DuPont™ Riston® 9000 Series
DATA SHEET & PROCESSING INFORMATION

Photopolymer Dry Film Resist for Acid Etching, Alkaline Etching, Plating, and Photochemical Machining

Product Features/Applications

• Negative working, aqueous processable dry film photoresist.
• Available in 20 micron (0.8 mil), 33 micron (1.3 mil), 38 micron (1.5 mil), 50 micron (2.0 mil), and 75 micron (3.0 mil) thicknesses.
• Suitable for pattern plate applications on scrubbed and unscrubbed electroless copper.
• Suitable for print and etch applications with acid or alkaline etching.
• Suitable for some photochemical machining applications.
• Suitable for tent-and-etch applications.
• Compatible with double-treat copper surfaces.

Processing Data

This Data Sheet documents specific process information for Riston® 9000 Series. Data quoted in this guide have been generated using production equipment as well as laboratory test methods, and are offered as a guideline. 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. For additional information, see publication (TB-9944)
PART 1: Copper Surfaces and Surface Preparation

For prelamination cleaning, see General Processing Guide.

Riston® 9000 is compatible with the following surfaces and surface preparations:

- Vendor copper (standard foil, fine grain foils, reverse treated foils):
  - Scrubbed
  - Chemically cleaned
  - Electrochemically cleaned.
- Electroless copper:
  - Unscrubbed
  - Pumice and brush scrubbed
- Double Treat copper

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

- Duratech PCL
- Enthone Entek Cu56

(others may give equally acceptable results)

PART 2: Lamination

Lamination Conditions
DuPont HRL-24 & HRL-24/YieldMaster® Film Laminator

- Pre-Heat (optional):
- Lamination Roll Temp.: 100-125 °C (212-260°F)

Note: Expected Board Exit Temperature:

<table>
<thead>
<tr>
<th>Layer Type</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innerlayers</td>
<td>60-70°C (140-160°F)</td>
</tr>
<tr>
<td>Outerlayers (Cu/Sn or Cu/SnPb)</td>
<td>45-55°C (110-130°F)</td>
</tr>
<tr>
<td>Outerlayers (Gold Plate)</td>
<td>50-55°C (120-130°F)</td>
</tr>
</tbody>
</table>

(Note for information on how to use Board Exit Temperature for process control, see General Processing Guide)

- 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

- Total Water Flow Rate, (YIELDMASTER® models only): 3-15 cc/min.

Note: Use distilled water; hard water is acceptable but may cause scale build up and clogged nozzles.

PART 3: Exposure

Riston® 9000 can be exposed on all standard equipment used in the printed circuit board industry. Choose lamps that compliment the peak resist wavelength response of 350 to 380 nm.

Resolution down to 75 microns (3.0 mil) lines and spaces is possible with Riston® 9000 in optimized production environments.
Recommended Exposure Range

<table>
<thead>
<tr>
<th></th>
<th>Riston 9008</th>
<th>Riston 9013</th>
<th>Riston 9015</th>
<th>Riston 9020</th>
<th>Riston 9030</th>
</tr>
</thead>
<tbody>
<tr>
<td>RST</td>
<td>10 – 18</td>
<td>10 - 18</td>
<td>10 – 18</td>
<td>10 – 18</td>
<td>10 – 18</td>
</tr>
<tr>
<td>SST</td>
<td>7 - 10</td>
<td>7 - 10</td>
<td>7 - 10</td>
<td>7 - 10</td>
<td>7 - 10</td>
</tr>
<tr>
<td>mj/cm²</td>
<td>30 – 60</td>
<td>40 – 90</td>
<td>40 – 100</td>
<td>55 – 120</td>
<td>55 – 130</td>
</tr>
</tbody>
</table>

Suggestions:
- Start with RST 13-14 for fine line applications, (100 microns L/S).
- Start with RST 15-16 for ≥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/cm²) from APM Radiometer Model 87 on a DuPont PC-130 exposure unit.

PART 4: Development
Riston® 9000 Series can be developed in sodium or potassium carbonate with good productivity. It has been formulated to require little or no antifoam in development.

Development Recommendation
- **Spray Pressure:** 1.4-2.4 bar (20-35 psig)
  (high impact direct-fan or cone nozzle preferred).
- **Chemistry:**
  Na₂CO₃  0.7-1.0 wt%; 0.85 wt% preferred
  Na₂CO₃.H₂O: 0.8-1.1 wt%; 1.0 wt% preferred
  K₃CO₃: 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 buildup in the developer, resulting in increased weekly equipment clean-out costs.

- **Temperature:** 27-35°C (80-95°F); 30°C (85°F) preferred
- **Breakpoint:** 50-70 % (65 % preferred)
- **Dwell Times** (approximate)
  - Riston® 9015: 28 seconds
  - Riston® 9020: 37 seconds
  - Riston® 9030: 52 seconds
- **Resist Loading:**
  Feed & Bleed: 2-12 mil-ft²/gal; 0.06-0.37 m²/liter
  Batch Processing: 0 - 12 mil-ft²/gal; 0 - 0.37 m²/liter
- **Rinse water:** hard water (150-250 ppm CaCO₃ equivalent), preferred. Rinse water may be artificially hardened. Consult your DuPont Technical Representative for details.
- **Rinse Spray Nozzles:** High Impact, directfan 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.

Note: Dwell Time ranges were established in Chemcut type C-2000 developer equipment, using sodium carbonate and 2 - 10 mil-ft²/gal loading, with all other variables set within the preferred ranges mentioned above.
Stripping Recommendations

- **Chemistry:**
  - NaOH: 1.5 - 3.0wt%
  - KOH: 1.5 - 2.5wt%
  - 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.
- **Defoamers:** Follow recommendations in Developer Section.

Proprietary Strippers

The following proprietary stripper have been used successfully for Riston®9000:
- Ardrox PC-4055
- Ardrox PC-4077
- Dexter RS1677 (Delta Strip 775)
- ADF-12 (Electrochemicals)

Others may perform equally well.

Generic mixtures of 3% NaOH (or KOH) plus 3% MEA (monoethanolamine) have also been used successfully.

Storage & Safe Lighting


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 (TB-9944) “Handling Procedure for DuPont Photopolymer Films”.

Waste Disposal

For questions concerning disposal of photoresist waste refer to the latest DuPont literature and Federal, State, and Local Regulations.
For further information, please contact your local representative.

DuPont Electronic Technologies
14 T. W. Alexander Drive
Research Triangle Park, NC 27709 USA

www.imaging-materials.dupont.com

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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.