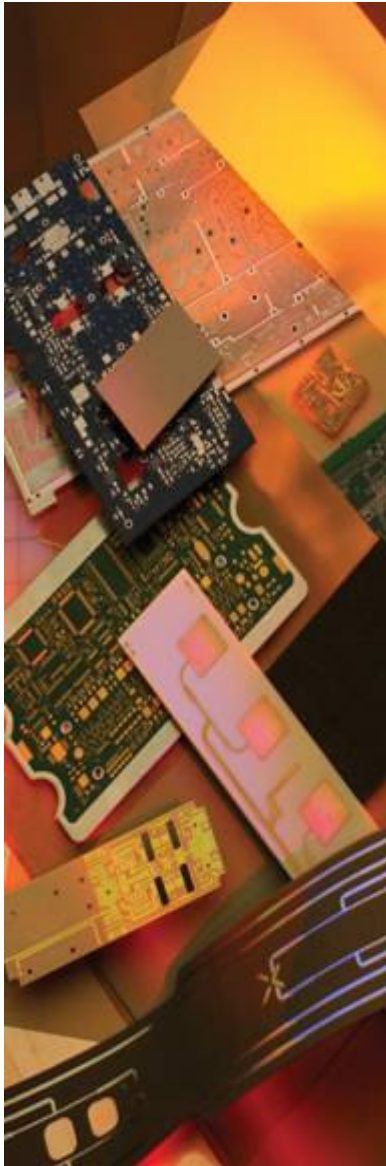


51N

Multifunctional, High Tg Epoxy Low-Flow Prepreg



51N 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 $> 350^{\circ}\text{C}$ 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 (T_g) of 170°C 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 $T_{260} > 60$ minutes, $T_{280} > 30$ minutes and $T_{300} = 15$ 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
- Attaching heat sinks to finished PCB assemblies
- Dielectric insulators
- Other applications where minimal and uniform resin flow is required

Typical Properties:

51N

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant <i>(may vary with Resin %)</i>			
@ 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 x 10 ⁷	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	3.3 x 10 ⁷	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	2.9 x 10 ⁷	IPC TM-650 2.5.17.1
E24/125	MΩ	4.0 x 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	kpsi (MPa)	6.5 (45)	IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)		ASTM D-695
Poisson's Ratio (x, y)	-		ASTM D-3039
4. Physical Properties			
Water Absorption	%	0.15	IPC TM-650 2.6.2.1
Specific Gravity	g/cm ³	1.35	ASTM D792 Method A
Thermal Conductivity	W/mK	0.25	ASTM E1461
Flammability	class	Meets V0	UL-94

* Based on typical rigid laminates construction

Availability:

Arlon Part Number	Glass Style	Resin %	Pressed Thickness	Flow Range
51N0672	106	72	0.0026"	80–140 mils
51N8065	1080	65	0.0033"	80–140 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:

- Pre-vacuum for 30 - 45 minutes
- Control the heat rise to 8°F - 12°F (4°C - 6°C) per minute between 150°F and 250°F (65°C and 121°C)

Panel Size		Pressure	
in	cm	psi	kg/sq cm
12 x 12	40 x 40	150	12
12 x 18	40 x 46	200	14
16 x 18	30 x 46	250	18
18 x 24	46 x 61	300	21

- Lamination pressures given above are recommended start points. Lower pressures have in some cases been found to work well with 51N because of its reduced resin viscosity. Contact Arlon Technical Service to discuss specific applications.
- Product temperature at start of cure = 360°F (182°C).
- Cure time at temperature = 90 minutes
- Cool down under pressure at $\leq 10^\circ\text{F}/\text{min}$ ($6^\circ\text{C}/\text{min}$)

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

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

51N

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