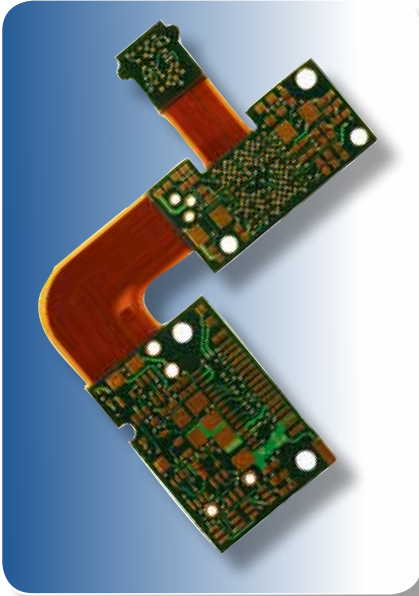
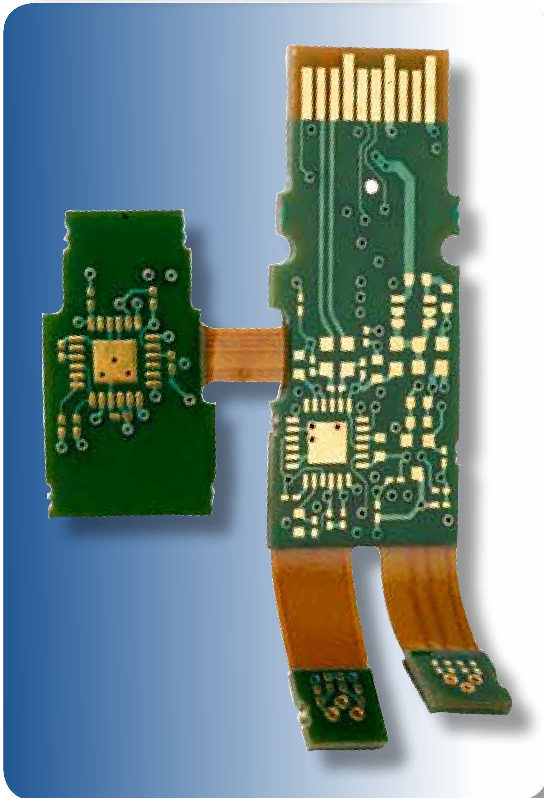
51N

Multifunctional, High Tg Epoxy Low-Flow Prepreg



51N-LF is a non-DICY multifunctional epoxy low-flow prepreg system designed to provide high reliability through lead-free solder operations. The high decomposition temperature and high thermal stability of this material is ideal for use in complex rigid-flex fabrication and assembly operations where minimum resin flow is required.



Features:

- Decomposition temperature > 350°C is ideally suited for lead-free solder processing and offers significant improvement over traditional FR-4 Epoxy systems.
- Multifunctional epoxy resin system with a Glass transition temperature (Tg) of 170°C for optimized thermal cycling PTH reliability
- Improved bond adhesion over multiple thermal excursions results in better reliability through reflow and rework operations.
- Best-in-class thermal performance for an epoxy system with T260 > 60 minutes, T280 > 30 minutes and T300 = 15 minutes
- Electrical and mechanical properties meet the requirements of IPC-4101B/124 prepreg, modified to be “Low-Flow”
- Compatible with lead-free solder processing
- RoHS/WEEE compliant

Typical Applications:

- Bonding multilayer rigid-flex boards
- Finished PCB assemblies requiring excellent thermal stability
- Dielectric insulators
- Other applications where minimal and uniform resin flow is required

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Typical Properties:

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant			
@ 1 MHz	-	4.2	IPC TM-650 2.5.5.3
@ 1 GHz	-	4.1	IPC TM-650 2.5.5.9
Dissipation Factor			
@ 1 MHz	-	0.02	IPC TM-650 2.5.5.3
@ 1 GHz	-	0.02	IPC TM-650 2.5.5.9
Volume Resistivity			
C96/35/90	MΩ-cm	2.6×10^{7}	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	3.3×10^{7}	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	2.9×10^{7}	IPC TM-650 2.5.17.1
E24/125	MΩ	4.0×10^{6}	IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	1000 (39.4)	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV		IPC TM-650 2.5.6
Arc Resistance	sec	>120	IPC TM-650 2.5.1
2. Thermal Properties			
Glass Transition Temperature (Tg)			
TMA	°C	166	IPC TM-650 2.4.24
DSC	°C	170	IPC TM-650 2.4.25
Decomposition Temperature (Td)			
Initial	°C	354	IPC TM-650 2.3.41
5%	°C	368	IPC TM-650 2.3.41
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	>30	IPC TM-650 2.4.24.1
T300	min	15	IPC TM-650 2.4.24.1
CTE (X,Y)	ppm/°C	13-15	IPC TM-650 2.4.41
CTE (Z)			
< Tg	ppm/°C	44	IPC TM-650 2.4.24
> Tg	ppm/°C	245	IPC TM-650 2.4.24
z-axis Expansion (50-260°C)	%	2.6	IPC TM-650 2.4.24
3. Mechanical Properties			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb/in (N/mm)	6.7 (1.2)	IPC TM-650 2.4.8
At Elevated Temperatures	lb/in (N/mm)	6.7 (1.2)	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	6.4 (1.1)	IPC TM-650 2.4.8
Young's Modulus	Mpsi (GPa)	2.6 (18)	IPC TM-650 2.4.18.3
Flexural Strength	kpsi (MPa)	84 (578)	IPC TM-650 2.4.4
Tensile Strength CD/MD	kpsi (MPa)	6.5 (45)	IPC TM-650 2.4.18.3
Poisson's Ratio	-		ASTM D-3039
4. Physical Properties			
Water Absorption (0.062")	%	0.15	IPC TM-650 2.6.2.1
Specific Gravity	g/cm3	1.35	ASTM D792 Method A
Thermal Conductivity	W/mK	0.25	ASTM E1461
Flammability	class	Meets V0	UL-94

Results listed above are typical properties, provided without warranty, expressed or implied, and without liability. Properties may vary, depending on design and application. Arlon reserves the right to change or update these values.

Availability:

Arlon Part Number	Glass Style	Resin %	Pressed Thickness	Flow Range
51N0672	106	72	0.0022”	60—120 mils
51N0666	106	66	0.0017”	60—120 mils
51N8065	1080	65	0.0032”	60—120 mils
51N8060	1080	60	0.0027”	60—120 mils

Recommended Process Conditions:

Process inner-layers through develop, etch, and strip using standard industry practices. Use brown oxide on inner layers. Adjust dwell time in the oxide bath to ensure uniform coating. Bake inner layers in a rack for 60 minutes at 225°F - 250°F (107°C - 121°C) immediately prior to lay-up. Vacuum desiccate the prepreg for 8 - 12 hours prior to lamination.

Lamination Cycle:

1) Pre-vacuum for 30 - 45 minutes

2) Control the heat rise to 8°F - 12°F (4.5°C - 6.5°C) per minute between 150°F and 300°F (65°C and 150°C)

3) Lamination Pressure: 150-300 PSI (11-21 Kg/cm2) depending on complexity

4) Product temperature at start of cure = 360°F (182°C).

5) Cure time at temperature = 90 minutes

6) Cool down under pressure at ≤ 10°F/min (6°C/min)

Drill at 350-400 SFM. Undercut bits are recommended for vias 0.023” (0.9cm) and smaller

De-smear using alkaline permanganate or plasma with settings appropriate for multifunctional epoxy systems.

Conventional plating processes are compatible with 51N-LF

Standard profiling parameters may be used; chip breaker style router bits are not recommended

Bake for 1 - 2 hours at 250°F (121°C) prior to solder reflow or HASL

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