

# Nelco Advanced Circuitry Materials

## Nelco® N4000-7 Nelco® N4000-7 SI®



### CAF Resistant, Low-CTE FR-4 Epoxy Laminate & Prepreg

*The Nelco® N4000-7 low-CTE epoxy laminate and prepreg system is a cost-effective solution for use in a broad range of multilayer PCB designs requiring low Z-axis expansion, excellent thermal stability and superior hole-wall integrity.*

#### Key Features

##### Outstanding Z-axis, thermal stability and hole wall integrity

- Improved thermal, mechanical and chemical properties that meet or exceed those of many high-Tg materials
- Suitable for cost-sensitive, high-reliability applications

##### Automotive Testing

- Passes the stringent Q1000 thermal cycle tests of -40°C to +125°C for 1000 cycles

##### SI (Signal Integrity) option

- When used, SI glass provides enhanced electrical performance which can be used for high speed, low loss designs when needed

##### CAF\* resistant

- The low Z-CTE and proven CAF resistance allow N4000-7 to be used in high reliability applications typically reserved for higher Tg materials

##### Cost-effective standard FR-4 processing

- Key processing parameters of drilling, desmear and lamination use standard low Tg FR-4 methods
- Accelerated press cycles and drilling when compared to high Tg materials
- 45 min press at 170°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.
- Meets UL 94V-0 and IPC-4101/98 specifications\*
- All Nelco® materials are RoHS compliant.

\* material also meets the specifications of IPC-4101/24 unfilled slash sheet.

#### Applications

- Wireless Handsets
- Wireless Infrastructure
- Digital Broadband Multilayers
- Automotive
- Underhood Automotive
- Backplanes
- Fine-Line Multilayers
- Fine Pitch BGA Multilayers
- Direct Chip Attach

#### Global Availability

Nelco Products, Inc. (California) - Americas  
+1.714.879.4293

Neltec, Inc. (Arizona) - Americas  
+1.480.967.5600

Nelco Products Pte. Ltd. - Asia Pacific  
+65.6861.7117

Neltec, S.A. - Europe  
+33.562.98.52.90

www.parkelectro.com  
info@parkelectro.com

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

# Nelco® N4000-7 and N4000-7 SI®

## CAF Resistant, Low-CTE FR-4 Epoxy Laminate & Prepreg

	N4000-7	N4000-7 SI	U.S. Units	N4000-7	N4000-7 SI	Metric	Test Method
<b>Mechanical Properties</b>							
Peel Strength - 1 oz. (35 micron) Cu							
After Solder Float	7.5	7.5	lb / inch	1.31	1.31	N / mm	IPC-TM-650.2.4.8
At Elevated Temperature	8.1	8.1	lb / inch	1.42	1.42	N / mm	IPC-TM-650.2.4.8.2a
After Exposure to Process Solutions	9.0	9.0	lb / inch	1.58	1.58	N / mm	IPC-TM-650.2.4.8
X / Y CTE [-40°C to +125°C]	12 - 15	12 - 15	ppm / °C	12 - 15	12 - 15	ppm / °C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 [50°C to Tg]	50	50	ppm / °C	50	50	ppm / °C	IPC-TM-650.2.4.24
Z Axis CTE Alpha 2 [Tg to 260°C]	270	270	ppm / °C	270	260	ppm / °C	IPC-TM-650.2.4.24
Z Axis Expansion [50°C to 260°C]	3.7	3.7	%	3.7	3.7	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)	3.5 / 2.8	TBD	psi x 10 <sup>6</sup>	24.1 / 19.3	TBD	GN / m <sup>2</sup>	ASTM D3039
Poisson's Ratios (X / Y)	0.13 / 0.11	TBD		0.13 / 0.11	TBD		ASTM D3039
Thermal Conductivity	0.525	0.525	W / mK	0.525	0.525	W / mK	ASTM E1461
Specific Heat	1.22	1.22	J / gK	1.22	1.22	J / gK	ASTM E1461
<b>Electrical Properties</b>							
Dielectric Constant (50% resin content)							
@ 1 MHz (TFC / LCR Meter)	4.5	4.0		4.5	4.0		IPC-TM-650.2.5.5.3
@ 1 GHz (RF Impedance)	4.0	3.6		4.0	3.6		IPC-TM-650.2.5.5.9
@ 2.5 GHz (Stripline)	3.9	3.4		3.9	3.4		IPC-TM-650.2.5.5.5
@ 10 GHz (Stripline)	3.9	3.3		3.9	3.3		IPC-TM-650.2.5.5.5
Dissipation Factor (50% resin content)							
@ 1 MHz (TFC / LCR Meter)	0.018	0.016		0.018	0.016		IPC-TM-650.2.5.5.3
@ 2.5 GHz (Stripline)	0.017	0.015		0.017	0.015		IPC-TM-650.2.5.5.9
@ 10 GHz ( Stripline)	0.017	0.016		0.017	0.016		IPC-TM-650.2.5.5.5
Volume Resistivity							
C - 96 / 35 / 90	10 <sup>8</sup>	10 <sup>8</sup>	MΩ - cm	10 <sup>8</sup>	10 <sup>8</sup>	MΩ - cm	IPC-TM-650.2.5.17.1
E - 24 / 125	10 <sup>7</sup>	10 <sup>7</sup>	MΩ - cm	10 <sup>7</sup>	10 <sup>7</sup>	MΩ - cm	IPC-TM-650.2.5.17.1
Surface Resistivity							
C - 96 / 35 / 90	10 <sup>8</sup>	10 <sup>8</sup>	MΩ	10 <sup>8</sup>	10 <sup>8</sup>	MΩ	IPC-TM-650.2.5.17.1
E - 24 / 125	10 <sup>7</sup>	10 <sup>7</sup>	MΩ	10 <sup>7</sup>	10 <sup>7</sup>	MΩ	IPC-TM-650.2.5.17.1
Electric Strength	1250	1250	V / mil	4.3x10 <sup>4</sup>	4.3x10 <sup>4</sup>	V / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	>50	kV	>50	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	124	124	seconds	124	124	seconds	IPC-TM-650.2.5.1
<b>Thermal Properties</b>							
Glass Transition Temperature (Tg)							
DSC (°C)	155	155	°C	155	155	°C	IPC-TM-650.2.4.25c
TMA (°C)	150	150	°C	150	150	°C	IPC-TM-650.2.4.24c
DMA (°C) (Tan d Peak)	160	160	°C	160	160	°C	IPC-TM-650.2.4.24.3
Degradation Temp (TGA) (5% wt. loss)	330	330	°C	330	330	°C	IPC-TM-650.2.4.24.6
Pressure Cooker - 60 min then solder dip							IPC-TM-650.2.6.16
@288°C until failure (max 10 min.)	Pass	Pass		Pass	Pass		(modified)
T <sub>260</sub>	16	16	minutes	16	16	minutes	IPC-TM-650.2.4.24.1
<b>Chemical / Physical Properties</b>							
Moisture Absorption 0.07	0.07	wt. %	0.07	0.07	wt. %		IPC-TM-650.2.6.2.1
Methylene Chloride Resistance	0.31	0.31	% wt. chg.	0.31	0.31	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.97	1.97	g / cm <sup>3</sup>	1.97	1.97	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.

Aeroglide™, CoreFix®, Easycure™, EF®, EP™, LD®, Mercurywave™, Nelco®, Nelcote®, Nova™, PeelCote™, RTFoil® and SI® are trademarks of Park Electrochemical Corp.

\*CAF resistance has been established to greater than 500 hours using a specific OEM coupon design and test procedure. For details on this or other CAF tests, please visit [www.parkelco.com](http://www.parkelco.com).

Nelco reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Nelco does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights nor the rights of others. This disclaimer of warranty is in lieu of all warranties whether expressed, implied or statutory, including implied warranties of merchantability or fitness for a particular purpose.



PARK  
ELECTROCHEMICAL  
CORP.