



THERMOUNT® Nonwoven 100% Aramid Reinforcement

Recommendations for Routing Printed Wiring Boards

THERMOUNT® is a nonwoven 100% aramid reinforcement for printed wiring boards. Composed of para-aramid short fibers and meta-aramid binder, THERMOUNT® reinforcement is used in combination with thermoset resins (epoxy, polyimide, or cyanate ester). Due to their high strength, para-aramid fibers require special cutting tools and parameters for routing smooth edges on printed wiring boards.

Using these recommendations, printed wiring boards reinforced with THERMOUNT®, and in combination with woven fiberglass, can be routed at high productivity using industry standard materials. In particular, the combination of a plastic pressure foot, a phenolic top plate, and a double-fluted router bit has been shown to produce optimum results. The plastic pressure foot is effective at holding the panels in intimate contact during routing, preventing vibration between the panels. Extending the soldermask past the cut edge of the printed wiring board also contributes to a uniform routed edge.

1. Double-flute spiral end mill (Hawara Type 826 or Megatool Type RS router bit) or single-flute end mill (Precision Carbide EM10625898)
2. Vacuum path channel should be the same width as the end mill diameter
3. Rout in a counter-clockwise direction
4. Stack panels 2 - 7 high, depending on thickness (maximum stack height = 0.200").
5. Place a 0.058" phenolic plate on top of the panel stack to prevent the cut aramid fibers from rolling up on the top panel. The phenolic plate also provides a smooth, low-friction surface for the plastic pressure foot to slide across.
6. Use a hard plastic sliding pressure foot which will provide sufficient pressure to maintain intimate contact between each panel in the stack during routing. A "brush-type" pressure foot does not provide the hold down force required to prevent panels from vibrating during the routing process.
7. Recommended Feed and Speed rates:

Router Diameter	Feed Rate	Speed
0.125"	30 - 35 ipm	30,000 - 35,000 rpm
0.093"	30 - 35 ipm	30,000 - 35,000 rpm
0.062"	25 - 30 ipm	40,000 - 45,000 rpm
0.031"	15 - 20 ipm	45,000 - 55,000 rpm

LaserVia™ Drilling Centers, LLC



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Trouble-Shooting Guide for Routing THERMOUNT® Printed Wiring Boards:

In the event that clean routed edges cannot be achieved using the basic routing recommendations, the following alternatives may be considered.

1. If the bottom edge on the bottom panel has fuzzy edges, place a 0.024" phenolic panel between the routing table surface and the bottom panel.
2. If the panels in the middle of the stack have fuzzy edges, place a piece of "newsprint-type" paper between panels to improve edge quality.
3. To further improve edge quality, slowing down the feed rate to 10 - 15 ipm typically reduces the vibration between panels and contributes to improved edge quality.
4. Double pass routing, with an offset of 0.020" between passes, may also contribute to improved edge quality. This technique requires internal pinning of each printed wiring board on the panel to hold the boards in place for the second pass.

Consultation Services and Source List:

QC Drilling/Routing Service, Inc.

37 Northwestern Drive
Salem, NH 03079
Ph: 603-890-6988
Fax: 603-890-6989
Attn: Bob Schneider

Precision Carbide Tool Company, Inc.

3310 Garland Lane
Plymouth, MN 55447
Ph: 612-473-4473
Fax: 612-473-4171
Attn: Tom Krueger

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The recommendations in this processing guide are intended to transfer DuPont experience with fabrication and assembly of printed wiring boards reinforced with THERMOUNT® nonwoven aramid. This information is based on data generated using multifunctional epoxy resin with a glass transition temperature of 180°C (356°F by DSC) and a polyimide resin with a glass transition temperature of 260°C (500°F by DSC). Printed wiring boards composed of THERMOUNT® reinforcement and epoxy or polyimide resin have been successfully fabricated and assembled using these recommendations. DuPont does not, however, guarantee successful results will be obtained using these recommendations because of the diverse combinations of processes and equipment utilized in the printed wiring board industry. In most cases, it is appropriate to follow the specific recommendations of the particular laminate and prepreg supplier.

The information in this guide was prepared as a possible aid when using THERMOUNT® nonwoven aramid reinforcement. Anyone intending to use recommendations contained in this publication concerning equipment, processing techniques and/or products should first be satisfied that the information is suitable for their application and meets all appropriate safety and health standards. Refer to other DuPont publications for safe handling and use instructions before using product. Both manufacturing and end-use technologies may undergo further refinements; therefore, DuPont reserves the right to modify properties and to change current recommendations as additional knowledge and experience are gained. DuPont makes no guarantee of results and assumes no obligation whatsoever in connection with these recommendations. This information is not a license to operate under, or intended to suggest infringement of, any existing patents.

For proper handling of laminate and prepreg reinforced with THERMOUNT®, refer to the Material Safety Data Sheet (MSDS) for THERMOUNT® and the particular resin system. The MSDS for THERMOUNT® may be obtained by calling 1-800-221-2560 or writing to:

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