

# Park Advanced Circuitry Materials

## Nelco® N4000-6



### High-Tg Multifunctional Epoxy Laminate & Prepreg

*The Nelco® N4000-6 is a high-Tg epoxy laminate and prepreg system that provides a wide range of performance versatility and ease of processing for demanding high-layer count applications.*

#### Key Features

##### A Proven High-Tg Substrate

- Years of field use with consistent results
- Consistent dielectric thickness
- Global availability

##### Robust Thermal Properties

- Tg of 175°C
- Passed the stringent Q1000 thermal cycling requirement
- Suitable for high-layer count, sophisticated PWB designs

##### Superior electrical properties

- Excellent electrical properties for a standard loss material
- Supporting advanced technology PWB designs

##### Enhanced Standard FR-4 processing

- Key processing parameters of drilling, desmear and lamination use standard low Tg FR-4 methods

##### - Excellent drilling characteristics, especially in high layer-count designs

- 90 min press at 182°C and 200-300 psi.

##### And Much More

- Vacuum laminated
- Available in a wide variety of constructions, copper weights and glass styles including standard copper, double treat and RTFOIL® laminate
- Available as a 2 mil core product meeting the specifications of a capacitive laminate
- Meets UL 94V-0 and IPC-4101/24 and /26 specifications
- All Nelco® materials are RoHS compliant

#### Applications

- Fine-Line Multilayers
- Backplanes
- Surface-Mount Multilayers
- BGA Multilayers
- CSP Attachment
- Automotive
- Underhood Automotive
- Wireless Communications
- Infrastructure
- Network Storage
- High-End Servers

#### Global Availability

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**Park's UL file number: E36295**



# Nelco® N4000-6

## High-Tg Multifunctional Epoxy Laminate & Prepreg

Property / Condition	Value (U.S. Units)		Value (Metric Units)		Test Method
<b>Mechanical Properties</b>					
Peel Strength - 1 oz. (35 micron) Cu					
After Solder Float	9.0	lb / inch	1.58	N / mm	IPC-TM-650.2.4.8
At Elevated Temperature	7.0	lb / inch	1.23	N / mm	IPC-TM-650.2.4.8.2a
After Exposure to Process Solutions	9.0	lb / inch	1.58	N / mm	IPC-TM-650.2.4.8
X / Y CTE [-40°C to +125°C]	12 - 15	ppm / °C	12 - 16	ppm / °C	IPC-TM-650.2.4.41
Z Axis Expansion [50°C to 260°C]	3.7	%	3.7	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)	4.4 / 3.7	psi x 10 <sup>6</sup>	29.9 / 25.1	GN / m <sup>2</sup>	ASTM D3039
Poisson's Ratios (X / Y)	0.16 / 0.14		0.16 / 0.14		ASTM D3039
Thermal Conductivity	0.3 - 0.4	W / mK	0.3 - 0.4	W / mK	ASTM E1461-92
Specific Heat	1.20 - 1.40	J / gK	1.20 - 1.40	J / gK	ASTM E1461-92
<b>Electrical Properties</b>					
Dielectric Constant (50% resin content)					
@ 1 MHz (TFC / LCR Meter)	4.3		4.3		IPC-TM-650.2.5.5.3
@ 1 GHz (RF Impedance)	4.1		4.1		IPC-TM-650.2.5.5.9
@ 2.5 GHz (Stripline)	4.0		4.0		IPC-TM-650.2.5.5.5
Dissipation Factor (50% resin content)					
@ 1 MHz (TFC / LCR Meter)	0.023		0.023		IPC-TM-650.2.5.5.3
@ 2.5 GHz ( Stripline)	0.022		0.022		IPC-TM-650.2.5.5.5
Volume Resistivity					
C - 96 / 35 / 90	10 <sup>8</sup>	MΩ - cm	10 <sup>8</sup>	MΩ - cm	IPC-TM-650.2.5.17.1
E - 24 / 125	10 <sup>7</sup>	MΩ - cm	10 <sup>7</sup>	MΩ - cm	IPC-TM-650.2.5.17.1
Surface Resistivity					
C - 96 / 35 / 90	10 <sup>7</sup>	MΩ	10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
E - 24 / 125	10 <sup>7</sup>	MΩ	10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
Electric Strength	1300	V / mil	5.1x10 <sup>4</sup>	V / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	kV	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	65	seconds	65	seconds	IPC-TM-650.2.5.1
<b>Thermal Properties</b>					
Glass Transition Temperature (T <sub>g</sub> )					
DSC (°C)	175 *	°C	175 *	°C	IPC-TM-650.2.4.25c
TMA (°C)	170 *	°C	170 *	°C	IPC-TM-650.2.4.24c
Degradation Temp (TGA) (5% wt. loss)	325	°C	325	°C	IPC-TM-650.2.4.24.6
Pressure Cooker - 60 min then solder dip @288°C until failure (max 10 min.)	Pass		Pass		IPC-TM-650.2.6.16 (modified)
T <sub>260</sub>	4 - 8	minutes	4 - 8	minutes	IPC-TM-650.2.4.24.1
<b>Chemical / Physical Properties</b>					
Moisture Absorption	0.1	wt. %	0.1	wt. %	IPC-TM-650.2.6.2.1
Methylene Chloride Resistance	0.7	% wt. chg.	0.7	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.92	g / cm <sup>3</sup>	1.92	g / cm <sup>3</sup>	Internal Method

Park Electrochemical Corp. is a global advanced materials company which develops and manufactures high-technology digital and RF/microwave printed circuit materials and advanced composite materials, parts and assemblies. The company operates under the Nelco®, Nelcote® and Nova™ names.

All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a Nelco representative directly. Nelco reserves the right to change these typical values as a natural process of refining our testing equipment and techniques.

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