Recommendations for Assembly- 85NT

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Recommendations for Storage, Drying, and Assembly of Printed Wiring Boards Containing Arlon 85NT Substrates

Arlon 85NT is a high Tg, polyimide substrate which contains nonwoven aramid reinforcement. Aramid reinforcement offers several performance benefits over standard materials:

1. Lowers the in-plane coefficient of thermal expansion (CTE) to 7-9 ppm/°C for polyimide laminates depending on resin content.
2. Lowers the dielectric constant to 3.6.
3. Provides excellent dimensional stability (<0.03%)
4. Improves fine feature formation due to its smooth surface
5. Enables high speed laser microvia formation.

Aramid fibers and polyimide resin absorb moisture when exposed to high humidity conditions. This moisture, typically in the range of 0.1 - 0.9%, can be removed in 2 - 6 hours using a conventional baking process at temperatures between 110°C - 150°C (230°F - 300°F). It has been demonstrated that 85NT PWBs can be assembled and reworked with zero defects when this baking operation immediately precedes assembly processes.

In some cases, companies which assemble components do not have the capability to bake PWBs prior to the assembly process. Moisture removal may be accomplished at the PWB fabrication operation if the PWBs are sealed properly in moisture proof bags, and only removed immediately prior to assembly. Baking at the fabricator has been shown to be effective with 85NT PWBs production assembly operations.
**Recommended Drying at the Fabricator:**

Bake PWBs for a minimum of 4 hours at 235°F (112°C), or a maximum of 6 hours at 275°F (136°C). Immediately seal PWBs in a metalized Mylar® bag within 1 hour of removal from the oven. The time and temperature of the bake depends on the PWB thickness and construction. Thicker PWBs (>0.080" [2.03 mm]) or PWBs with external copper planes should be baked for 6 hours at 275°F (136°C).

**Recommended Assembly of 85NT Printed Wiring Boards:**

**Case 1:** PWBs are pre-baked by the Fabricator and sealed in plastic bags

If metalized/Mylar® bags are opened for PWB inspection or testing, the PWBs should be re-sealed in bags immediately after the work has been accomplished. Based on moisture regain rates for 85NT, pre-dried PWBs may be exposed to 85%RH up to 12 hours prior to standard SMT assembly processes (maximum exposure temperature of 465°F (240°C) for 5 minutes). Multiple passes through assembly equipment has not led to failures in 85NT PWBs, provided the exposure to high humidity does not exceed 12 hours. If hold times cannot be avoided between assembly processes, store PWBs in a nitrogen dry box until assembly operations can resume. PWBs containing 85NT may be exposed to 50%RH for 36 hours prior to assembly (refer to moisture regain graphs shown below).

**Case 2:** PWBs are stored in uncontrolled environment without prior drying

Bake PWBs for a minimum of 4 hours at 235°F (112°C), or a maximum of 6 hours at 275°F (136°C), prior to assembly. Based on moisture regain rates for 85NT, PWBs may be exposed to 85%RH up to 12 hours prior to standard SMT assembly processes (maximum exposure temperature of 465°F (240°C) for 5 minutes). Multiple passes through assembly equipment has not led to failures in 85NT PWBs, provided the exposure to high humidity does not exceed 12 hours. If hold times cannot be avoided between assembly processes, store PWBs in a nitrogen dry box until assembly operations can resume. PWBs containing 85NT may be exposed to 50%RH for 36 hours prior to assembly (refer to moisture regain graphs shown below).
Rework and Hand-soldering:

If PWBs have been exposed to 85%RH for more than 12 hours, the baking operation must be repeated prior to rework or assembly. Bake PWBs for a minimum of 4 hours at 235°F (112°C), or a maximum of 6 hours at 275°F (136°C), prior to rework or hand-soldering. Soldering iron temperature should not exceed 575°F (301°C) for 5 seconds. Soldering irons with a precisely controlled “soldering tip temperature” (e.g. - Metcal) are recommended. PWBs containing 85NT may be exposed to 50%RH for 36 hours prior to rework or hand-soldering (refer to moisture regain graphs shown below).

When sensitive components which could be damaged by high temperature are being used, a vacuum dry box may be an acceptable alternative to remove moisture. Vacuum desiccate for a minimum of 24 hours at >29” Hg prior to rework. Vacuum drying at room temperature is not as effective as high temperature baking so a small scale test should be conducted prior to processing large volume production quantities.

Moisture Removal and Regain Graphs for 85NT PWBs:

Moisture removal of 85NT PWBs will depend on the temperature of the bake, and the thickness and construction of the PWB. Moisture will be removed from PWBs reinforced with 100% 85NT at different rates than HYBRID constructions that contain some percentage of glass reinforcement. Moisture is removed at a slightly faster rate when PWBs are baked at a higher temperature (refer to moisture removal graphs shown below).

Moisture regain of 85NT PWBs will depend on humidity conditions, and the thickness and construction of the PWB. PWBs reinforced with 100% 85NT will regain moisture at different rates than HYBRID constructions that contain some percentage of glass reinforcement. In general, when a PWB contains over 50% of Aramid reinforcement, the maximum allowable moisture regain by weight is 0.28% to assure reliable assembly. The time required to regain 0.28% moisture will depend on the humidity level in the storage area (refer to moisture regain graphs shown below).
Typical moisture removal and regain rates are shown in the graphs below for 100% 85NT PWBs.
The recommendations in this processing guide are intended to transfer Arlon experience with fabrication and assembly of printed wiring boards reinforced with nonwoven aramid. This information is based on data generated using ARLON 85NT polyimide resin with a glass transition temperature of >240°C (by TMA). Printed wiring boards composed of aramid reinforcement and polyimide resin have been successfully fabricated and assembled using these recommendations. Arlon 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 these specific recommendations.

The information in this guide was prepared as a possible aid when using 85NT materials. 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. Both manufacturing and end-use technologies may undergo further refinements; therefore, Arlon reserves the right to modify properties and to change current recommendations as additional knowledge and experience are gained. Arlon 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.