

SHIPLEY MEGAPOSIT® SPR® 955-CM PHOTO RESIST

Introduction

SPR955-CM i-Line photoresist delivers high throughput, critical level processing of contact hole and dense metal features when used with 0.24N and 0.26N developers.

Features

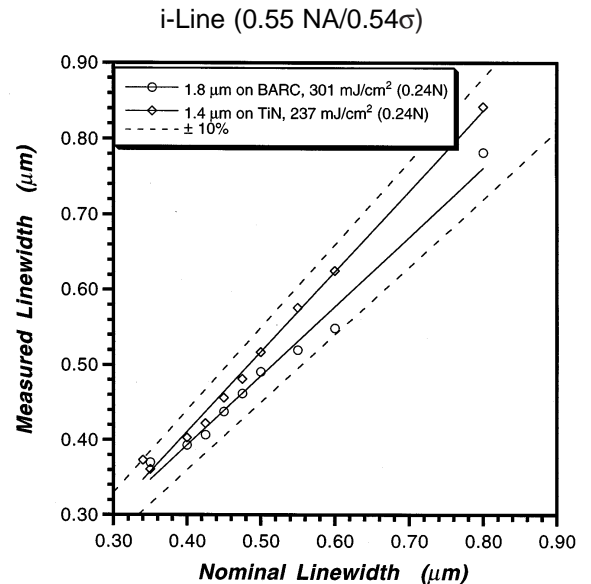
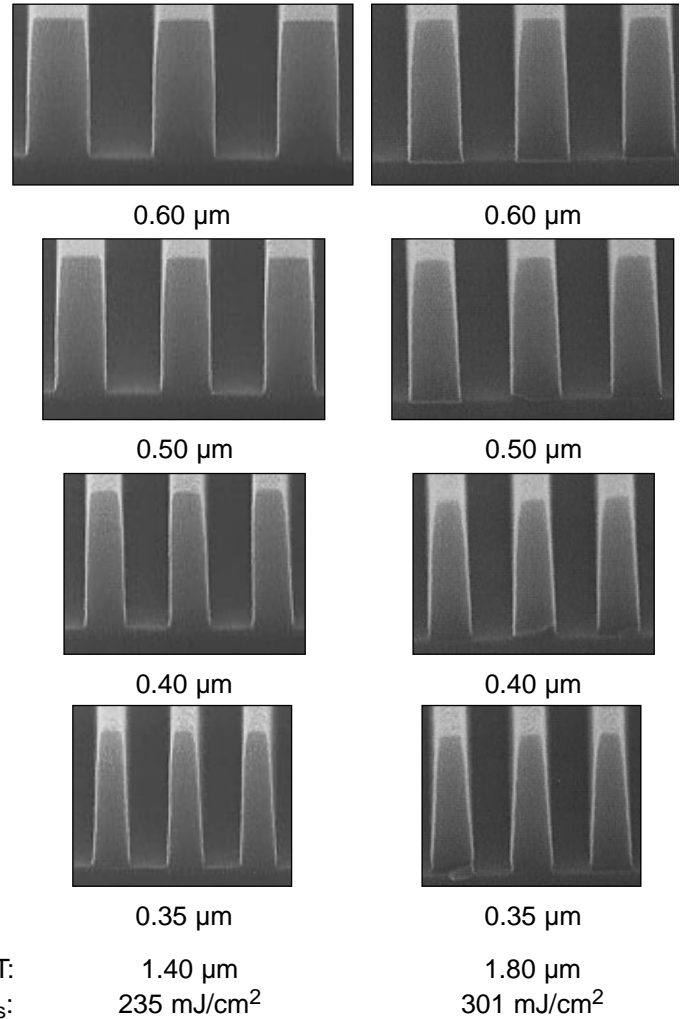
- ◆ Design rules $\geq 0.30 \mu\text{m}$ contact hole on oxide
 $\geq 0.35 \mu\text{m}$ dense features on metal
- ◆ Low optical density for improved profiles
- ◆ Wide depth of focus with minimal focus tilt
- ◆ High throughput (for 0.24N develop)
 - Exposure: $\leq 270 \text{ mJ/cm}^2$ sizing energy for $0.35 \mu\text{m}$ contact hole
 - $\leq 235 \text{ mJ/cm}^2$ sizing energy for $0.40 \mu\text{m}$ dense lines and spaces
- Develop: 45–60 sec. flexibility

Baseline Process Conditions

	Contact Hole Application
Thickness	0.7–1.2 μm
Softbake	90°C/90 sec. Proximity* Hotplate
PEB	120°C/90 sec. Proximity* Hotplate
Develop	LDD-26W (0.26N) MF-501 or MF-701 (0.24N)
	Dense Metal Features Application
Thickness	1.3–2.3 μm
Softbake	100°C/90 sec. Proximity* Hotplate
PEB	110°C/90 sec. Proximity* Hotplate
Develop	LDD-26W (0.26N) MF-501 or MF-701 (0.24N)

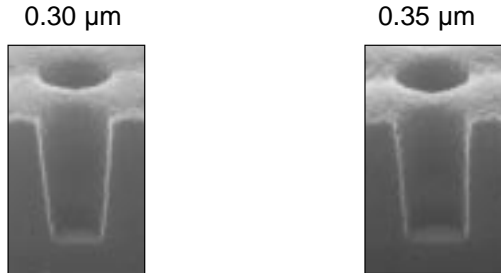
*Proximity gap = 150 μm

Throughput and Resolution



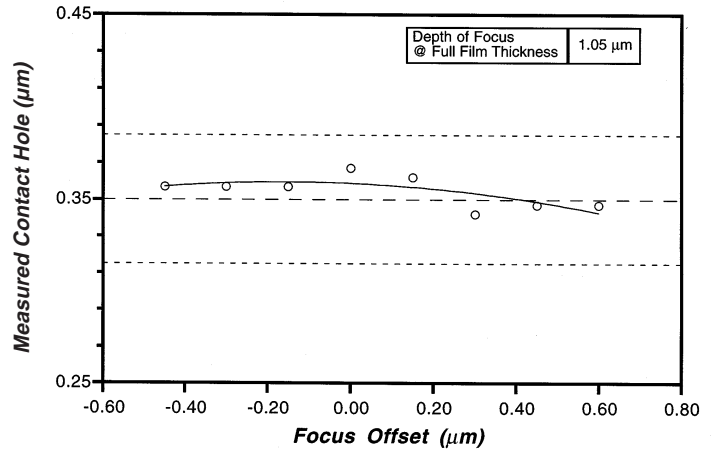
SPR[®]955-CM

Contact Hole Resolution



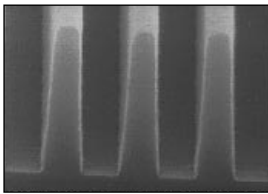
FT: 0.865 μm
 Substrate: 3,000Å Silicon Oxide
 Develop: MF-501 (0.24N)

0.35 μm Focus Latitude on Silicon



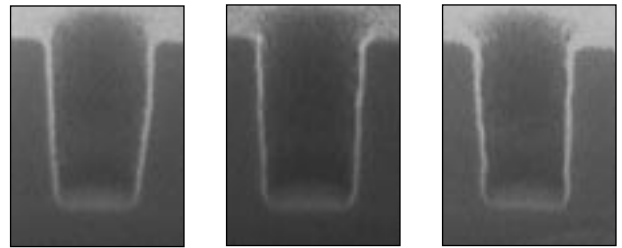
Dense Metal Feature Resolution

0.34 μm Lines/Spaces



FT: 1.40 μm
 Substrate: 400Å Titanium Nitride
 Develop: MF-501 (0.24N)

FT: 0.865 μm FL: 1.05 μm
 E_s: 270 mJ/cm²



Focus: -0.45 μm 0.00 μm +0.60 μm
 Developer: LDD-26W (0.26N)

Lithographic Performance

Contact Hole Application		
Lithographic Performance Results	Developer Type	
	0.24	0.26
Substrate	3,000Å SiO ₂	
Developer Normality	0.24	0.26
Film Thickness (μm)	0.865	0.865
Photospeed (mJ/cm ²)	78	55
0.35 μm E-Size (mJ/cm ²)	270	235
0.35 μm E _s :E ₀ Ratio	3.46	4.27
0.40 μm E-Size (mJ/cm ²)	225	170
0.40 μm E _s :E ₀ Ratio	2.88	3.10
Dense Resolution (μm)	0.30	0.30
0.35 Dense DoF (μm)	≥1.00	≥0.90
0.40 Dense DoF (μm)	≥1.10	≥1.00
0.35 Exp. Latitude (%)	21.2	21.0
0.40 Exp. Latitude (%)	28.7	29.0

Thick Photoresist for Metal Applications									
Lithographic Performance Results	0.24N Developer Applies to BARC and TiN				0.26N Developer Applies to BARC and TiN				
	1.30	1.50	1.80	2.30	1.30	1.50	1.80	2.30	
Film Thickness (μm)	1.30	1.50	1.80	2.30	1.30	1.50	1.80	2.30	
Photospeed (mJ/cm ²)	96	116	143	191	78	89	110	148	
0.40 μm E-Size (mJ/cm ²)	210	244	301	402	165	194	225	313	
0.40 μm E _s :E ₀ Ratio	2.19	2.18	2.10	2.10	2.12	2.18	2.00	2.10	
0.50 μm E-Size (mJ/cm ²)	210	244	278	338	170	194	205	265	
0.50 μm E _s :E ₀ Ratio	2.14	2.18	1.90	1.80	2.18	2.18	1.86	1.80	
Dense Linearity (μm)	0.33	0.33	0.35	0.40	0.35	0.35	0.38	0.40	
Dense Resolution (μm)	0.33	0.33	0.35	0.38	0.35	0.35	0.38	0.40	
0.40 μm DoF @ Full FT	1.05	1.05	0.75	0.60	1.05	0.90	0.50	0.60	
0.40 DoF vs CD (μm)	1.65	1.50	1.35	0.90	1.50	1.35	0.75	0.75	
0.50 μm DoF @ Full FT	1.50	1.40	1.10	0.60	1.35	1.20	0.90	0.75	
0.50 DoF vs CD (μm)	1.80	1.70	1.35	1.00	1.65	1.50	1.10	0.90	
0.40 Exp. Latitude (%)	26.2	24.6	14.0	8.0	20.0	22.1	13.2	8.0	
0.50 Exp. Latitude (%)	42.8	40.9	34.2	20.5	32.3	34.6	22.1	18.8	

Lithographic Performance Summary Table generated for a 0.55 NA, 0.54σ exposure using a 60 sec. single puddle.