86HP

ARLON ELECTRONIC MATERIALS

High Performance Polyimide

Arlon's 86HP is best in class for high temperature applications. Compared to conventional epoxy or polyimide resin systems, 86HP has lower Z-axis expansion (≤ 1%) and twice the thermal conductivity of conventional epoxy or polyimide systems.
Ideal for high layer count, HDI multiple sequential lamination cycles, and anti-CAF performance. Arlon's unique polyimide resin system offers a lower Dk/Df than conventional polyimide resin systems and formulated to meet UL-94-V0 flame requirements.
This exceptional resin system is designed to replace high temperature epoxy systems where high thermal exposures and long service life for aerospace, industrial and military applications are required.

Features:

- 86HP meets the requirements of IPC-4101/40/41
- Best-in-Class thermal properties
  - Tg=>250ºC
  - Decomposition temperature >430ºC
  - T300>60 minutes
- Extremely low Z-axis
  - ≤1% between 50-260ºC (vs. 2.5-3.0% for typical high-performance epoxy resin systems)
  - Minimizes the risk of latent PTH defects caused during solder reflow device attachment
- Anti-CAF passes 1000 hours at 85% RH/85ºC
- 3X thermal conductivity of conventional polyimide resins (0.6 W/mk)
- Suitable for HDI PWB's- Dk/Df of 3.5/0.005@1 GHz
- Toughened chemistry resists resin fracturing
- Exceptional drill life compared to conventional polyimide resin systems
- Halogen-free chemistry
- Compatible with lead-free processing
- Meets UL-94 V0
- RoHS/WEEE compliant/WEEE compliant

86HP

Typical Properties:

Property	Units	Value	Test Method
Electrical Properties			
Dielectric Constant @ 1 GHz	70% RC	3.5	IPC-TM-2.5.5.9
@ 5 GHz	57% RC	3.7	IPC-TM-2.5.5.9
@ 10 GHz	57% RC	3.7	IPC-TM-2.5.5.9
Dissipation Factor @ 1 GHz	70% RC	0.005	IPC-TM-2.5.5.9
@ 5 GHz	57% RC	0.007	IPC-TM-2.5.5.9
@ 10 GHz	57% RC	0.007	IPC-TM-2.5.5.9
Volume Resistivity			
C96/35/90	MΩ-cm	$>10^{10}$	IPC TM-650 2.5.17.1A
Surface Resistivity			
C96/35/90	MΩ	$>10^{9}$	IPC TM-650 2.5.17.1A
Electrical Strength	Volts/mil	1800	IPC TM-650 2.5.6.2A
Arc Resistance	sec	196	IPC TM-650 2.5.1B
Thermal Properties			
Glass Transition Temperature (Tg)			
DMA	°C	≥250	IPC TM-650 2.4.24C
Decomposition Temperature			
Initial	°C	380	IPC TM-650 2.4.24.6
5% weight loss	°C	430	IPC TM-650 2.4.24.6
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	>60	IPC TM-650 2.4.24.1
T300	min	>60	IPC TM-650 2.4.24.1
CTE (X,Y)	ppm/°C	16,14	IPC TM-650 2.4.41
CTE (Z)			
< Tg	ppm/°C	24	IPC TM-650 2.4.24C
> Tg	ppm/°C	174	IPC TM-650 2.4.24C
z-axis Expansion (50-260ºC)	%	≤1	IPC TM-650 2.4.24C
Mechanical Properties			
Peel Strength to Copper (0.5oz/17.5 micron)			
RTF	lbs/in	5.5	IPC TM-650 2.4.8
HVLP	lbs/in	4.4	IPC TM-650 2.4.8
1.0oz/35 micron STD	lbs/in	9	IPC TM-650 2.4.8
Young's Modulus CD/MD	Gpa	25/27	ASTM E111
Tensile Strength CD/MD	kpsi (MPa)	35 (241)	ASTM D3039
Poisson's Ratio	-	0.17	ASTM E13204
Physical Properties			
Water Absorption (0.059")	%	0.12	IPC TM-650 2.6.2.1A
Density	g/cm3	1.6	ASTM D792 Method A
Thermal Conductivity	W/mK	0.6	ASTM D5470
Flammability	class	V-0	UL-94
Anit-CAF (IPC 9254)	100 VDC	>1000 hours	IPC TM-650 2.6.25

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

86HP

Available Prepreg Thicknesses

Arlon Part Number	Glass Style	Resin (%)	Scaled Flow Hf (mils)	100% Cu Ratio Pressed Thickness (mils)
86H0677	106	77%	1.93 ± 0.3	2.40
86H6769	1067	69%	1.89 ± 0.3	2.15
86H8663	1086	63%	2.58 ± 0.3	3.00
86H3357	3313	57%	3.45 ± 0.3	3.80
86H2653	2116	53%	3.87 ± 0.3	4.50

Recommended Process Conditions:

Vacuum desiccate the prepreg for 8-12 hours prior to lamination. Process inner layers through develop, etch and strip using standard industry practices. The use of brown oxide or alternative oxide treatment is highly recommended prior to lamination. Bake inner layers in a rack and in an air circulating oven for a minimum of 60 minutes at 225ºF-250ºF (107ºC-121ºC) immediately prior to lay-up.

Lamination Cycle for Low Temperature Cure (Meets IPC-4101/40):

1) Pre-vacuum for 30-45 minutes
2) Control the heat rise to 4.5-6.5ºC (8.0-12.0ºF) per minute between 90-160ºC (194-320ºF).
3) Set cure temperature 204ºC (400ºF). Start cure time when temperature reaches 200ºC (392ºF).
4) Cure time 80 minutes at or above 200ºC (392ºF).
5) Step pressures are highly recommended for controlled dimensional stability of product.
    a) First pressure of 70-100 psi for when product temperature reaches 60ºC (140ºF).
    b) Second pressure of 140-250 psi @ 60-80ºC (140-176ºF).
    c) Third pressure of 350-450 psi @ 90-115ºC (194-239ºF).

Panel Size		Pressure	
in.	mm	psi	kg/cm2
12 x 18	305 x 457	350	21
16 x 18	406 x 457	400	28
18 x 24	457 x 610	450	32

Recommended starting pressures may vary depending on complexity of product.

6) Cool down rate of between 215-120ºC (419-248ºF) of <2ºC (4ºF) under contact pressure if possible.

Lamination Cycle for High Temperature Cure (Meets IPC-4101/41):

1) Pre-vacuum for 30-45 minutes
2) Control the heat rise to 4.5-6.5ºC (8.0-12.0ºF) per minute between 90-160ºC (194-320ºF).
3) Set cure temperature 215ºC (419ºF). Start cure time when temperature reaches 205ºC (400ºF).
4) Cure time 80 minutes at or above 215ºC (419ºF).
5) Step pressures are highly recommended for controlled dimensional stability of product.
    a) First pressure of 70-100 psi when product temperature reaches 60ºC (140ºF).
    b) Second pressure of 140-250 psi @ 60-80ºC (140-176ºF).
    c) Third pressure of 350-450 psi @ 90-115ºC (194-239ºF).

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6) Cool down rate of between 215-120ºC (419-248ºF) of <2ºC (4ºF) under contact pressure if possible.

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Mechanical Drilling Recommendations:

Drill Size (mm)	Spindle (krpm)	In-feed (inch/min)	Retract (inch/min)	S.F.M. (ft/min)	Chip Load (mil/rev.)	Max Hit count
0.25	100	70	500	258	0.7	1000
0.30	87	81	500	270	0.93	1000
0.35	78	90	500	282	1.15	1000
0.40	71	96	500	294	1.35	1000
0.45	66	101	500	306	1.53	1000
0.50	78	132	500	400	1.7	1000
0.55	71	131	500	400	1.85	1000
0.60	65	129	500	400	1.99	1000
0.65	60	126	500	400	2.11	1000
0.70	55	123	500	400	2.21	1000
0.75	52	119	500	400	2.3	1000
0.80	49	115	500	400	2.37	1000
0.85	46	111	500	400	2.43	1000
0.90	43	106	500	400	2.47	1000

Undercut drill bits are recommended.

The above drill parameters and hit counts are for reference only. Modification and adjustments should be evaluated based on board thickness, copper weight and hole size to ensure proper hole wall quality.

De-smear using alkaline permanganate or plasma with setting appropriate for polyimide; plasma is preferred for positive etchback.
Conventional plating processes are compatible with 86HP.
Standard profiling parameters may be used

Bake for 1-2 hours at 250ºF (121ºC) prior to any thermal excursions (reflow or HASL).