


Epoxy Woven Aramid



45NK is a woven Kevlar® aramid fiber reinforced multifunctional epoxy laminate and prepreg system engineered to provide in-plane CTE values as low as 6 ppm/°C for compatibility with leadless alumina ceramic chip carriers (LCCC's) and other low expansion SMT devices where control of laminate expansion is critical for solder joint reliability.

Features:

- Meets IPC4101/50 (Type AFG) description and specification
- High Tg (170°C) for improved reliability through process and in-use
- Low Dielectric Constant 3.9
- High modulus (19 x 106 psi) p-aramid woven fiber reinforcement with CTE of -4 ppm/°C provides low X-Y CTE of 5-7 ppm/°C
- Process compatible with conventional high Tg multifunctional epoxy systems
- 100% Organic resin/reinforcement system is suitable for laser drilling
- RoHS/WEEE compliant
- UL-94 V-0

Typical Applications:

- SMT Board Designs using LCCC's or other low expansion chip carriers
- SMT Designs requiring both low in-plane CTE and laser drilling

Typical Properties:

Property	Units	Value	Test Method
Electrical Properties			
Dielectric Constant @ 1 MHz	-	3.9	IPC TM-650 2.5.5.3
@ 1 GHz	-		IPC TM-650 2.5.5.9
Dissipation Factor @ 1 MHz		0.016	IPC TM-650 2.5.5.3
@ 1 GHz			IPC TM-650 2.5.5.9
Volume Resistivity			
C96/35/90	MΩ-cm	1.3 x 10 ⁷	IPC TM-650 2.5.17.1
E24/125	MΩ-cm		IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	3.2 x 10 ⁷	IPC TM-650 2.5.17.1
E24/125	MΩ		IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	750 min	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV		IPC TM-650 2.5.6
Arc Resistance	sec		IPC TM-650 2.5.1
Thermal Properties			
Glass Transition Temperature (Tg)			
TMA	°C		IPC TM-650 2.4.24C
DSC	°C	170	IPC TM-650 2.4.25D
Decomposition Temperature			
Initial	°C		IPC TM-650 2.4.24.6
5% weight loss	°C		IPC TM-650 2.4.24.6
T260	min		IPC TM-650 2.4.24.1
T288	min		IPC TM-650 2.4.24.1
T300	min		IPC TM-650 2.4.24.1
CTE (X,Y)	ppm/°C	5 - 7	IPC TM-650 2.4.41
CTE (Z)			
< Tg	ppm/°C	75	IPC TM-650 2.4.24C
> Tg	ppm/°C	225	IPC TM-650 2.4.24C
z-axis Expansion (50-260°C)	%	2.8	IPC TM-650 2.4.24C
Mechanical Properties			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb./in (N/mm)	6.0 (1.05)	IPC TM-650 2.4.8C
At Elevated Temperatures	lb./in (N/mm)	6.0 (1.05)	IPC TM-650 2.4.8.2A
After Process Solutions	lb./in (N/mm)	6.0 (1.05)	IPC TM-650 2.4.8C
Young's Modulus CD/MD	Mpsi (GPa)	4.0 (27.5)	ASTM E111
Tensile Strength CD/MD	kpsi (MPa)		ASTM D3039
Poisson's Ratio	-	0.2	ASTM E13204
Physical Properties			
Water Absorption (0.062")	%	0.8	IPC TM-650 2.6.2.1A
Density	g/cm ³	1.37	ASTM D792 Method A
Thermal Conductivity	W/mK	0.22	ASTM E1461
Flammability	class	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.

45NK

Availability:

Arlon Part Number	Glass Style	Resin (%)	Volatiles	Nominal Pressed
45NK257	3500 Kevlar	57 ± 3	0.5% max	0.004"
45NK262	3500 Kevlar	62 ± 3	0.5% max	0.0045"

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 minutes
- 2) Control the heat rise to 8°F-12°F (4.5°C - 6.5°C) per minute between 210°F and 300°F (100°C and 150°C)

Panel Size		Pressure	
in.	mm	psi	kg/cm ²
12 x 18	305 x 457	275	19
16 x 18	406 x 457	350	25
18 x 24	457 x 610	400	27

- 3) Product temperature at start of cure = 360°F (180°C).
- 4) Cure time at temperature = 90 minutes
- 5) Cool down under pressure at ≤ 10°F/min (5°C/min)

Process Notes:

Kevlar® fabric compresses and distorts under pressure, more so than E Glass, which dictates the use of lower lamination pressures. The use of an autoclave or vacuum assist lamination makes the use of lower pressure possible. Typically the pressures used under vacuum should be about 50% of those used for standard press lamination e.g. 12" x 18" (30 cm x 46 cm) panel non-vacuum 300 PSI (2 kg /cm²) versus vacuum 150 PSI (10.5 kg/cm²).

