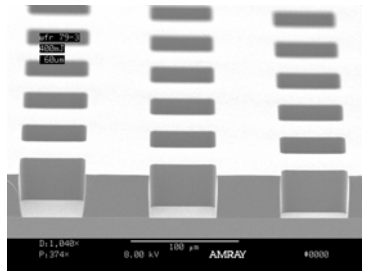
100 µm



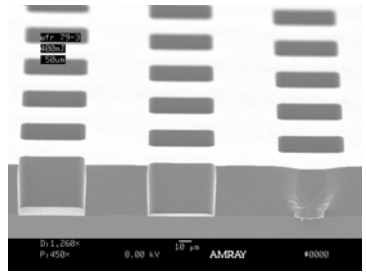
80 µm



60 µm

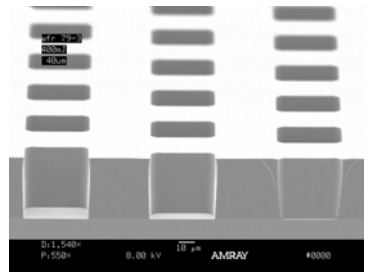


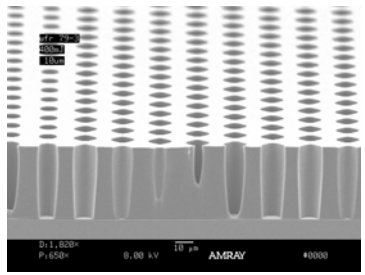
50 µm



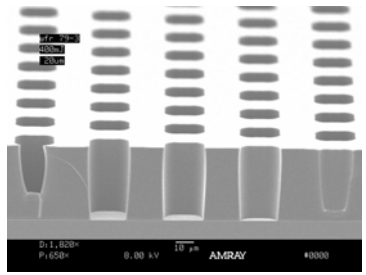
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

40 µm

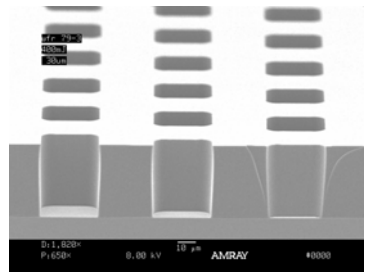




10 µm



20 µm

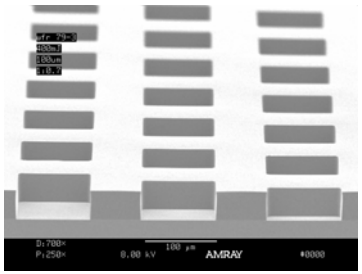


30 µm

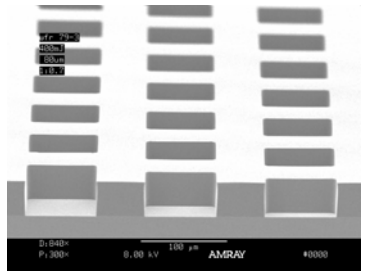
AZ® 40XT-11D Photoresist, FT=40 µm

Contact Holes (1:0.7 Pitch) Linearity @ 400 mJ/cm²

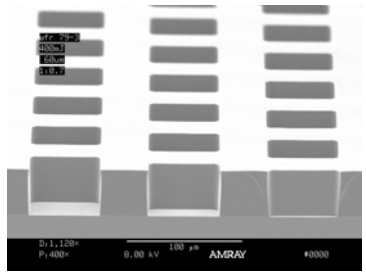
100 µm



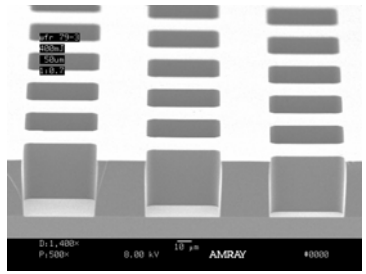
80 µm



60 µm

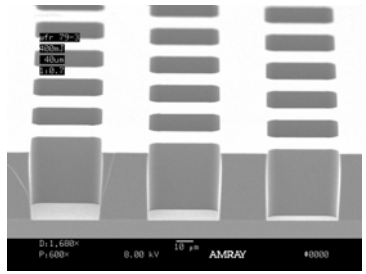


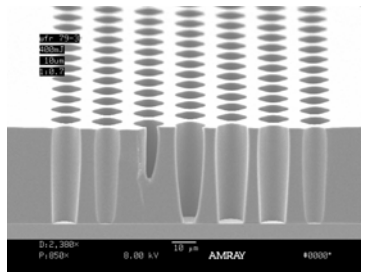
50 µm



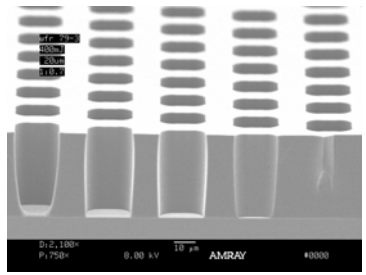
Film Thickness: 40 µm
Suss ACS 300 Plus coat and Bake
SB: 126°C/ 7 minutes
Suss MA200 CC Mask Aligner/ 20 µm proximity gap
PEB: 105°C/ 100 seconds
AZ 300 MIF/ 4X60 sec spray/puddle @ 23 °C

40 µm

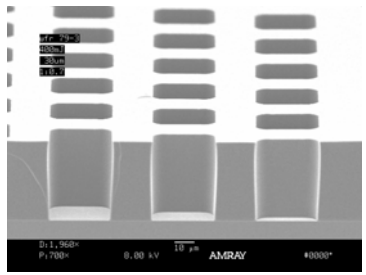




10 µm



20 µm



30 µm

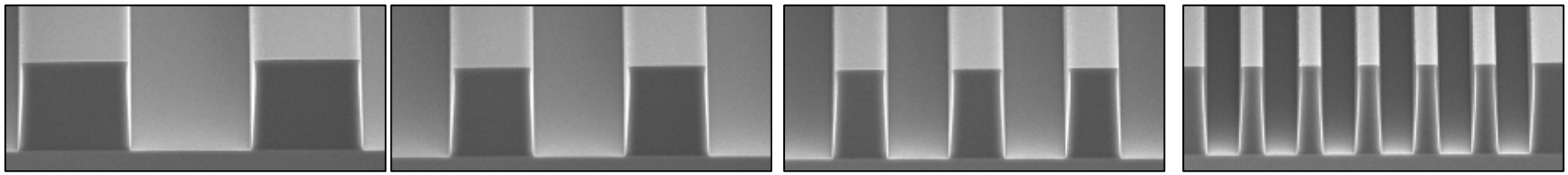
AZ® 40XT-11D Photoresist

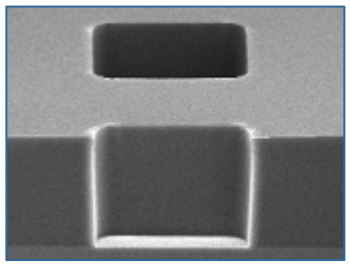
Lithographic Performance Summary:

Resist	Features (1:1)	Film Thickness (μm)	DTP 40 μm (mJ/cm²)	Exposure Latitude 40 μm (%)	Linearity (μm)
AZ® 40XT-11D	Dense Lines	40	427	98	20
AZ® 40XT-11D	Contact Holes	40	443	114	20

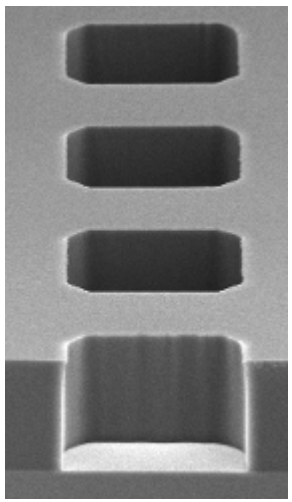
AZ® 40XT-11D
Performance on Silicon at 40µm FT

40 µm | 30 µm | 20 µm | 10 µm





DTP = 250 mJ/cm²



Softbake:	115°C/60sec @ 0.05” gap, + 60sec @ 0.025” gap, + 240sec @ 0.002” gap
EBR:	EBR 600 for 60 sec followed by bake 115°C/10sec @ 0.002” gap
Exposure:	Suss MA-200, Broadband, proximity exposure; Exposure gap: FT+30µm (70µm)
PEB:	100°C/30sec @ 0.002” gap
Develop:	3x60 sec puddle AZ 300 MIF Developer @23°C

AZ® 40XT-11D Summary

- Chemically Amplified Platform
- Vertical profiles on aligners
- Excellent photospeed; good develop time
- TMAH Developer compatible
- Superior overall throughput
- Superior adhesion on substrates
- Superior DRIE performance, ideal for MEMS
- Copper substrate compatible
- Good plating compatibility
- Standard wet strip process for removal