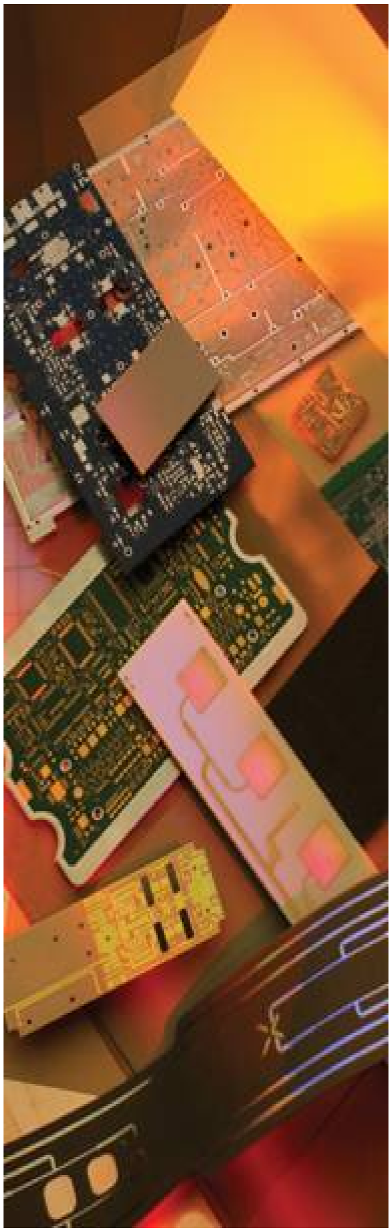
EP2

Enhanced Polyimide Laminate And Prepreg



EP2 Enhanced Polyimide is the next generation of polyimide and prepreg products, engineered for improved properties and processing and for applications requiring optimum thermal performance. EP2 is a filled product, yet with significantly improved copper adhesion compared to traditional polyimides. Reduced water absorption, higher thermal conductivity and reduced CTE are all achieved while maintaining the full 250°C Tg of polyimide for thermal stability through process and application. Reduced cure cycle compared to traditional polyimides offers reduced process throughput times.

Features:

- Glass Transition Temperature of 250°C
- Lower electrical loss results in improved signal integrity
- Low Z-Axis expansion (0.65% 50 to 260°C) reduces stress on PTH's through process and thermal cycling.
- Copper Peel 25% higher than traditional unfilled polyimides
- Moisture Absorption reduced by 25% compared to traditional polyimide
- Decomposition temperature (5% Td) of 424°C for excellent high temperature service life and process temperature resistance
- Reduced cure time by 25-50% compared to traditional polyimides
- Electrical and Mechanical Properties meet the requirements of IPC-4101/40 and 41
- Toughened, non-MDA chemistry resists drill fracturing
- Fully compatible with lead-free solder processing
- Meets NASA Outgassing requirements
- Meets the UL-V0 Flammability Requirements
- RoHS and WEEE Compliant

Typical Applications:

- PCBs that are subjected to high temperatures during processing and rework, such as lead-free soldering. Reduced risk of latent PTH damage due to low Z-Direction CTE.
- Applications with significant service life expectations at high temperatures, such as aircraft engine instrumentation, on-engine applications, down-hole drilling and industrial sensor packages, under-hood automotive controls and burn-in Testing of IC's (Burn-In Boards).

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Typical Properties:

EP2

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant *(may vary with Resin %)*			
@ 1 MHz	-	4.2	IPC TM-650 2.5.5.3
@ 1 GHz	-		IPC TM-650 2.5.5.9
Dissipation Factor			
@ 1 MHz	-	0.006	IPC TM-650 2.5.5.3
@ 1 GHz	-		IPC TM-650 2.5.5.9
Volume Resistivity			
C96/35/90	MΩ-cm	$2.8x10^8$	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	$3.9x10^8$	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	$1.2x10^8$	IPC TM-650 2.5.17.1
E24/125	MΩ	$1.3x10^8$	IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	1400 (55.9)	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV	65	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	250	IPC TM-650 2.4.24
DSC	°C		IPC TM-650 2.4.25
Decomposition Temperature (Td)			
Initial	°C	363	IPC TM-650 2.3.41
5%	°C	424	IPC TM-650 2.3.41
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	15	IPC TM-650 2.4.24.1
T300	min	10	IPC TM-650 2.4.24.1
CTE (x,y)	ppm/°C	13-14	IPC TM-650 2.4.41
CTE (z)			
< Tg	ppm/°C	25	IPC TM-650 2.4.24
> Tg	ppm/°C	150	IPC TM-650 2.4.24
z-axis Expansion (50-260°C)	%	0.65	IPC TM-650 2.4.24
3. Mechanical Properties			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb/in (N/mm)	8.5 (1.5)	IPC TM-650 2.4.8
At Elevated Temperatures	lb/in (N/mm)	8.0 (1.4)	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	8.4 (1.5)	IPC TM-650 2.4.8
Young's Modulus	Mpsi (GPa)	4.0 (27.6)	IPC TM-650 2.4.18.3
Flexural Strength (lengthwise/crosswise)	kpsi (MPa)	72/58 (496/400)	IPC TM-650 2.4.4
Tensile Strength	kpsi (MPa)	35 (239)	IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)		ASTM D-695
Poisson's Ratio (x, y)	-	0.21, 0.19	ASTM D-3039
4. Physical Properties			
Water Absorption	%	0.16	IPC TM-650 2.6.2.1
Density	g/cm^3	1.6	ASTM D792 Method A
Thermal Conductivity	W/mK	0.45	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.

Availability:

Arlon Part Number	Glass Style	Resin %	Nominal Press Thickness (mils)	Flow %
EP20482	104	82%	2.5	28
EP20484	104	84%	3.0	30
EP20683	106	83%	3.5	28
EP26781	1067	81%	4.0	24
EP28078	1080	78%	5.0	26
EP22661	2116	61%	6.0	20
EP22848	7828	48%	8.0	14

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. Store prepreg at 60-70°F at or below 30% RH. 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°C - 6°C) per minute between 150°F and 250°F (65°C and 121°C). Vacuum lamination is preferred. Start point vacuum lamination pressures are shown in the table below:

Panel Size		Pressure		Pressure / 29" Vacuum	
in	cm	psi	kg/sq cm	psi	kg/cm2
12 x 18	40 x 46	275	19	200	14.0
16 x 18	30 x 46	350	25	250	17.5
18 x 24	46 x 61	400	28	300	21.0

3) Product temperature at start of cure = 410°F (210°C).

4) Cure time at temperature = 60 minutes for Inner cores, 90 minutes final lamination

5) Cool down under pressure at ≤ 10°F/min (5°C/min)

Drill at 325-350 SFM with –0.8 to 1.0mil chip-load. Undercut bits are recommended for vias 0.018" (0.045cm) and smaller

De-smear using alkaline permanganate or plasma with settings appropriate for polyimide; plasma is preferred for positive etchback

Conventional plating processes are compatible with EP2. May not require plasma etchback (3 point contact) for reliable plating performance.

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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