

Process Applications

□ Photoresist Strip

- Bulk Strip Removal
- Implant
 - UV Cured
 - Baked
- Post Etch
 - Post Oxide
 - Post Poly
 - Post Metal
- Clean /Descum (post developed)
- Low Temperature Resist Removal
- Selective strip to organic low k material

□ Etch Applications

- Cyclotene / BCB Clean
- Surface Preparation
- Pad Etch
- Round (Oxide) Etch
- High Selectivity Nitride
- Backside Etch
- Sicheome

□ Advanced Packaging

- BCB Descum
- Plating Resist Strip
- Polyimide Etch / Descum
- Dry Film

Silicon

GaAs

Wafer Bumping

Thin Film Heads

MST/MEMS

Matrix System 1- Strip & Etch

Models 104, 105, 145, 106, 111, 303

Field Proven System 1 100mm - 150mm Platform

- RF power, Downstream, isotropic processing
- Reliable, Simple to Operate
- >725 systems in field
- Small Footprint: 25"W x 28"D
- Low CoO
- CE and UL 1262 Compliant
- Model 111
 - High Rate, No-Damage, Resist Strip (2.25-3.5 um/min) >50 wph
- Model 106
 - High Temperature Resist Strip (<300°C) 45 wph
- Model 105
 - Moderate Temperature Resist Strip (80-250 °C) 35wph
 - Descum / Clean, GaAs, MEMS Applications
- Model 104
 - Low Temperature (25-90 °C), Controlled Resist Clean / Descum & Surface Preparation, Metal De-Oxidation
- Model 145
 - Low Temperature (25-90 °C), Controlled Resist Clean / Descum
- Model 303
 - Isotropic Etch of Oxides, Nitride, SiChrome, Low K, BCB



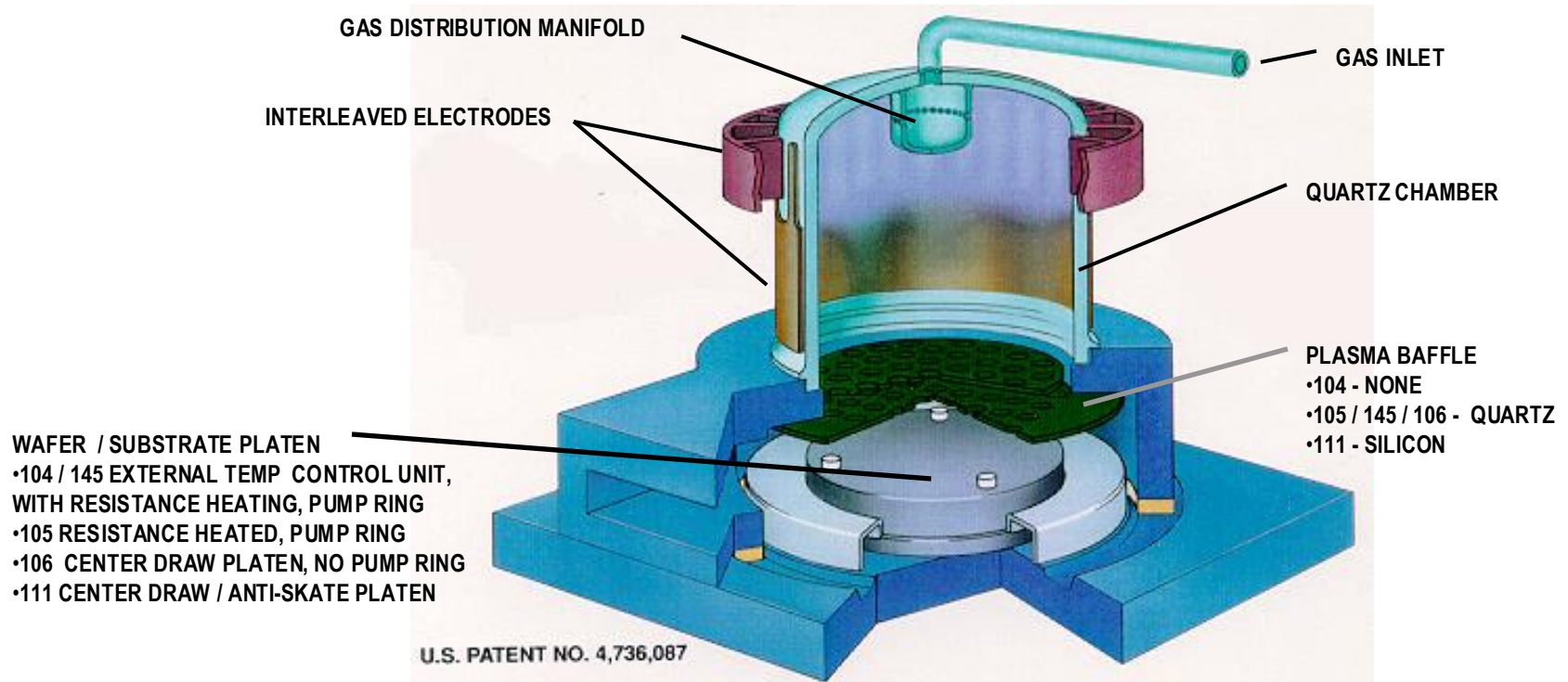
Matrix System 1

Through-the-Wall Configuration

- ❑ Saves valuable fab Bay floor space
- ❑ Available as Models 204, 205, 245, 206, 211, 403
- ❑ Similar footprint in chase area as stand alone style
- ❑ Only cassette, robot and display project into Bay.



System 1 Resist Strip Reactor



System 1, Model 105

150mm Performance

Specification

□	<u>SPECIFICATION</u> Rate:	0.8 - 1.5 μ /min. (@ 200 to 250 deg C.) bulk strip 1000 A/min descum@150C
□	Removal Uniformity:	<15% (Max-Min) Strip <15% (Max-Mn) Descum
□	Temperature Control:	80 - 250°C ($\pm 2^\circ$ C)
□	Process Range (for bulk strip application)	
	Pressure:	3.0 to 5.0 torr
	Power:	250-475 W
	Flow:	1.0-2.5 liters O ₂
	Endpoint:	Diode array
□	Particulates:	<0.05/cm ² (0.03 μ m or greater)
□	Damage	
	CV:	<0.1V from control
	Mobile Ion:	<1-2 E ¹⁰
	Vt:	0% total shift on 98% of points tested, no shift >5%

Actual

□	<u>ACTUAL</u> Rate:	1.5 μ m/min (@30 sec partial strip)*
□	Removal Uniformity:	10% (max-min) (6mm edge exclusion)
□	Temperature Control:	250°C ($\pm 5^\circ$ C)
□	Process conditions	
	Pressure:	4.0 torr
	Power:	425 W
	Flow:	O ₂ 1.75 liters
		*Resist Type: AZ1350J
		Thickness: 1.5 μ m
		Bake Temp: 120 deg C

Model 106 Stripper Featured Enhancements

Enhancements for System 106 over Model 105:

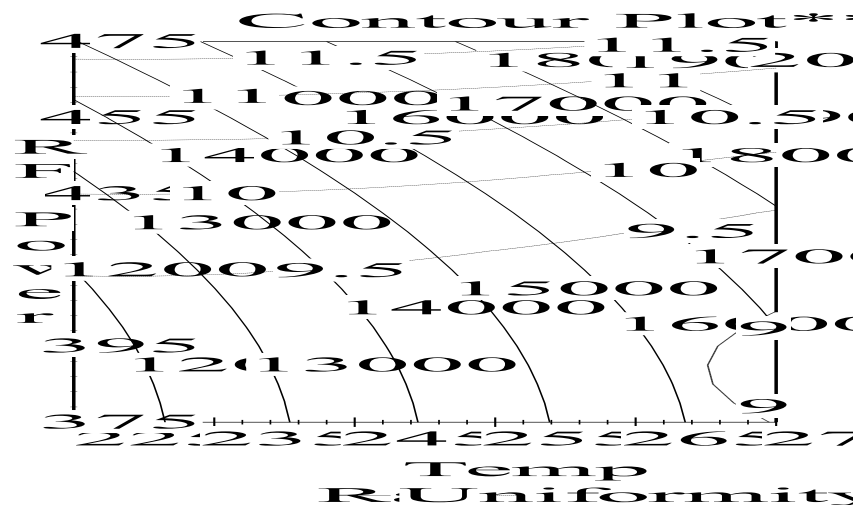
- **High-Temperature, Center-Draw Wafer Chuck**
 - Chuck Temperature range increased to 300°C maximum
 - Higher wafer temperature increases strip rate
- **Center-Draw Chuck Design improves chamber flow dynamics**
 - Improves process window & uniformity
 - Reduces parts, eliminates pump ring, improves maintenance
- **Thermally isolated chuck & baseplate**
 - Eliminates need for baseplate water cooling
- **Wafer cool down station**
 - Allows wafer cooling with small increase in system overhead time
- **Throughput increase can be 10-25%, depending on process**
- **Model 106 upgrade from Model 105 is field-retrofittable and cost effective**
- **Model '105CD' has Center-Draw Chuck improvement only vs Model 105.**

System 1, Model 106

150mm Performance

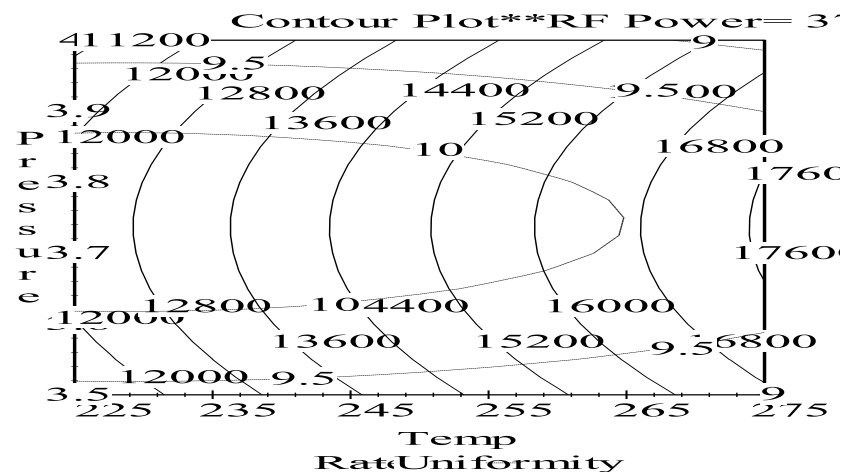
Specification

☐ SPECIFICATION	Rate:	1.1 - 2.0 μ /min. (@ 225 to 275 deg C.) bulk strip
☐	Removal Uniformity:	1000 A/min descum <15% (Max-Min) Strip <10% (Max-Mn) Descum
☐	Temperature Control:	125 - 300°C ($\pm$ 2°C)
☐	Process Range (for bulk strip application)	
	Pressure:	3.0 to 5.0 torr
	Power:	375-475 W
	Flow:	1.0-2.5 liters O ₂
	Endpoint:	Diode array
☐	Particulates:	<0.05/cm ² (>0.03 μ m)
☐	Damage	
	CV:	<0.1V from control
	Mobile Ion:	<1-2 E ¹⁰
	Vt:	0% total shift on 98% of points tested, no shift >5%



Actual

☐ ACTUAL	Rate:	2.0 μ /min (@30 sec partial strip)*
☐	Removal Uniformity:	10.4% (max-min) (6mm edge exclusion)
☐	Temperature Control:	275°C ($\pm$ 5°C)
☐	Process conditions	
	Pressure:	4.0 torr
	Power:	425 W
	Flow:	O ₂ 1.75 liters
	*Resist Type:	AZ1350J
	Thickness:	1.5 μ m
	Bake Temp:	120 deg C



Model 111 Stripper

Featured Enhancements

Enhancements for System 111 over Models 106/105:

□ Silicon Baffle

- Effectively “getters” ion species, lowering plasma damage threshold
- Prevents plasma coupling that’s possible in dual quartz baffle arrangement, see CHARM data
- No ion leakage permits operating at lower pressure, higher flow, in a faster rate regime
- Laser drilled holes, and very thick substrate for longevity/reliability
- Compatible with typical process gases and applications: high dose implant, post etch, descum, etc.

□

Anti-Skate, High Temperature Chuck

- Chuck Temperature range 125 °C - 300 °C
- Anti-Skate feature enables atmospheric wafer pre-heat at any chuck temperature
- A-S chuck thermally isolated from chamber base plate, eliminating water cooling of baseplate

□

Upgraded Software version 4.07CX18 enables Pre-heat

- Pre-heat of just 4 seconds(user selectable) can increase strip rate up to 100%
- No system overhead time penalty for pre-heat

□

Wafer cool down station

- Allows wafer cooling with small increase in system overhead time

□

Higher Gas Flow, Lower Pressure capability

□

Add blower to standard roughing pump: 165 CFM (@200mtorr) pump speed, I.e.QDP40/250

□

Throughput increase can be 10-50%, depending on process

□

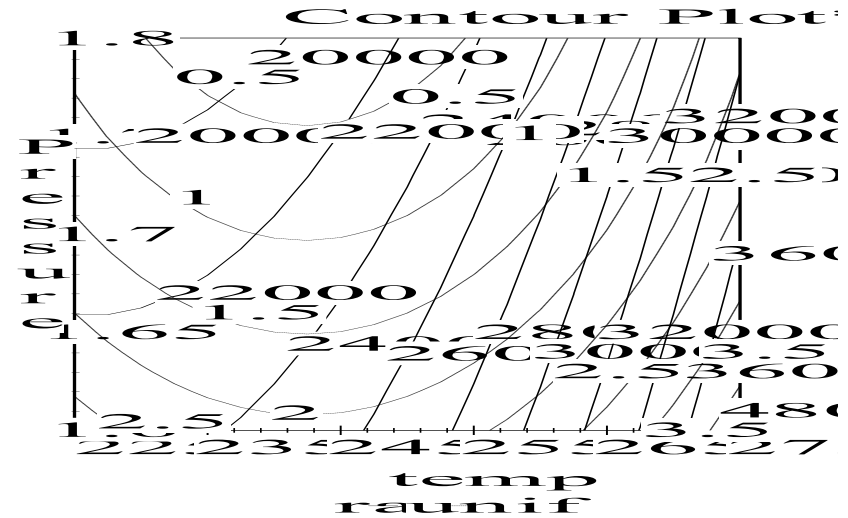
Model 111 Upgrade from 105/106 is Field Retrofittable and Cost Effective

System 1, Model 111

150mm Performance

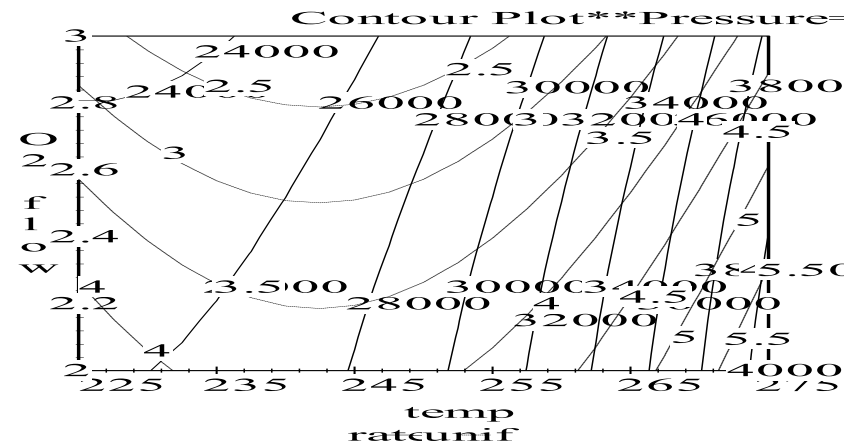
Specification

□	<u>SPECIFICATION</u> Rate:	2.2 - 3.7 u/min. (@ 225 to 275 deg C.) bulk strip
□	Removal Uniformity:	1000 A/min descum <15% (3 sigma) Strip <10% (3 sigma) Descum
□	Temperature Control:	125 - 300°C (±2°C)
□	Process Range (for bulk strip application)	
	Pressure:	1.6 to 1.8 torr
	Power:	375-475 W
	Flow:	2.0-4.0 liters O2
	Endpoint:	Diode array
□	Particulates: <0.05/cm ² (0.03µm or greater)	
□	Damage	
	CV:	<0.1V from control
	Mobile Ion:	<1-2 E¹⁰
	Vt:	0% total shift on 98% of points tested, no shift >5%



Actual

☐	ACTUAL Rate:	2.7 um/min (@30 sec partial strip)*	
☐	Removal Uniformity:	6.0% (3 sigma)	(6mm edge exclusion)
☐	Temperature Control:	250°C (±5°C)	
☐	Process Conditions		
	Pressure:	1.6 torr	
	Power:	450 W	
	Flow:	O ₂ 3.0 liters	
			*Resist Type: AZ1350J
			Thickness: 1.5 um
			Bake Temp: 120 deg C



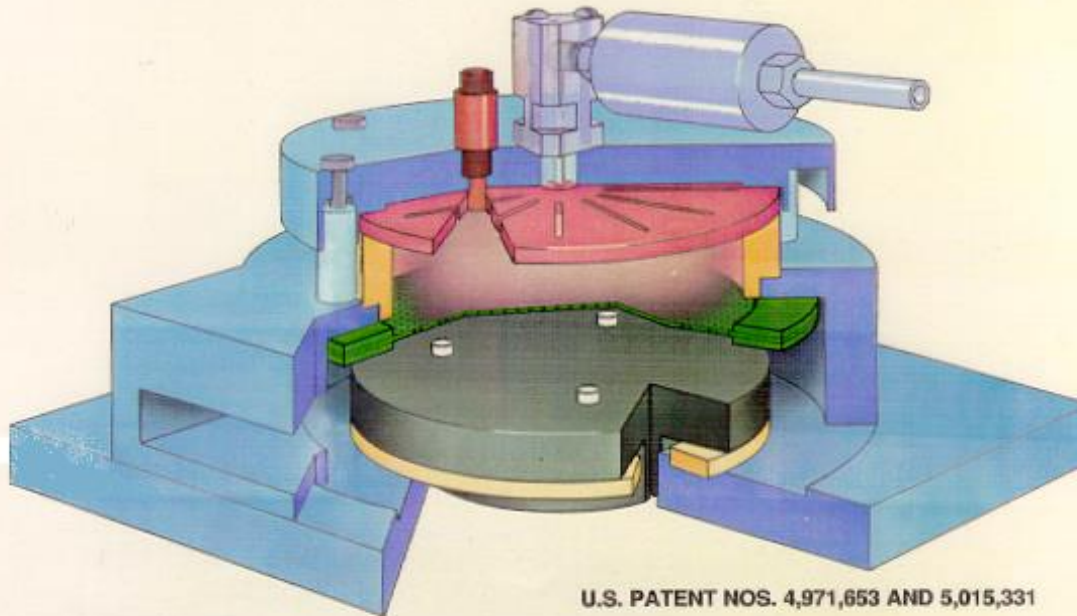
Model 104 System 1

TFH Applications

- ❑ **Pre-Metal Deposition Clean**
- ❑ **Pre-Plate Descum**
- ❑ **Pre-Wet-Etch Descum**
- ❑ **Pre-Gap Etch Descum**
- ❑ **Ion Milled Resist Surface Removal**
- ❑ **Resist Thinning**
- ❑ **Resist Stripping**
- ❑ **Adhesion Promotion**
- ❑ **Resist Removal Before Lapping**
- ❑ **Resist Surface Clean**
- ❑ **Metal Oxidation**

Model 303 Downstream Etcher

Downstream Isotropic Etch Reactor



APPLICATIONS

- Oxide "Round" Etch (contact/via)
- LPCVD Nitride Etch
- Backside Etch

BENEFITS

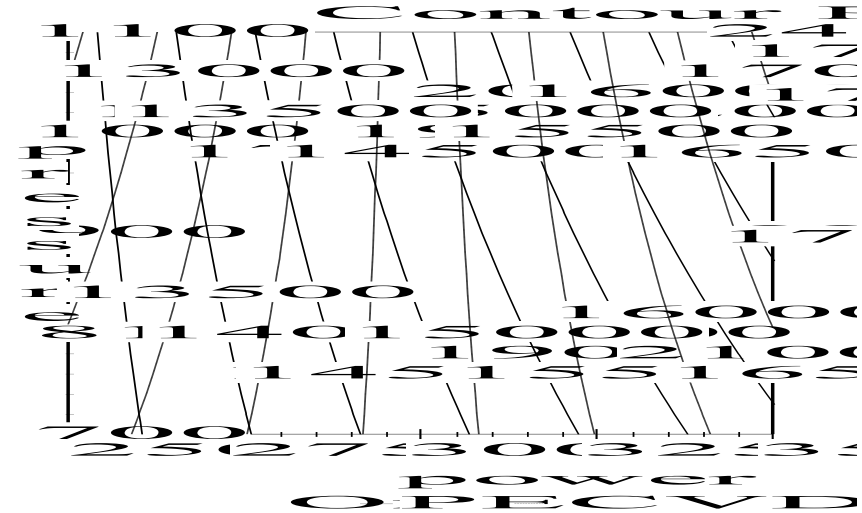
- High Etch Rates
- High Selectivities
- Excellent Uniformity & Repeatability

System 1, Model 303 Etcher

150mm Etch Performance

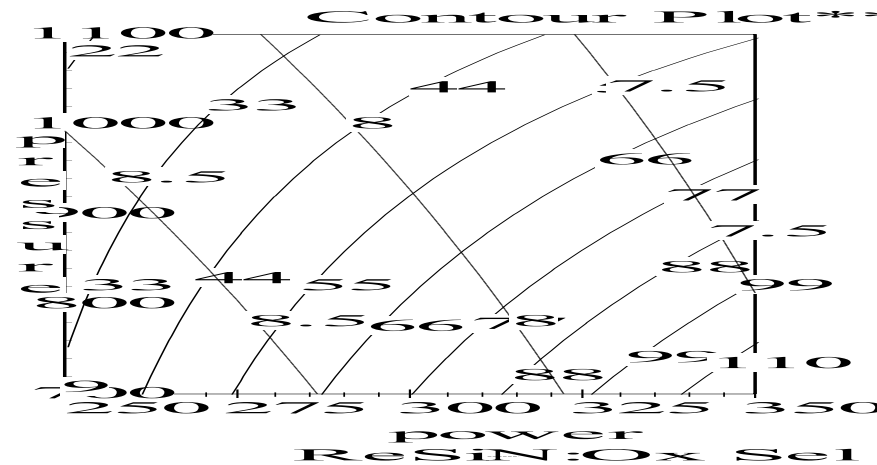
Specification

□ SPECIFICATION Rate:	>2000 Å/min. Th. Oxide >15,000 Å/min. LPCVD Nitride
□ Selectivity	>10:1 PR:Oxide
□ Temperature Control:	20-120°C (±2°C)
□ Process Range (for various application)	
Pressure:	0.50 to 1.80 torr
Power:	75-325 Watts
Flow:	10-60 sccm NF3 0-50 sccm O2 0-120 sccm He
Endpoint:	Monochrometer
□ Particulates:	<0.15/cm ² (>0.03µm size)



Actual

□ ACTUAL Rate:	>2000 Å/min. Oxide >15,500 Å/min. LPCVD Nitride
□ Selectivity :	>7:1 SiN:Oxide
□ Temperature Control:	110°C (±2°C)
□ Process Range	
Pressure:	0.9 torr
Power:	325 W
Flow:	60 sccm NF3 8 sccm O2 70 sccm He



Isotropic Etch Applications

System 1, Model 303

- ❑ **Isotropic Oxide Etch for Contacts and Vias**
- ❑ **Silicon ARC Removal**
- ❑ **Passivation Etch Oxynitride**
- ❑ **Passivation Etch Nitride**
- ❑ **Backside Poly Etch**
- ❑ **Backside Nitride Etch**
- ❑ **LPCVD Nitride Etch (LOCOS)**
- ❑ **ASM Alignment Mark Etch**
- ❑ **SiChrome Etch**

Isotropic Oxide Etch, Vias and Contacts

Model 303 Isotropic Etcher

Isotropic (Round) Via and Contact Etch Benefits:

- High Selectivity to Photoresist: >20:1
- Insensitive to oxide doping variations
- Applicable down to 0.5 micron
- Matrix 303 uses far less etch gas/wafer than competitive systems

Process recipe:

- 1.5T / 50sccm NF3 / 50sccm He / 325W RF / 110°C

Process Results(150mm):

- BPSG Etch Rate: >6500 Å/min
- TEOS Etch Rate >2500 Å/min
- Thermal Oxide Rate: >2000 Å/min
- Uniformity: <+/-5%
- Thruput(3000Å BPSG): >60WPH

SiChrome Etch Process

Model 303 Isotropic Etcher

SiChrome Film:

- **<250Å film, over oxide, resist patterned, 100mm wafer**

Process recipe:

- **1.0T / 138sccm CF4 / 15 sccm O2 / 325W RF / 25°C**

Process Results:

- **SiCr Etch Rate: 2-3 Å/second**
- **Uniformity: <10% 3σ**
- **Oxide E. R. 3-4 Å/second**
- **Profile: isotropic**
- **Throughput: >40WPH**