DuPont™ Riston®
Special FX Series - FX515
DATA SHEET & PROCESSING INFORMATION

For Fine Line Print and Etch in Photochemical Machining and PWB Applications

Product Features / Applications

• Negative working, aqueous processable dry film photoresist.

• Available in 15 micron (0.6 mil) thickness.

• Designed particularly for fine line print and etch applications with acid etching.

• Suitable for most fine feature photochemical machining applications such as lead frames.

Processing Data

This Data Sheet documents specific process information for Riston® FX515. 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).
PART 1A: Copper Surfaces and Surface Preparation

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

Riston® FX515 is compatible with the following copper surfaces and surface preparations:

• Vendor copper (standard foil, fine grain foils, reverse treated foils)
• Electroless copper:
  Unscrubbed
  Pumice and brush scrubbed
• Panel plated copper (including conveyorized plating such as Uniplate® or “Segmenta”)
  Scrubbed
• Double Treat Copper

PART 1B: Photochemical Machining Surfaces and Surface Preparation

Riston® FX515 is compatible with the following photochemical machining surfaces and surface preparations:

Note: wet lamination tends to improve resist adhesion on most photochemical machining metals. A prebake of 120°C for 10 minutes is recommended to drive off any adsorbed hydrogen or other gases unless the bake causes unacceptable oxidation of the metal surface. For additional detail refer to Technical Bulletin TB-9629.

• Aluminum
  Not anodized: Hot alkaline cleaner (40-50°C), 3-6% sodium hydroxide microetch, 35% nitric acid smut removal.
  Anodized: Mild, neutral soak cleaner.
• Chromium
  Hot alkaline cleaner (40-50°C).
• Copper Alloys / Brass
  Mild alkaline or acid cleaner as is used for printed circuit board cleaning.
• Gold
  Hot alkaline cleaner (40-50°C) followed by 2-5% sulfuric acid dip.
• Magnesium
  Mild alkaline cleaner. Mechanical cleaning with pumice may be used if necessary and the final surface finish allows.
• Nickel
  Commercially available degreaser. Mechanical cleaning with pumice may be used if needed. A 5% hydrochloric or sulfuric acid dip followed by drying can be used to activate the surface.
• Silver
  If the surface finish is not critical, mechanically clean with pumice. Otherwise use an alkaline soak cleaner and neutralize with dilute sulfuric or citric acid.

• Zinc
  If the surface finish is not critical, mechanically clean with pumice. Otherwise use an alkaline soak cleaner and rinse well.
• Stainless Steel
  Alkaline soak clean and neutralize with dilute sulfuric acid. Wet lamination is particularly recommended for stainless steel.

PART 2: Lamination

Lamination Conditions for DuPont HRL-24 & HRL-24/ Yieldmaster® Film Laminator

• Pre-heat: Optional
  • Lamination Roll Temperature: 100-120°C (212-248°F)

Note: Expected Board Exit Temperature:

Innerlayers: 60-70°C (140-160°F)
Outerlayers (gold plate): 50-55°C (120-130°F)
Outerlayers (Cu/Sn or Cu/Sn-Pb): 45-55°C (110-130°F)
(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 pressure • 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 clog nozzles.

Lamination Conditions for Automatic Sheet Laminators

• Pre-heat: Optional
  • Seal Bar Temp.: 50-70°C (122-158°F)
  • Lamination Roll Temperature: 100-120°C (212-248°F)

Note: Expected Board Exit Temperature:

Innerlayers: 60-70°C (140-160°F)
Outerlayers (gold plate): 50-55°C (120-130°F)
Outerlayers (Cu/Sn or Cu/Sn-Pb): 45-55°C (110-130°F)
(For information on how to use Board Exit Temperature for process control, see General Processing Guide)
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 (5-10 ft/min)
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 clog nozzles.

General Suggestions
- Start with roll temperatures of 110 to 115°C and adjust as necessary.
- Ensure that any panel holes are completely dry before resist lamination.
- Resist wrinkling can be caused by high temperatures. Decrease roll temperature or eliminate pre-heat.
- Panels may be exposed immediately after lamination; however, allow enough time for panels to cool to room temperature before exposure.
- Note comments under Safe Handling with respect to exceeding the highest recommended lamination roll temperature.
- Maximum recommended hold time with wet lamination is 24 hours.

PART 3: Exposure
Riston® FX515 can be exposed on all standard equipment used in the printed circuit board industry. Choose lamps that complement the peak resist response of 350 to 380 nm. Resolution down to 30 microns (1.2 mil) lines and spaces is possible with Riston® FX515 in optimized production environments and 25 microns (1.0 mil) in laboratory environments.

Recommended Exposure Range

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<tr>
<th>Riston</th>
<th>FX515</th>
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<tr>
<td>RST</td>
<td>6-18</td>
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<tr>
<td>SST</td>
<td>6-9</td>
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<td>mJ/cm²</td>
<td>16-65</td>
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Note:
- RST = DuPont Riston® 25-Step Density Tablet
- SST = Stouffer 21-Step Sensitivity Guide

PART 4: Development

Development Recommendations

Spray Pressure: 1.4-2.1 bar (20-30 psig).
- High impact direct-fan or cone nozzles preferred

Chemistry:
- Na₂CO₃: 0.7-1.0 wt%; 0.85 wt% preferred
- Na₂CO₃·H₂O: 0.8-1.1 wt%; 1.0 wt% preferred
- K₂CO₃: 0.8-1.1 wt%; 1.0 wt% preferred
- Temperature: 27-35°C (80-95°F); 30°C (85°F) preferred
- Breakpoint: 50-65% (60% preferred)
- Dwell Times (approx.): Riston® FX515: 13 - 18 seconds.

Resist Loading:
- Feed & Bleed: 2-12 mil-ft²/gal; 0.08-0.49 m²/liter for 15 micron film thickness.
- Batch Processing: 0-16 mil-ft²/gal; 0-0.65 m²/liter for 15 micron film thickness.

Rinse Water:
- Hard water (150-250 ppm CaCO₃ equivalent). Softer water can be hardened by the addition of magnesium sulfate or calcium chloride or a first soft water rinse can be followed by a dilute acid rinse followed by a water rinse.

Rinse Spray Nozzles:
- High Impact, Direct Fan Nozzles preferred.

Drying:
- Blow dry thoroughly; hot air preferred.

Feed & Bleed Control:
- Set pH controller range from 10.5 to 10.7 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.

Maximum hold time before stripping:
- 5 days.

Note: Dwell Time ranges were established in Tokyo Chemical Machinery 1200 NLE type developer equipment, using fresh sodium carbonate, with all other variables set within the preferred ranges mentioned above.

Defoamers
Riston® FX515 could require the use of a defoamer. If required, add 0.3-0.8 ml/liter (1-3 ml/gallon) of one of these antifoams:

- Alpha Metals PC 4772D
- Pluronic® 31R1
- Dexter 1210 & 120F
- Alpha Metals 754

Others may work equally well.
PART 5: Etching
Riston® FX515 is compatible with most acid etchants; e.g., cupric chloride (free HCl normality \( \leq 3.0 \text{ N} \)), \( \text{H}_2\text{O}_2/\text{H}_2\text{SO}_4 \), and ferric chloride.

PART 6: Stripping
Riston® FX515 is formulated to dissolve slowly in stripping solution after breaking up into pieces. This can greatly increase the life of the stripping solution and reduce costs if the resist can be removed before dissolving.

Stripping Recommendations
Chemistry:
NaOH: 1.5-3.0 wt%; faster stripping at 3.0 wt%
KOH: 1.5-3.0 wt%; faster stripping at 3.0 wt%

Proprietary Strippers:
Concentration per vendor recommendation.

Spray Pressures: 1.4-2.1 bar (20-30 psig).
Spray Nozzles: High impact direct fan.
Breakpoint: 50% or lower.

Stripper Dwell Times (seconds) at 55°C (130°F). Dwell time is the total time spent in the stripper, given a 50% breakpoint.

<table>
<thead>
<tr>
<th>Riston FX515</th>
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<tbody>
<tr>
<td>3.0 wt% NaOH</td>
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<tr>
<td>1.5 wt% KOH</td>
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Defoamers:
Follow recommendations in Development Section.
Proprietary Strippers:
Per vendor recommendations

- Generic mixtures of 3% NaOH (or KOH) plus 3% MEA (monoethanolamine).

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.

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