Nelco® N4000-7 EF®

165°C Tg, Halogen-Free Epoxy

The Nelco® N4000-7 EF® series of laminates and prepregs is your total environmental solution. This advanced halogen-free resin system provides superior CAF resistance for high temperature, lead-free assembly designs.

Key Features

Outstanding moisture resistance and thermal stability
- Proven lead-free assembly compatibility for high layer count designs
- Designed for environmentally conscious, high-reliability applications
- Very low moisture uptake provides high reliability when multiple solder reflow or repair operations are required

Uncompromised electrical values
- No compromise in electrical performance with the elimination of bromine when compared against similar brominated materials
- Superior dielectrics when compared to many standard-loss FR-4 epoxy systems

Halogen-Free
- Providing a complete lead and halogen free "green" solution
- UL 94V-0 flammability rating without the use of bromine flame retardants

CAF* resistant
- The low Z-CTE and proven CAF resistance provide long-term reliability in advanced designs using increased circuit densities and decreased feature pitch.

High Tg FR-4 processing
- Processes using standard high Tg FR-4 methods
- 90 min press at 193ºC and 275-350 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-4101/94 specifications
- All Nelco® materials are RoHS compliant.

Applications

- Lead-Free Assemblies
- Fine-Line Multilayers
- Backplanes
- Surface-Mount Multilayers
- BGA Multilayers
- Automotive Electronics
- MCM-Ls
- Direct Chip Attach
- Wireless Communications
- Telecommunications Infrastructure

Global Availability

Nelco, California	+1.714.879.4293
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Nelco, Asia Pacific	+65.6861.7117
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Mechanical Properties	Value	U.S. Units	Value	Metric	Test Method
Peel Strength - 1 oz. (35 micron) Cu					
After Solder Float	6.7	lb/inch	1.20	N/mm	IPC-TM-650.2.4.8
At Elevated Temperature	5.7	lb/inch	1.00	N/mm	IPC-TM-650.2.4.8.2a
After Exposure to Process Solutions	5.6	lb/inch	1.00	N/mm	IPC-TM-650.2.4.8
X/Y CTE [-40°C to +125°C]	12 - 17	ppm/°C	12 - 17	ppm/°C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 [50°C to Tg]	65	ppm/°C	65	ppm/°C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 2 [Tg to 260°C]	250	ppm/°C	250	ppm/°C	IPC-TM-650.2.4.41
Z Axis Expansion [50°C to 260°C]	3.5	%	3.5	%	IPC-TM-650.2.4.41
Young's Modulus (X/Y)	4.5/4.0	psi x 10^6	28.3/23.4	GN/m^2	ASTM D3039
Poisson's Ratios (X/Y)	0.175/0.153		0.175/0.153		ASTM D3039
Thermal Conductivity	0.47	W/mK	0.47	W/mK	ASTM E1461-92
Specific Heat	0.95	J/gK	0.95	J/gK	ASTM E1461-92
Electrical Properties					
Dielectric Constant (50% resin content)					
@ 1 MHz (TFC/LCR Meter)	4.1		4.1		IPC-TM-650.2.5.5.3
@ 1 GHz (RF Impedance)	4.0		4.0		IPC-TM-650.2.5.5.9
@ 10 GHz (Split Post Cavity)	3.8		3.8		Internal Method
Dissipation Factor (50% resin content)					
@ 1 MHz (TFC/LCR Meter)	0.013		0.013		IPC-TM-650.2.5.5.3
@ 10 GHz (Split Post Cavity)	0.016		0.016		Internal Method
Volume Resistivity					
C - 96/35/90	10^7	Mμ - cm	10^7	Mμ - cm	IPC-TM-650.2.5.17.1
E - 24/125	10^7	Mμ - cm	10^7	Mμ - cm	IPC-TM-650.2.5.17.1
Surface Resistivity					
C - 96/35/90	10^6	Mμ	10^6	Mμ	IPC-TM-650.2.5.17.1
E - 24/125	10^6	Mμ	10^6	Mμ	IPC-TM-650.2.5.17.1
Electric Strength	1000	V/mil	$3.9x10^4$	V/mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	kV	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	158	seconds	158	seconds	IPC-TM-650.2.5.1
Thermal Properties					
Glass Transition Temperature (T_g)					
DSC (°C)	165	°C	165	°C	IPC-TM-650.2.4.25c
TMA (°C)	155	°C	155	°C	IPC-TM-650.2.4.24c
DMA (°C)	190	°C	190	°C	IPC-TM-650.2.4.24.3
Degradation Temp (TGA) (5% wt. loss)	425	°C	425	°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		(modified)
T_{260}	> 30	minutes	> 30	minutes	IPC-TM-650.2.4.24.1
T_{288}	2 - 4	minutes	2 - 4	minutes	IPC-TM-650.2.4.24.1
Chemical/Physical Properties					
Moisture Absorption	0.10	wt. %	0.10	wt. %	IPC-TM-650.2.6.2.1
Methylene Chloride Resistance	0.02	% wt. chg.	0.02	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.92	g/cm^3	1.92	g/cm^3	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. 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.

*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.parkelectro.com.

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