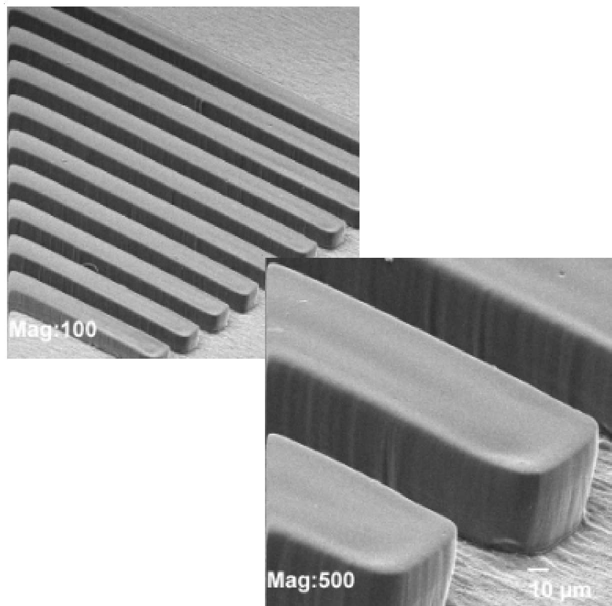
DuPont™ Riston®
PlateMaster PM200 Series

DATA SHEET & PROCESSING INFORMATION

Plating Resist for Copper, Tin, & Tin/Lead



Product Features/ Applications

- Negative working, aqueous processable dry film photoresist.
- Designed for pattern plate applications on scrubbed and unscrubbed electroless copper, and Direct Plate surfaces.
- Strong mechanical scratch resistance for development and post development process to achieve high yields.
- Increased productivity (Photospeed, development speed and stripping speed).
- Improved dry film conformation under conversional lamination parameters.
- Vivid print out image after exposure.
- Available in 40 micron (1.5 mil), 50 micron (2.0 mil), and 75 micron (3.0 mil) thicknesses.

Processing Data

This Data Sheet documents specific process information for Riston® PlateMaster PM200. Data quoted in this guide have been generated using production equipment as well as laboratory test methods, and are offered as a guidline. Actual production parameters will depend upon the equipment, chemistries, and process controls in use, and should be selected for best performance. For more background on general Riston® processing see the General Processing Guide (DS98-41).

The miracles of science™

PART 1: Copper Surfaces and Surface Preparation

PlateMaster PM200 has very strong resistance to lifting on all surfaces. Riston® PlateMaster PM200 is compatible with the following surfaces and surface preparations:

- Electroless:
  - Unscrubbed
  - Pumice and Brush scrubbed
- Direct metallization surfaces:
  - BlackHole
  - (should be compatible with other direct metallization surfaces)
- Panel plated copper (including conveyorized plating such as Uniplate® or "Segmenta")
  - Unscrubbed
  - Scrubbed

Antitarnish

The following antitarnishes have been used successfully per manufacturers' processing recommendations:

- Enthone Entek Cu56 (0.3 vol% below)
  (Others may give equally acceptable results)

For prelamination cleaning suggestions, see General Processing Guide and its references.

PART 2: Lamination

Riston® PlateMaster PM200 was formulated for excellent conformation in hot roll lamination.

Lamination Conditions DuPont HRL-24 & HRL-24 Film Laminator

- Preheat: 45-50°C on Cu surface (optional)
- Lam. Roll Temp: 100-120°C (215-245°F)
- Roll Speed: 0.6-1.5 m/min (2-5 ft/min)
- Air Assist Pressure: 0-2.8 bar (0-40 psig)

Note: for >1.4 bar use heavy-duty rolls

Laminator Conditions for Automatic Sheet Laminators

- Preheat: 45-50°C on Cu surface
- Seal Bar Temp.: 50 - 80°C
- Lam. Roll Temp: 100-115°C
- Seal Bar Pressure: 3.5-4.5 bar (50-65 psig)
- Lam. Roll Pressure: 3.0-5.0 bar (43-72 psig)
- Seal Time: 1-4 seconds
- Lamination Speed: 1.5-3 m/min

Note: For Hakuto Mach 610i laminators, a lamination roll temperature range of 105-120°C is recommended.

General Suggestions

- Start with Roll temperatures of 110 to 115°C and adjust as necessary.
- Reduced lamination roll pressure and/or temperature may be required in tenting applications to avoid tent breakage and resist flow into through-holes.
- Ensure that panel holes are completely dry before resist lamination.
- Resist wrinkling can be caused by high temperatures. Decrease roll temperature or eliminate preheat.
- Panels may be exposed immediately after lamination; however, allow enough time for panels to cool to room temperature before exposure for phototool dimensional stability.
- Note comments under Safe Handling with respect to exceeding highest recommended lamination roll temperature.

PART 3: Exposure

Riston® PlateMaster PM200 can be exposed on all standard equipment used in the printed circuit board industry. Choose lamps that compliment the peak resist response of 350 to 380 nm.

Riston® PlateMaster PM200 has better resolution and wider exposure latitude than other resists. It is also more resistant to off-contact exposure defects, which are common in glass/glass exposure frames.

Resolution down to 50 microns (2 mil) lines and spaces is possible with Riston® PlateMaster PM200 in optimized production environments.

Recommended Exposure Range				
	PM240	PM250	PM275	PM299
RST	10-17	10-17	10-17	10-17
SST	7-9	7-9	7-9	7-9
mJ/cm^2	35-78	40-90	52-104	60-110

Suggestions:

- Start with RST 13-14 for fine line applications, (100 microns L/S).
- Start with RST 15-16 for $\geq$125 microns L/S.

Note:

- RST = DuPont Riston® 25-Step Density Tablet (read as highest resist step)
- SST = Stouffer 21-Step Sensitivity Guide (read as highest resist step)
- Exposure energy (mJ/cm^2) from International Light Radiometer model IL1400A with Super Slim UV Probe (SSL001A) on an Olec AP30-8000 exposure unit.

PART 4: Development

Riston® PlateMaster PM200 can be developed in sodium or potassium carbonate with good productivity. It has wide development latitude and is less sensitive to developer concentration, breakpoint, and rinse water hardness than most other resists.

Development Recommendation

- **Spray Pressure:**
  1.4-2.4 bar (20-35 psig) (high impact direct-fan or cone nozzle preferred).
- **Chemistry:**
  Na_2CO_3: 0.7-1.0 wt%; 0.85 wt% preferred
  $Na_2CO_3.H_2O$: 0.8-1.1 wt%; 1.0 wt% preferred
  K_2CO_3: 0.75 -1.0 wt%; 0.9 wt% preferred

***Note*:** The use of buffered development solutions, containing KOH (Potassium Hydroxide) or NaOH (Sodium Hydroxide), is not recommended with DuPont Riston® Photoresists. These solutions can lead to excessive foaming and high dissolved photoresist loading, compromising sidewall quality and photoresist resolution. Also, use of buffered chemistries can increase residue build-up in the developer, resulting in increased weekly equipment clean-out costs.

Temperature: 27-30°C (80-85°F); 28°C(82°F) preferred

Breakpoint: 50-70 % (60 % preferred)
Dwell Time (approx. time with 60% breakpoint))

Riston® PlateMaster 240:	32-48 secs
Riston® PlateMaster 250:	36-52 secs
Riston® PlateMaster 275:	46-62 secs
Riston® PlateMaster 299:	55-73 secs

Resist Loading:

Replenishment	**PM240**	**PM250**
Feed & Bleed	0.12 m^2/liter (4.9 ft^2/gal)	0.10 m^2/liter (4.1 ft^2/gal)
Batch Processing	0.19 m^2/liter (7.7 ft^2/gal)	o.15 m^2/liter (6.1 ft^2/gal)

Rinse water: hard water (150-250 ppm $CaCO_3$ equivalent)
Rinse Spray Nozzles: High Impact, direct fan nozzles preferred
Drying: blow dry thoroughly; Hot air preferred
Feed & Bleed Control: Set pH controller to a set point of 10.6 for best results, or maintain active carbonate at 65-78% of total carbonate, or use board count to maintain the recommended resist loading.
Batch Processing Control: Dump when reaching pH 10.2,or when active carbonate has fallen to 60% of total carbonate.

Defoamers

Riston® PlateMaster PM200 could require the use of a defoamer. If required, add 1-3 ml/liter (4-11 ml/gallon) of these antifoams:

- Pluronic 31R1

Others may work as well.

PART 5: Plating
(acid copper sulfate; tin/lead;tin)

(Follow plating vendors' recommendations)

Riston® PlateMaster PM200 can be used for pattern plate processes with acid copper, tin/lead, tin, nickel and gold plating baths. Riston® PlateMaster PM200 has very strong resistance to lifting and underplating.

Recommendations: Preplate Cleaning Process Sequence

- Acid Cleaner : 38-50°C (100-120°F); 2-4 minutes
- Spray and/or Tank Rinse: 2 minutes
- Microetch to remove 0.15-0.25 µm (5-10 µ") copper (time: as required)
- Spray and/or Tank Rinse: 2 minutes
- Sulfuric acid (5-10 vol%) dip; 1-2 minutes
- (Optional: spray rinse; 1-2 minutes)

PART 6: Etching

- Riston® PlateMaster PM200 is compatible with most acid etchants, e.g., cupric chloride (free HCl normality $\leq$ 3.0 N), hydrogen peroxide/sulfuric, and ferric chloride.
- Riston® PlateMaster PM200 is not formulated to resist most alkaline ammonical etch processes.

PART 7: Stripping

Riston® PlateMaster PM200 film is formulated to dissolve slowly in stripping solution after breaking up into pieces. This can greatly increase the life of stripping solution and reduce costs, if the resist can be removed before dissolving.

Stripping Recommendations

- **Chemistry:**
  NaOH: 1.5 - 3.0wt%; faster stripping at 3wt%
  KOH: 1.5 - 3.0wt%; faster stripping at 3wt%
  Proprietary Strippers: concentration per vendor recommendation
- **Spray Pressures:** 1.4-2.4 bar (20-35 psig)
- **Spray Nozzles:** High Impact direct fan
- **Breakpoint:** 50% or lower
- **Stripper Dwell Times** (seconds) at 55°C(130°F) (approximate). Dwell time is total time spent in the stripper, given a 50% breakpoint

Chemistry	PM240	PM250
3.0 wt% NaOH	60-80	90-120
1.5wt% NaOH	130-160	150-180
3.0wt% KOH	110-140	130-170
1.5 wt% KOH	140-170	150-180

- **Defoamers:** Follow recommendations in Developer Section.

Proprietary Strippers

Proprietary stripper formulations under evaluation.

Waste Disposal

For questions concerning disposal of photoresist waste refer to the latest DuPont literature and Federal, State, and Local Regulations.

Safe Handling

Consult the Material Safety Data Sheet (MSDS) for Riston® dry film photoresist vapors. The vapor MSDS for this film was prepared using the highest lamination roll temperature recommended for use. If you choose to exceed this temperature, be aware that the amount of vapor may increase and that the identity of the materials vaporized may vary from those in the MSDS. For more Safe Handling information, see publication Technical Bulletin TB-9944 , "Handling Procedure for DuPont Photopolymer Films".

Storage

See recommendations in the General Processing Guide (DS98-41).

For further information on DuPont™ PM200 Series, please contact your local representative.

DuPont Electronic Technologies
14 T. W. Alexander Drive
Research Triangle Park, NC 27709 USA
www.imaging-materials.dupont.com

This information corresponds to DuPont's current knowledge on the subject. It is offered solely to provide possible suggestions for your own experiments and is not intended to substitute for any testing you may need to conduct to determine the suitability of DuPont's products for your particular purposes. This information may be subject to revision as new knowledge and experience becomes available.

Since DuPont cannot anticipate all variations in actual end-use conditions, it makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right
Caution : Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement", H-51459.

The miracles of science™