TECHNOPREG 47N

NO-FLOW EPOXY PREPREG

- Tg 130°C — Thermally Stable
- Tetrafunctional, UL 94-V0
- MIL-P-13949 Qualified Product
- No-Flow in Relief Areas
- Wide Processing Latitude

ARLON

MATERIALS FOR ELECTRONICS DIVISION

General Introduction

Arlon's 47N Tetrafunctional No-Flow Epoxy prepregs provide MIL-P-13949 Qualified, UL-94 V0 performance with 130°C Tg, higher than acrylic adhesives or traditional no-flow epoxy products. Available on 104, 106 and 1080 fiberglass fabric styles, 47N provides an engineered solution to a variety of bonding needs.

Engineered Solutions for Critical Applicators

- Bonding Flex Rigid Layers
- Bonding Rigid Caps to RFPWB's
- Bonding Insulators to PWB's
- Bonding Heat Sinks to PWB's

1.) **Bonding rigid-flex printed wiring board (RFPWB) layers together and bonding rigid (0.005" tetrafunctional) caps to flexible layers.**

47N No-Flow has the low expansion characteristics associated with the higher Tg of a tetrafunctional system and reduces the probability of PTH failures, cracked barrels and lifted pads often associated with flex-rigid applications.

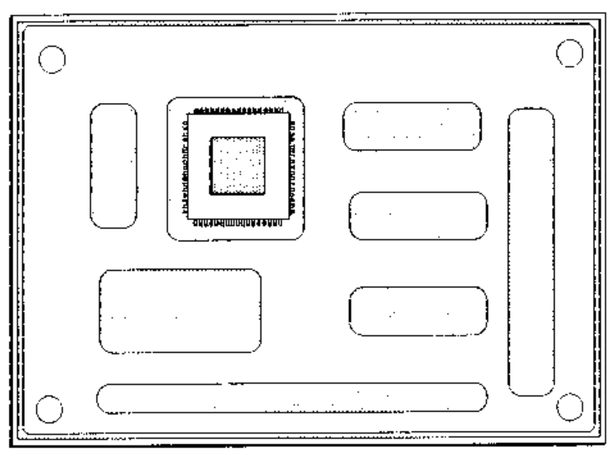
Note: use of flex layers with the least possible thickness of acrylic adhesive, or use of adhesiveless flex layers, will further reduce risk of PTH failure. Use of a thicker cap layer (0.010" if possible) will reduce the probability of pad lifting.

2.) **Bonding tetrafunctional (0.005" Unclad) insulators to tetrafunctional PWB's.**

Insulators frequently contain clearance areas (cutouts) which must remain free of resin flow. Standard acrylic or difunctional FR-4 prepregs may also be unable to withstand thermal cycling requirements and result in delamination. 47N tetrafunctional no-flow matches the properties of the tetrafunctional PWB's.

3.) **Bonding Heat Sinks to PWB's.**

A wide variety of heat sinks must be bonded to PWB's. In many cases, regardless of the material of which the PWB is manufactured, relatively low temperatures and pressures are used in bonding to prevent damage to the reflowed tin lead surface already in place. 47N can be bonded using a variety of temperature and pressure cycles, yet provide thermal stability in use.



Heatsink Bonding with 47N

Benefits of Using 47N No-Flow

- **Reduction in Z-Axis Expansion** when compared to standard difunctional epoxy or acrylic adhesive systems.
- **Improved Thermal Stability** compared to standard FR-4 or acrylic systems.
- **MIL-P-13949 Qualified Product as GFK.**
- **UL 94-V0 Product.** Listed in Arlon's Technoply FR Series under UL File E48692.
- **Compatible with most standard conformal coatings.**
- **Resin Chemistry Compatible With Standard FR-4** and tetrafunctionals used in rigid sections of RFPWB's.
- **Resistant to Methylene Chloride** and other chemicals used in the PWB process.
- **Non-Flowing into Clearance and Relief Areas.** *[Note: Clearance and relief areas are clearances in an outer layer of material that provide access to the layer underneath it, usually for component mounting. This is also the demarcation line between the rigid and flex portions, where the rigid cap "steps down" to the flexible layer of a rigid-flex PWB.]*

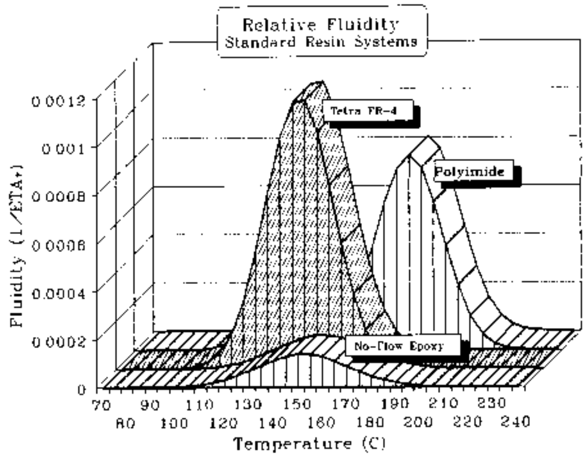
Product Availability

47N0475,	75% RC,	104 Glass,	Scaled Flow Nominal 2.1 mil
47N0672,	72% RC,	106 Glass,	Scaled Flow Nominal 2.4 mil
47N8065,	65% RC,	1080 Glass,	Scaled Flow Nominal 3.2 mil

MIL-P-13939 Flow is <3.0% Typical

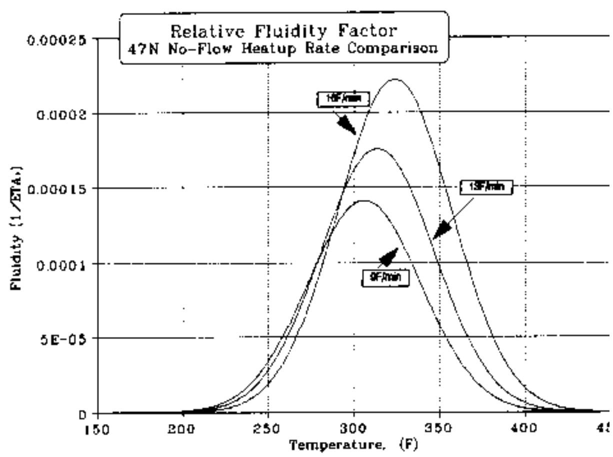
47N Resin Rheology

Although it is classified as a "No Flow", its rheological characteristics have been engineered to provide maximum flexibility in designing lamination cycles. As a result, Arlon's 47N No-Flow Tetrafunctional Prepreg is processable under a wide range of process conditions.



Fluidity curves illustrate the relative fluidity of 47N compared with conventional Tetrafunctional FR-4 and Polyimide. Fluidity is the mathematical inverse of viscosity (1/ETA*, where ETA* is expressed in poise) and indicates both the point where flow begins to occur and the point of greatest flow.

47N Fluidity Curves indicate the effect of heatup rate on fluidity. Note that the faster heatup rates give higher fluidity.



In addition, 47N viscosity curves are provided on a time base at different rates of heating to illustrate more clearly the effect of varying heat rate on viscosity and "working window". Note that the time to minimum viscosity varies with heatup rate.

The use of these sets of rheological curves includes determining when to apply pressure and providing a means to increase or reduce total flow of the system during processing.

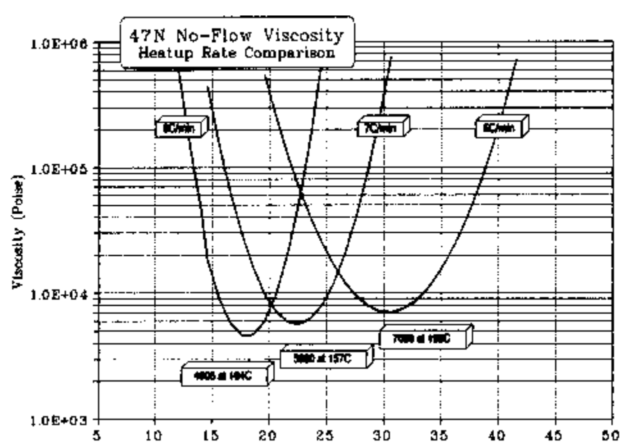
Process Guidelines

Prepreg Storage is critical for No-Flow prepregs because, unlike normal higher flow materials, no-flows cannot easily displace air voids or voids caused by expanding moisture. Before use, we advise vacuum desiccation of 47N for 12 to 24 hours at 29" Hg.

Vacuum or vacuum assist lamination is required for removal of any entrapped air. Although 47N is very process tolerant, No-Flow products do not displace entrapped gasses as well as normal prepregs, and vacuum will help assure a void-free final product.

47N laminates well with either a cold press start or a hot start.

Use of a silicone rubber pad or other appropriate hydraulic material to balance the pressure over the board area is suggested for most flex-rigid applications.



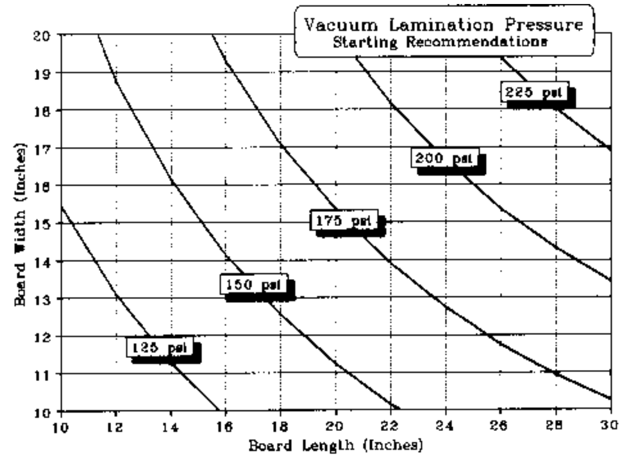
Bonding of heat sinks is different from RFPWB manufacture, and may require lower temperatures and/or pressures. It is possible to laminate 47N as low as 300°F and at pressures of 60-80 psi where heat sink bonding must not cause solder to remelt. Somewhat longer cure times (2 hours) will be needed to get proper cure at low temperatures.

RFPWB Lamination Cycle

1.) Vacuum draw down the package for 30-60 minutes at 29" Hg or better before loading in the press. Press under vacuum and maintain the vacuum beyond the set point of the resin (320-340°F).

2.) Start with a hot press, with platen temperature 340-350°F.

3.) Control the heat rise to 10-16°F/min (5-7°C/min) in the interval between 175°F (80°C) and 320°F (160°C).



4.) Set lamination pressure between 150 and 300 psi, depending on panel size and complexity. Recommended starting point pressures were derived using a statistical analysis of laminating data. Caution: many factors will affect the determination of the "right" pressure for use with the product. A thorough test of the product for the proposed application is advised.

If the material being laminated is fairly small and has a number of cutouts, the effective area can be significantly reduced, and pressure may have to be cut back accordingly to avoid excessive flow into cutout areas.

5.) Cure time is 60 minutes at 340-350°F. (If lower temperatures must be used, such as for heat sink bonding, time must be adjusted accordingly.)

Typical Properties (Rigid Laminate)

Glass Transition Temperature		130°C
Continuous Operating Temperature		140°C
Flammability (UL File E48692)		94 V0
Coefficient of Thermal Expansion (ppm/°C)		X = 11
		Y = 10
		Z = 56
Peel Strength (lb/in) when laminated to 1 ounce E.D. copper		9.0
Flexural Strength (psi)		84,000
Water Absorption (%)		0.1
Dielectric Constant	0.062" Rigid (1 MHz)	4.8
(Permittivity)	0.008" Laminate (1 MHz)	4.3
Dissipation Factor		0.022
Volume Resistivity (Megohm-cm)	Ambient	5.1×10^{7}
	Cond. D24/23	7.4×10^{6}
Surface Resistivity (Megohms)	Ambient	8.8×10^{6}
	Cond. D24/23	1.5×10^{6}

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