

# N4000-13 EP

## High-Speed Multifunctional Epoxy Laminate & Prepreg



### Benefits

- Low DF and DK
- Excellent thickness control for tight tolerance
- Support for advanced technology PWB designs
- Available in a variety of constructions

### Applications

- High Speed Storage Networks
- Internet Switches / Routing Systems
- Wireless Communication Infrastructure
- Backplanes



N4000-13 EP is an enhanced epoxy resin system engineered for today's lead-free requirements. It provides enhanced thermal reliability with good electrical and signal loss properties for demanding high speed low loss designs.

### Excellent Electrical Properties

- Excellent thickness control for tight tolerance impedance applications
- Low DK and DF for low signal distortion and faster signal propagation

### Thermal and Mechanical Properties

- $T_g > 210^\circ\text{C}$
- Low Z-CTE and proven CAF resistance provide long-term reliability for RF and digital applications
- Lead-free assembly compatibility with maximum reflow temperature of  $260^\circ\text{C}$
- Long-term reliability

### Excellent CAF Performance

- Provides excellent CAF resistance even after multiple lead-free assembly exposures

### High-Tg FR-4 Processing

- Identical processing to N4000-13, similar to traditional high Tg FR-4 materials
- 90 mins press at  $193^\circ\text{C}$  and 275-350 psi

Meets UL 94V-0 and IPC-4101/29, /98, /99 and /101 Specifications

UL file number: E36295

Properties	Conditions	Typical Value	Unit	Test Method
<b>Electrical Properties</b>				
Dielectric Constant (50% resin content)	@ 2.5 GHz (Split Post Cavity)	3.7		
	@ 10 GHz (Stripline)	3.6		IPC-TM-650.2.5.5.5
Dissipation Factor (50% resin content)	@ 2.5 GHz (Spilt Post Cavity)	0.009		
	@ 10 GHz (Stripline)	0.009		IPC-TM-650.2.5.5.5
Volume Resistivity	C - 96 / 35 / 90	10 <sup>8</sup>	MΩ - cm	IPC-TM-650.2.5.17.1
	E - 24 / 125	10 <sup>7</sup>		
Surface Resistivity	C - 96 / 35 / 90	10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
	E - 24 / 125	10 <sup>7</sup>		
Electric Strength		4.7x10 <sup>4</sup> (1200)	V/mm (V/mil)	IPC-TM-650.2.5.6.2
<b>Thermal Properties</b>				
*Glass Transition Temperature (Tg)	DMA(°C) (Tan d Peak)	240	°C	IPC-TM-650.2.4.24.3
Degradation Temperature (TGA)	Degradation Temp (TGA) (5% wt. loss)	350	°C	IPC-TM-650.2.4.24.6
T-260	Time to delamination @ 260°C	30+	minutes	IPC-TM-650.2.4.24.1
T-288	Time to delamination @ 288°C	10+	minutes	IPC-TM-650.2.4.24.1
Thermal Conductivity		0.35	W/mK	ASTM E1461
<b>Mechanical Properties</b>				
Peel Strength	1 oz (35μ) Cu	1.31 (7.9)	N/mm (lbf/inch)	IPC-TM-650.2.4.8
	After Solder Float	1.31 (7.5)	N/mm (lbf/inch)	IPC-TM-650.2.4.8
X / Y CTE	-40°C to + 125°C	10 / 14	ppm/°C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 (50°C to Tg)		65	ppm/°C	IPC-TM-650.2.4.24
Z Axis CTE Alpha 2 (Tg to 260°C)		275	ppm/°C	IPC-TM-650.2.4.24
Z Axis Expansion	50°C to 260°C	3.4	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)		28.5 / 22.4 (4.2 / 3.3)	GN/m2 (psi x 10 <sup>6</sup> )	ASTM D3039
Poisson's Ratios (X / Y)		0.13/0.11		
<b>Chemical / Physical Properties</b>				
Moisture Absorption		0.1	wt. %	IPC-TM-650.2.6.2.1

\* DMA is the preferred method for measuring Tg - other methods may be less accurate.

- All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a company representative directly
- N4000-13 EP can be manufactured in laminate thickness from 2 mil (0.05 mm) and up.
- N4000-13 EP is available in most common panel sizes.
- Please contact AGC for availability of any other constructions, copper weights glass styles including very low profile copper and RTFOIL®

