

45NK

EPOXY WOVEN ARAMID LAMINATE AND PREPREG



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. 45NK exceeds the requirements of IPC 4101/50 (Type AFG).

Features:

- High Tg (170°C) for improved reliability through process and in-use
- Low Dielectric Constant 3.9
- High modulus (19×10^6 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 exceeds IPC 4101 /50 requirements

Typical Applications:

- SMT Board Designs using LCCC's or other low expansion chip carriers (See Figure 1)
- SMT Designs requiring both low in-plane CTE and laser drilling

Typical Properties:

Property	Units	Value	Test Method
1. 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	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
2. Thermal Properties			
Glass Transition Temperature (Tg)			
TMA	°C		IPC TM-650 2.4.24
DSC	°C	170	IPC TM-650 2.4.25
Decomposition Temperature (Td)			
Initial	°C		IPC TM-650 2.3.41
5%	°C		IPC TM-650 2.3.41
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 2.4.24
> Tg	ppm/°C	225	IPC TM-650 2.4.24
z-axis Expansion (50-260°C)	%	2.8	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 (1.05)	IPC TM-650 2.4.8
At Elevated Temperatures	lb/in (N/mm)	6 (1.05)	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	6 (1.05)	IPC TM-650 2.4.8
Young's Modulus	Mpsi (GPa)	4.0 (27.5)	IPC TM-650 2.4.18.3
Flexural Strength	kpsi (MPa)		IPC TM-650 2.4.4
Tensile Strength	kpsi (MPa)		IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)		ASTM D-695
Poisson's Ratio	-	0.2	ASTM D-3039
4. Physical Properties			
Water Absorption (0.062")	%	0.8%	IPC TM-650 2.6.2.1
Specific Gravity	g/cm ³	1.37	ASTM D792 Method A
Thermal Conductivity	W/mK	0.22	ASTM E1461
Flammability	Class	V-0	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	Fabric Style	Resin Content	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 (vacuum press is preferred – see notes, below):

- 1) Pre-vacuum for 30 minutes
- 2) Control the heat rise to 8°F - 12°F (4°C - 6°C) per minute between 130°F and 230°F (55°C and 110°C)

Panel Size		Pressure	
in	cm	psi	kg/cm ²
12 x 12	30 x 30	250	17
12 x 18	30 x 46	275	19
16 x 18	41 x 46	350	25
18 x 24	46 x 61	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).

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Arlon Electronic Materials...
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For samples, technical assistance and customer service, please contact Arlon Electronic Materials Division at the following locations:

NORTH AMERICA:

Arlon EMD, 9433 Hyssop Drive, Rancho Cucamonga, CA
Tel: (909) 987-9533 • Fax: (909) 987-8541

FRANCE:

CCI Eurolam
9, rue Marcelin Bertholet
92160 Antony, France
Phone: (33) 146744747
Fax: (33) 146666313

ISRAEL:

Tech Knowledge, Ltd.
159 Yigal Alon Street,
Tel Aviv 6744367, Israel
Phone: (972) 36958117
Fax: (972) 36917117

CHINA:

Zack Peng
Room 6A, Unit 2, Bldg 2
Jin Cheng Shi Dai, Tian Road
Shenzhen, China 518103
Phone: (86) 75528236491
Fax: (86) 75528236463

GERMANY:

CCI Eurolam
Otto-Hahn-Str. 46
63303 Dreiech Germany
Phone: (49) 610339920
Fax: (49) 6103399229

ITALY:

Dralmi, SAS
Via Cellini 5
20129 Milano Italy
Phone: (39) 025460507
Fax: (39) 0255013199

JAPAN:

Nakao Corp.
12-8 Nihonbashi Hisamatsu-Cho
Tokyo 103-0005 Japan
Phone: (81) 336623201
Fax: (81) 336617118

UK & SCANDINAVIA:

CCI Eurolam – UK
Ulness Walton Lane
Leyland, PR26 8NB, UK
Phone: (44) 1772452236
Fax: (44) 1772456859