AZ® P4620 Photoresist Data Package

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AZ's Thick Film Photoresist Roadmap

Lift-off FT : 2-10 µm	TSV / Etch Implant, Plating FT : 3-15 µm	Copper/UBM Plating FT : 5-30 µm	Gold Plating FT : 10-30 µm	Solder / Metal Plating FT : >30 µm	MEMS / Ink Jet FT : >30 µm	DUV TFRH/Implant FT: 3 - 8 µm

Commercialized materials

- <------------ AZ® P4620/ AZ® 4562 -------------->
- <-------------------- AZ® 2008HS ------------------>
- AZ® nLOF Series
- <------ AZ® 9260/10XT -------->
- AZ® N4000
- AZ® PLP30/PLP40
- <------------ AZ® 50XT ---------->
- AZ® TX 1311
- AZ® VS-01HJ

Advanced TF Products

- <----------------------- AZ® 125nXT Series ----------------------->
- ←-----AZ® 12XT Series------->
- <---------AZ® 40XT-11D-------->
- <---AZ® 15nXT--->
- AZ® TX VS-02HJ

Materials under development

- <----------------- AZ® IPS-528 -------------------->
- <---- AZ® 3DT-102 --->
- <-------------------- AZ® 125nXT-AD Series -------------------->

Red=Neg, Blue =Pos; nLOF, N4000, 15nXT, 12XT, 40XT = chemically amplified; 125nXT = photopolymer; 10XT, 9200, P4620, 2008HS, PLP, 50XT, 4500 = 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
15nXTÂÛ^¦ã•Á	ÁÁÁÁÁÁÔA	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.**

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AZ P4620 Process Conditions:

Optitrac Coat/ Bake

Coat: Static dispense on Silicon

Target Film Thickness: **15 µm**

Softbake: 110 C hotplate/ 180 sec. HP

Exposure: PLA-501F ghi line Aligner

Develop: AZ 400K 1:4, Immersion for 300 sec., 23 C

Plating liquid: MICROFAB Cu200 (EEJA)

Plating height: 7.0um, Plating: 25 C / 30 min.

Analysis:

Amray SEM

AZ P4620 Copper plating

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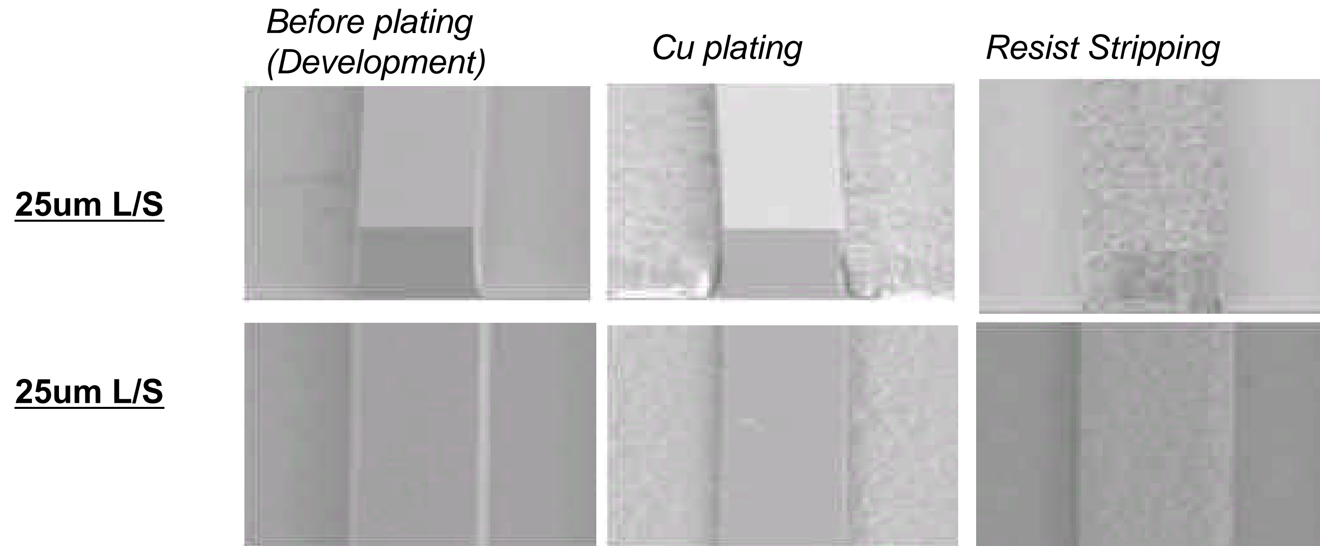
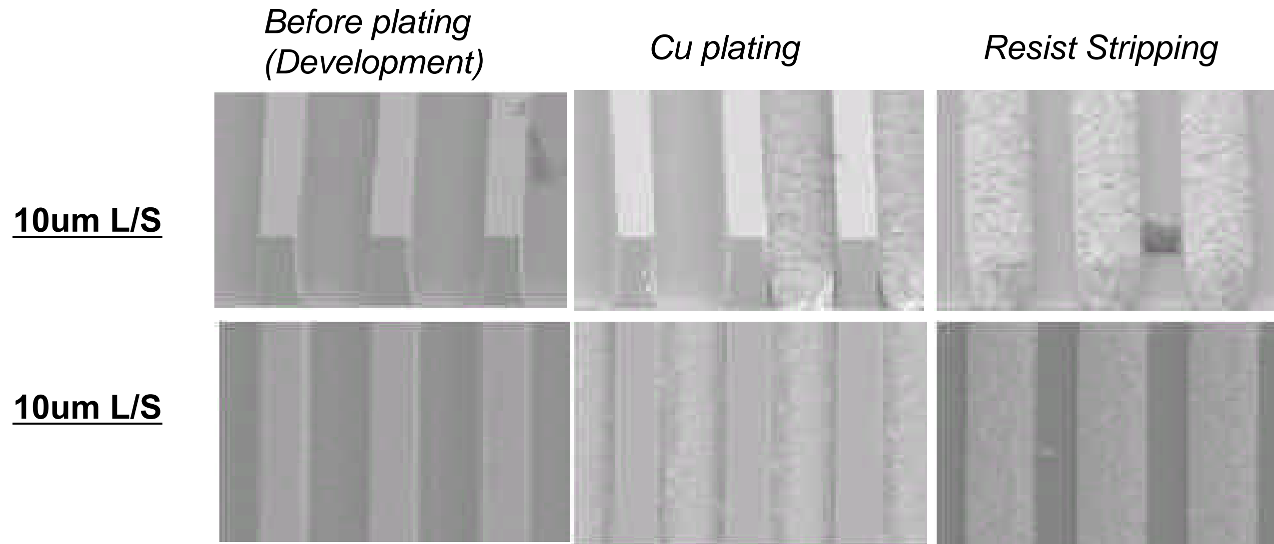


Plating process condition

Photoresist thickness: **15um**, Prebake: 110 C / 180 sec (Hotplate)
Exposure: PLA-501F（Soft contact, ghi-line aligner)
Development: AZ 400K 1:4, Immersion for 300 sec, 23 C
Plating liquid: MICROFAB Cu200 (EEJA)
Plating height: 7.0um, Plating: 25 C / 30 min.

AZ Electronic Materials

AZ P4620 Copper plating



Plating process condition

Photoresist thickness: **15um**, Prebake: 110C/180 sec. (Hotplate)
Exposure: PLA-501F（Soft contact, ghi-line aligner)
Development: AZ 400K 1:4, Immersion for 300 sec., 23 C
Plating liquid: MICROFAB Cu200 (EEJA)
Plating height: 7.0um, Plating: 25 C / 30 min.

AZ® P4620 Gold Plating Process

FT:	28um, Single Coat
Softbake:	1) 100ºC / 500 sec. (Hotplate)
	2) 90ºC / 180 min. (Oven)
Rehydration time:	60 minutes
Exposure:	UTS-SS-III (ghi-line)
Develop:	AZ 400K 1:3, 21.5ºC
Plating:	Cyanide Gold Plating Solution

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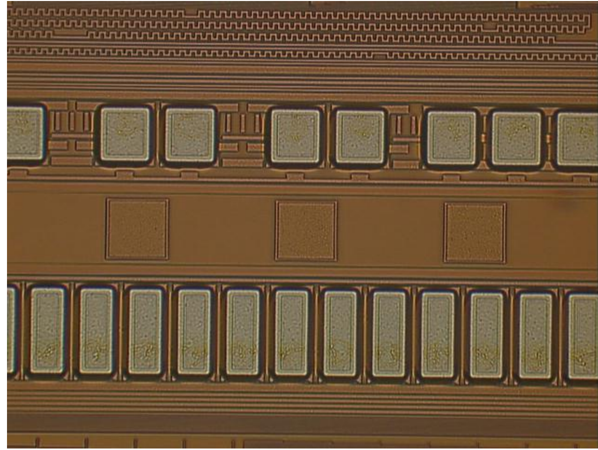
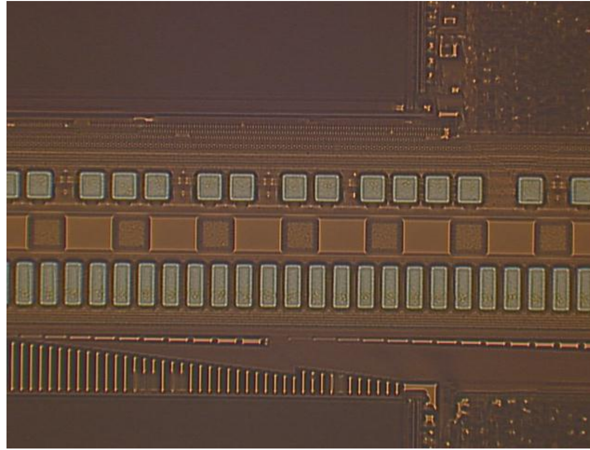
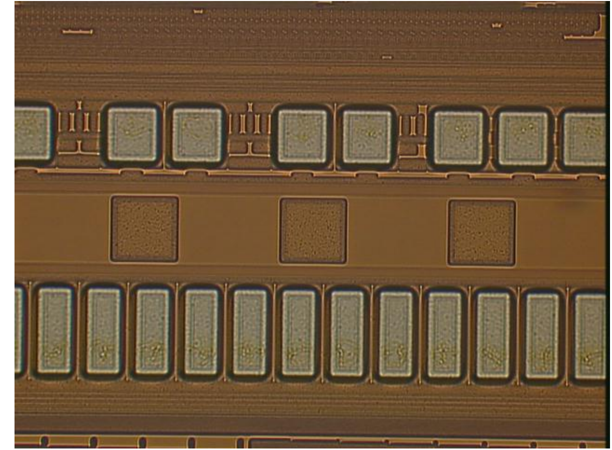
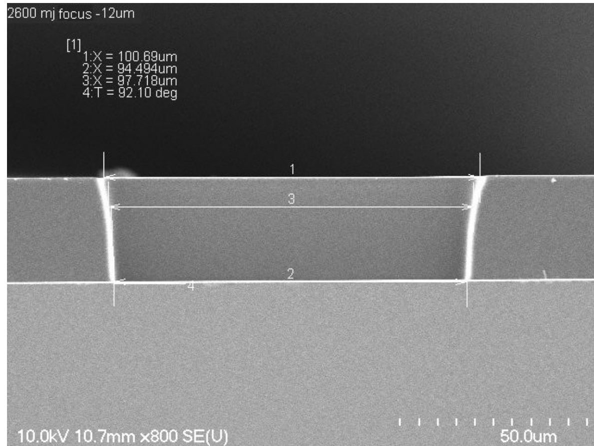
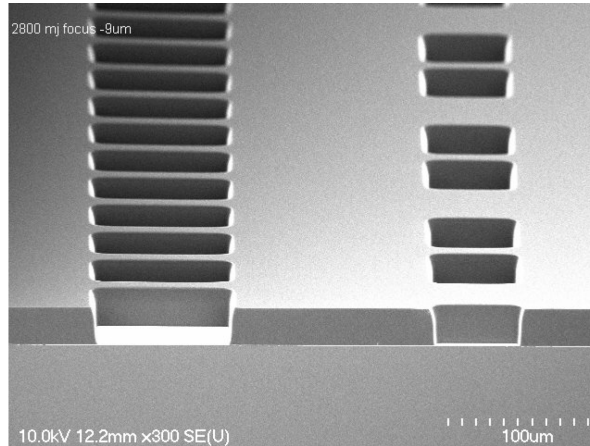
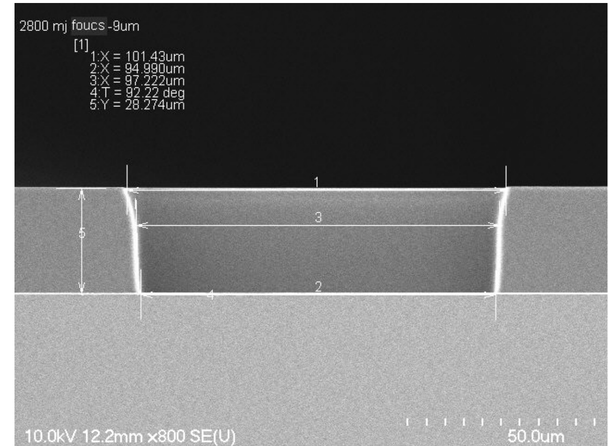
AZ® P4620 Gold Plating Process







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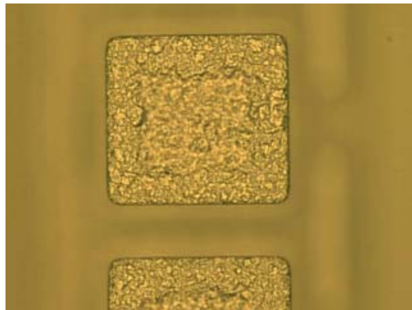
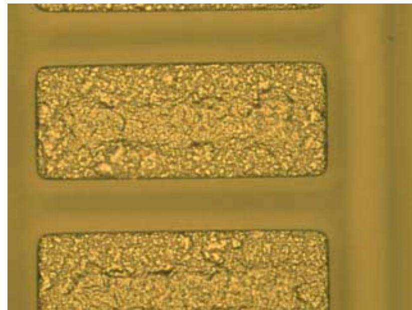
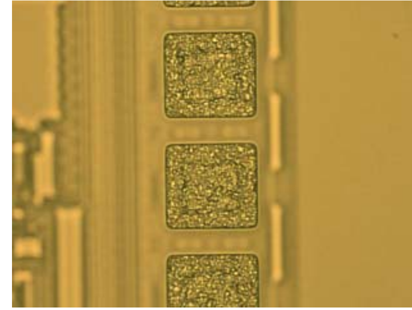
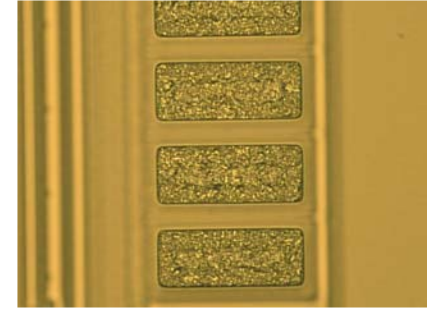
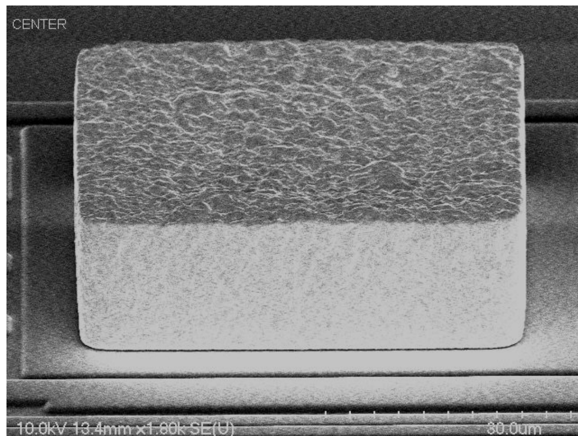
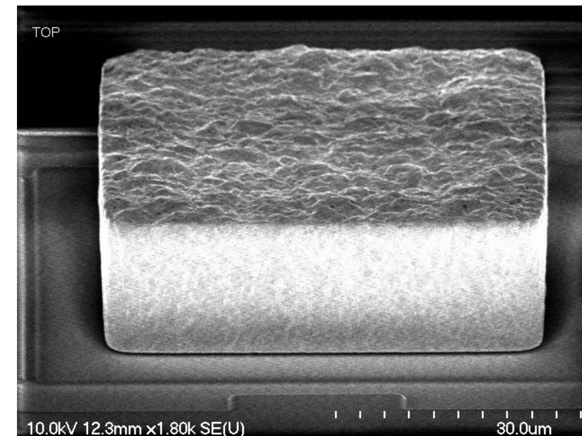
AZ® P4620 Gold Plating Process

Photoresist Mask CD = 93.5um;   Au Bump CD = 96um.





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AZ P4620 Lithography performance

Process Conditions:

Optitrac Coat/ Bake
Coat: Static dispense on Silicon
Target Film Thickness: **12 μm**
Softbake: 110C hotplate/ 80 sec. full contact
Exposure: Ultratech 1500 gh line Stepper
Develop: AZ® 300 MIF, continuous spray for 200 sec. @ 23 C

Analysis:

Amray SEM

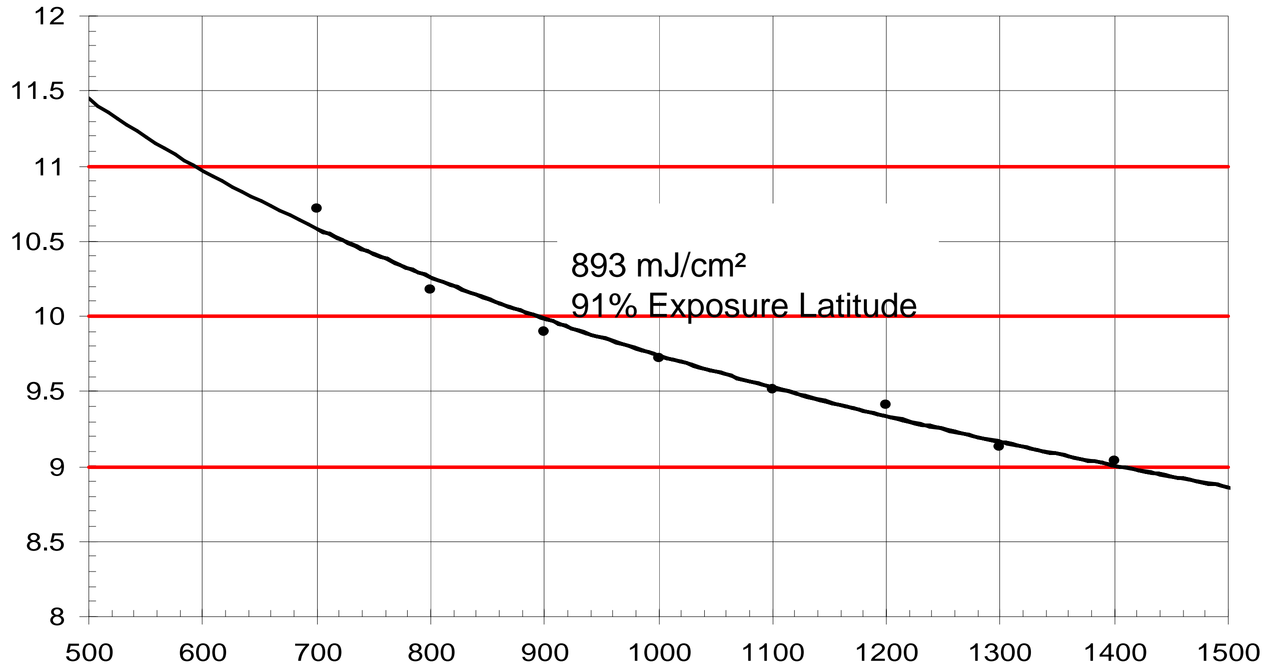
AZ Electronic Materials ®

AZ P4620 Lithography performance

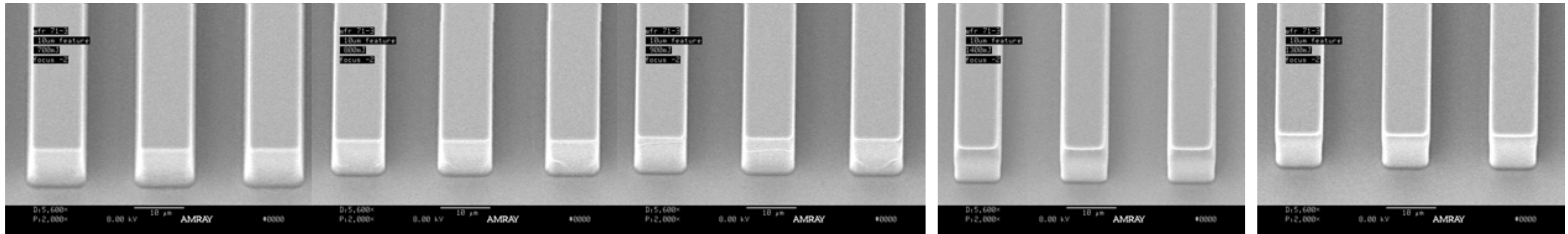
Summary of Results:

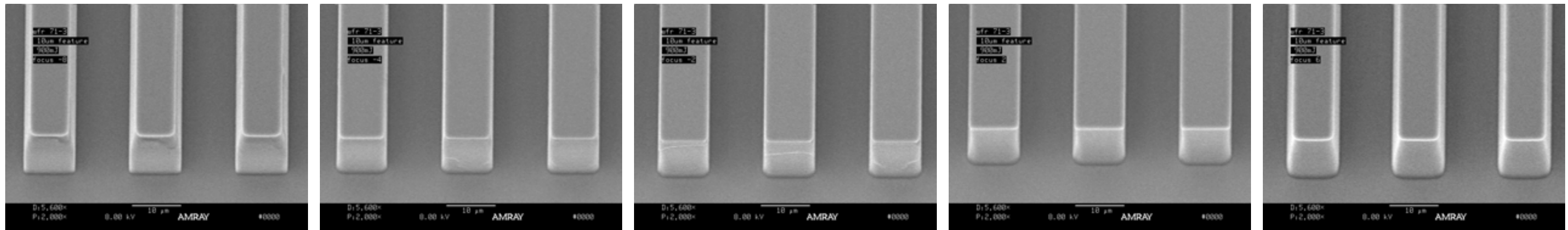
	(mm)	DTP 10 mm (mJ/cm²)	Exposure Latitude 10 mm (%)	DOF 10 mm (mm)	Linearity (mm)
Dense Lines	12	893	91	16	4.0
Contact Holes	12	927	91	>8	<10

AZ P4620 Lithography performance



AZ P4620 Lithography performance





Film Thickness: **12 µm**
Optitrac coat and Bake
SB: 110 C/ 80 sec
Ultratech 1500 gh line Stepper
AZ 300 MIF, 200 sec continuous spray @ 23 C

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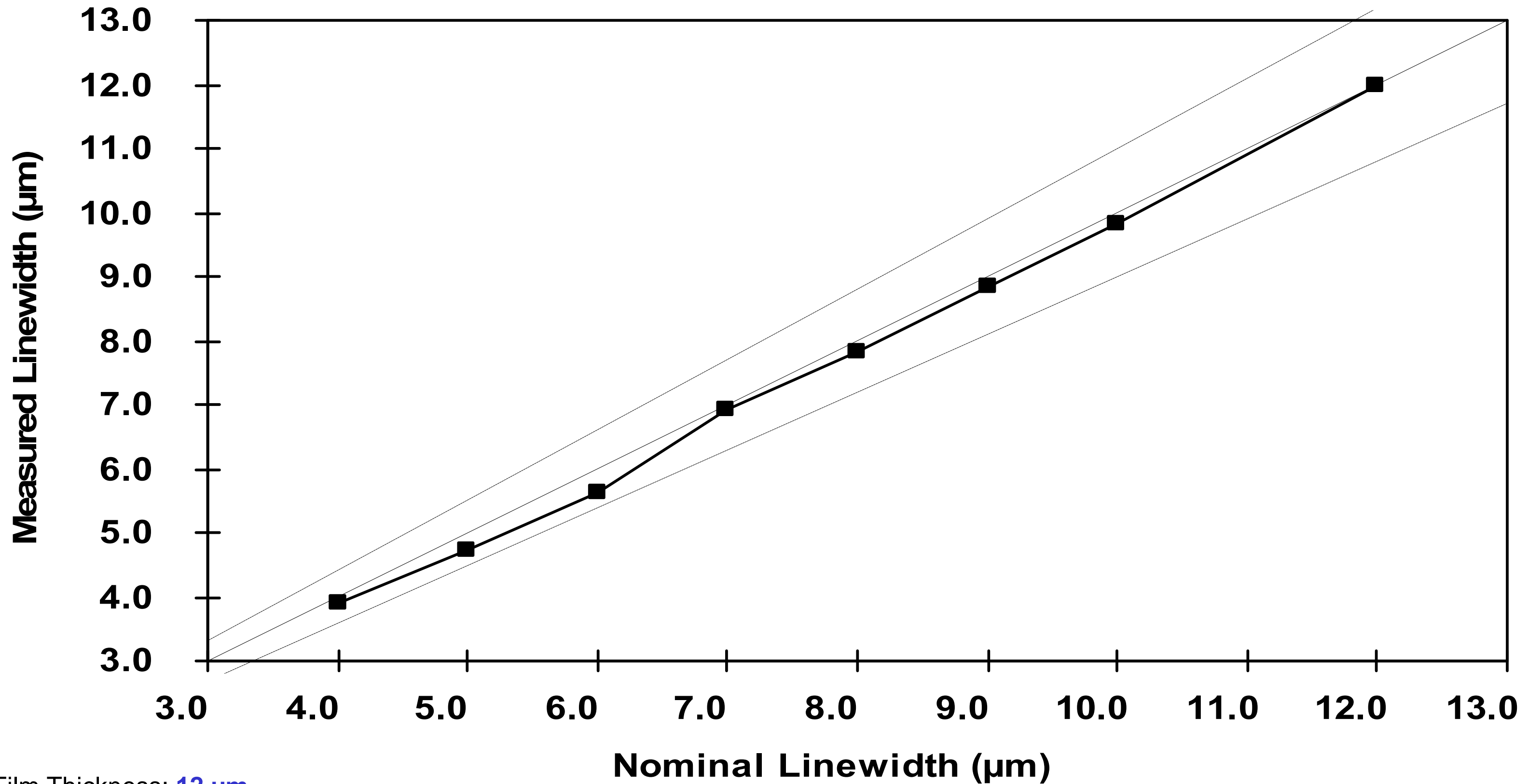
AZ P4620 Lithography performance



Film Thickness: **12 µm**
Optitrac coat and Bake
SB: 110 C / 80 sec
Ultratech 1500 gh line Stepper
AZ 300 MIF, 200 sec continuous spray @ 23 C

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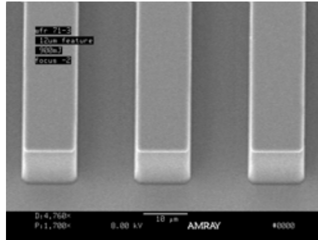
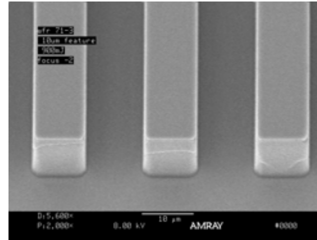
AZ P4620 Lithography performance

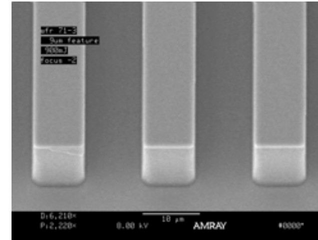
12 µm



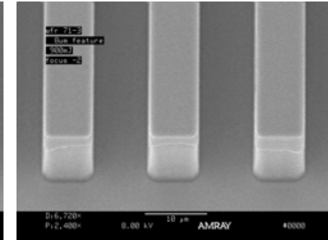
10 µm



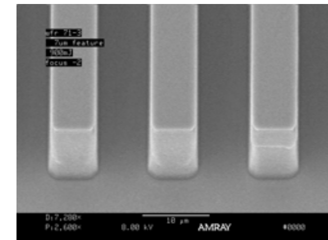
9.0 µm



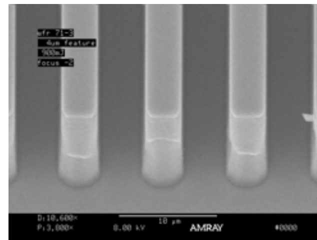
8.0 µm



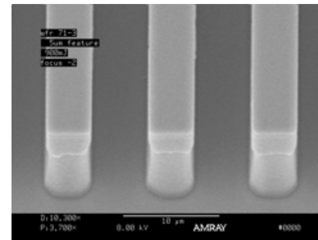
7.0 µm



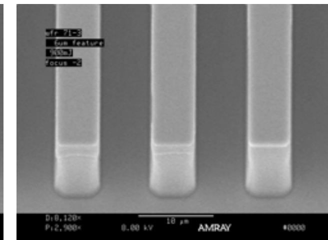
Film Thickness: **12 µm**
Optitrac coat and Bake
SB: 110 C / 80 sec
Ultratech 1500 gh line Stepper
AZ 300 MIF, 200 sec continuous spray @ 23 C



4.0 µm



5.0 µm



6.0 µm

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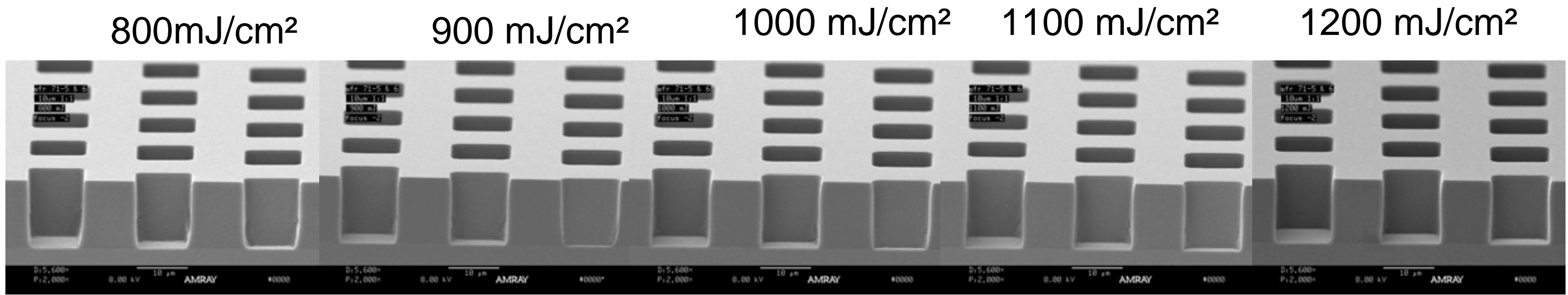
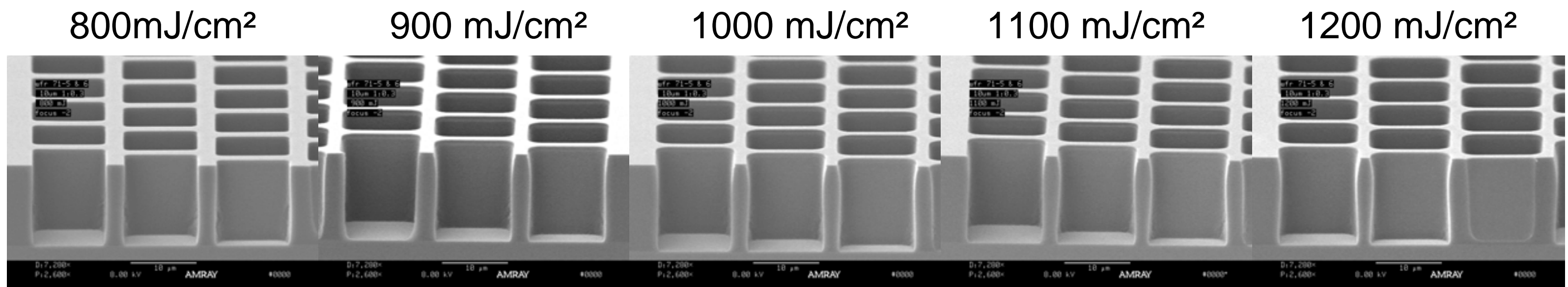
AZ P4620 Lithography performance

800mJ/cm² | 900 mJ/cm² | 1000 mJ/cm² | 1100 mJ/cm² | 1200 mJ/cm²



10.0 µm Contact Holes 1:1 Pitch

800mJ/cm² | 900 mJ/cm² | 1000 mJ/cm² | 1100 mJ/cm² | 1200 mJ/cm²



10.0 µm Contact Holes 1:0.3 Pitch

Film Thickness: **12 µm**
Optitrac coat and Bake
SB: 110 C / 80 sec
Ultratech 1500 gh line Stepper
AZ 300 MIF, 200 sec continuous spray @ 23 C

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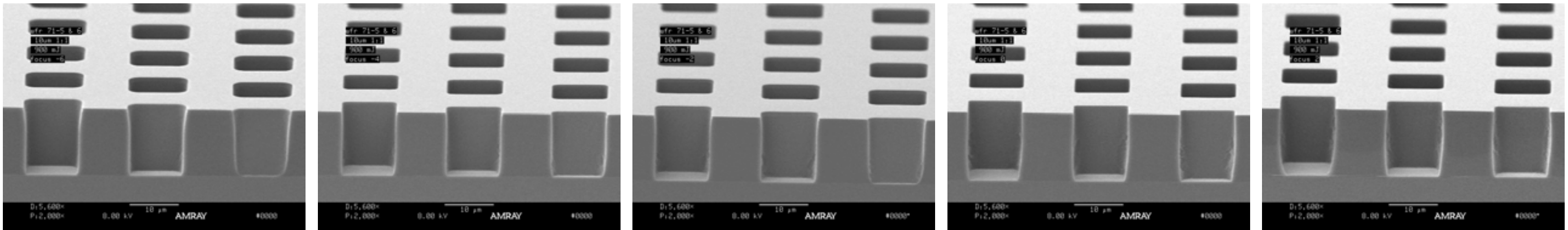
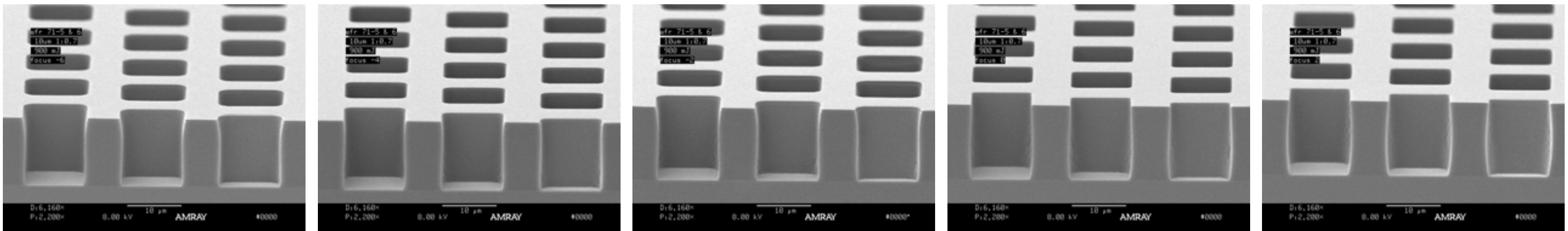
AZ P4620 Lithography performance

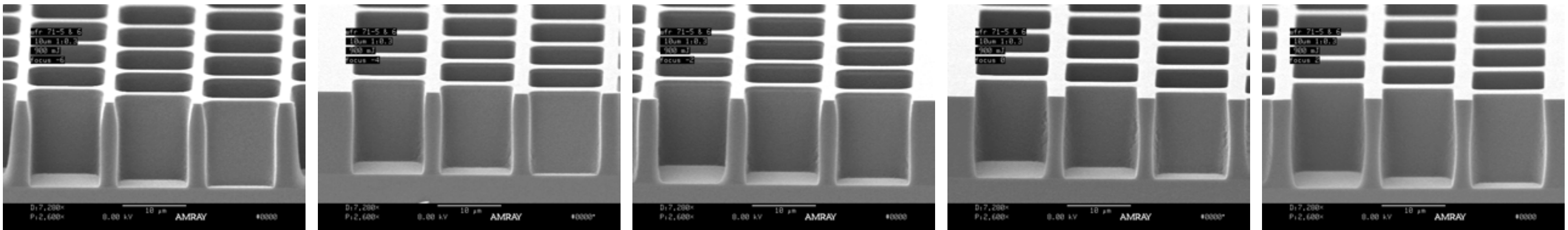
1:1



1:0.7



1:0.3



-6.0 µm | -4.0 µm | -2.0 µm | 0.0 µm | 2.0 µm

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AZ P4620 Lithography performance

Process Conditions:

Optitrac Coat/ Bake

Coat: Static dispense on Silicon

Target Film Thickness: **24 µm**

Softbake: 1st layer 110 C hotplate/ 80 sec. full contact

2nd layer 115 C hotplate/ 180 sec. full contact

Exposure: Ultratech 1500 gh line Stepper

Develop: AZ® 400K 1:4, continuous spray for 260 sec. @ 27 C

Analysis:

Amray SEM

AZ P4620 Lithography performance

Summary of Results:

	(mm)	DTP 10 mm (mJ/cm²)	Exposure Latitude 10 mm (%)	DOF 10 mm (mm)	Linearity (mm)
Dense Lines	24	1742	29	16	5.0
Contact Holes	24	1574	39	>8	<10

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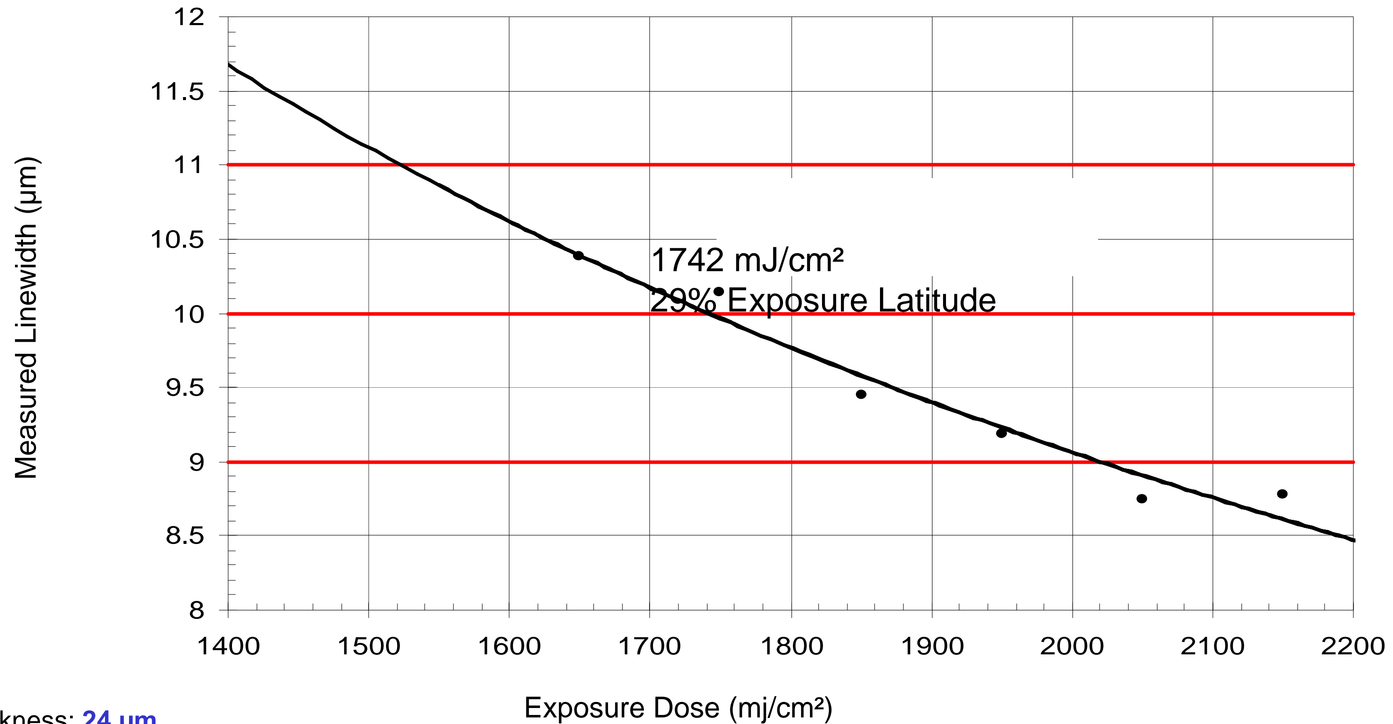
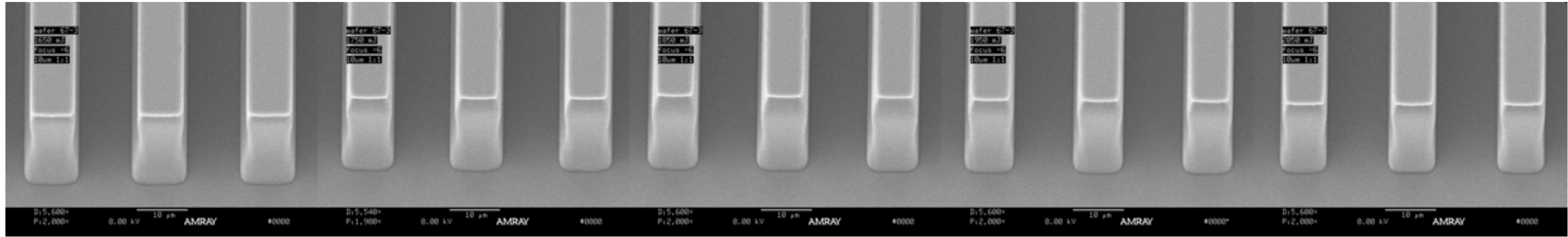
AZ P4620 Lithography performance



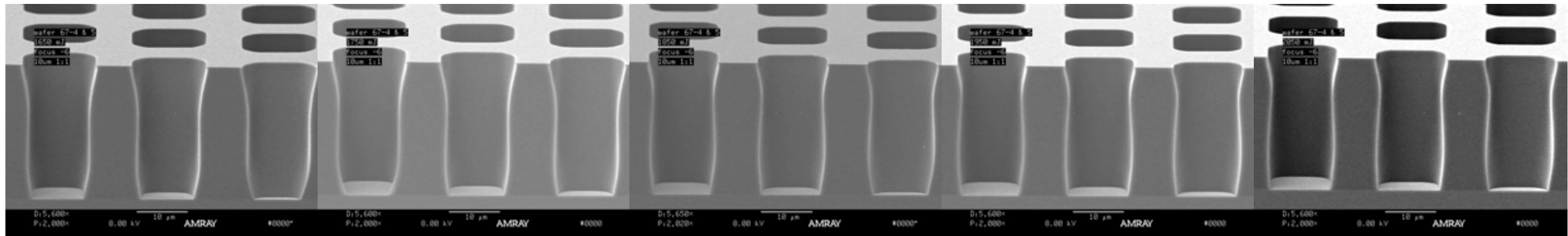
Film Thickness: **24 µm**
Optitrac coat and Bake
SB: 1st layer 110 C / 80 sec
2nd layer 115 C /180 sec
Ultratech 1500 gh line Stepper
AZ 400K 1:4, 260 sec continuous spray @ 27 C

AZ P4620 Lithography performance

1650 mJ/cm² | 1750 mJ/cm² | 1850 mJ/cm² | 1950 mJ/cm² | 2050 mJ/cm²



1650 mJ/cm² | 1750 mJ/cm² | 1850 mJ/cm² | 1950 mJ/cm² | 2050 mJ/cm²



Film Thickness: **24 µm**
Optitrac coat and Bake
SB: 1st layer 110 C / 80 sec
2nd layer 115 C /180 sec
Ultratech 1500 gh line Stepper
AZ 400K 1:4, 260 sec continuous spray @ 27 C

AZ® P4620 Lithographic Performance Summary

Process Conditions

Substrate :	Bare-Si
Film-thickness :	17μm
Softbake :	120°C / 240 sec. (DHP)
Exposure :	Canon PLA-501F (ghi-line)
Dose :	630 mJ/cm^2
Development :	AZ 400K Developer 1:4, Immersion - 300 sec., 23°C

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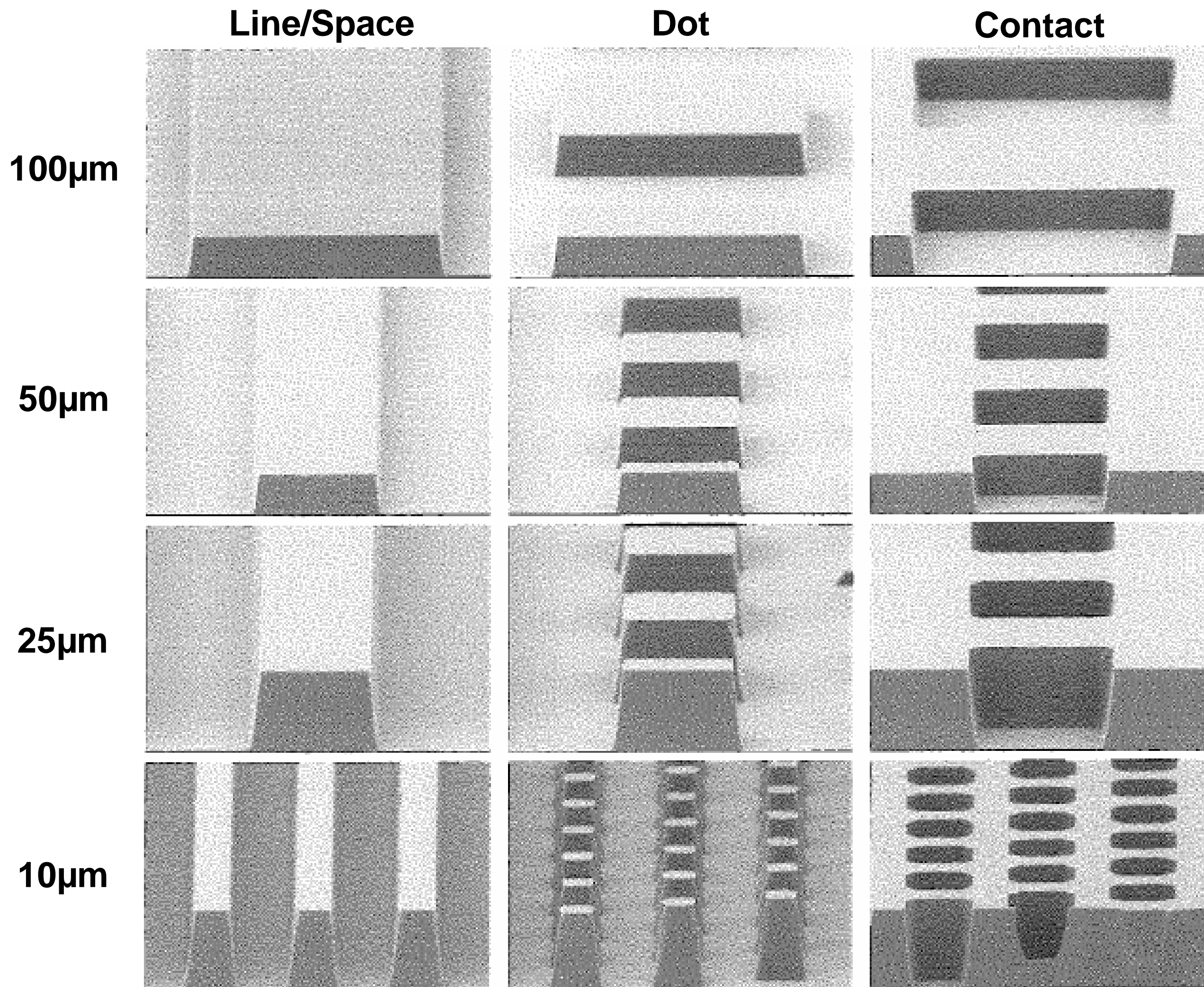
AZ® P4620 Lithographic Performance Summary



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AZ® P4000 Bleached Absorbance Curve

AZ P4000 Series resist(s)
Ellipsometrc Absorbance
Normalized to 1/µm

'k' ellipsometric: P4000

Absorbance ('k')

5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00

175 200 225 250 275 300 325 350 375 400 425 450 475 500

Wavelength (nm)

AZ® P4000 Unbleached Absorbance Curve

AZ P4000 Series resist(s)
Ellipsometrc Absorbance
Normalized to 1/µm

'k' ellipsometric: P4000

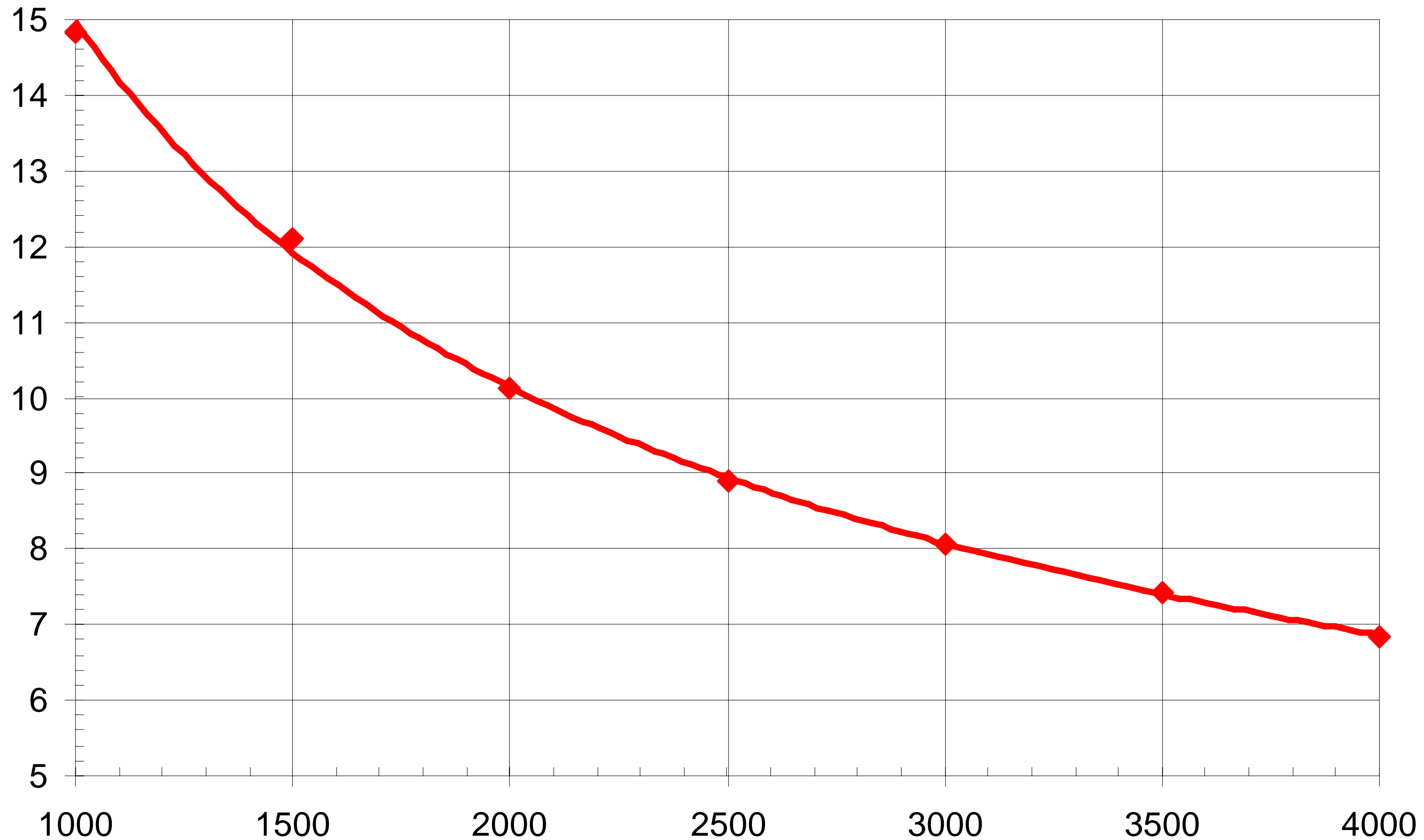
Absorbance ('k')

3.00
2.50
2.00
1.50
1.00
0.50
0.00

175 200 225 250 275 300 325 350 375 400 425 450 475 500

Wavelength (nm)

AZ® P4620 Spin Speed Curve



Substrate: 150 mm Silicon
Softbake: 110ºC/ 180 sec hotplate

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SEVERAL GRADES AVAILABLE

35
30
25
20
15
10
5
0

Film Thickness (u

1000 2000 3000 4000 5000 6000

Spin Speed (RPM)