

N4000-11

CAF Resistant, Low-CTE, High-Tg Multifunctional Epoxy Laminate & Prepreg

N4000-11 is a CAF resistant, high Tg (175° C by DSC) multifunctional epoxy dielectric substrate. This material is formulated to provide the PWB manufacturer and OEM with vastly improved thermal, mechanical, and electrical performance in high layer count, sophisticated PWB designs. The resin chemistry of the N4000-11 eliminates the use of Dicyandiamide (DICY) as the primary cross-linking agent, thereby offering dramatic improvement in thermal stability and moisture resistance compared to traditional FR-4 epoxy systems. N4000-11 is designed for applications requiring outstanding thermal stability, low Z - axis expansion, and superior electrical integrity.

N4000-11 has been formulated as a next generation high Tg FR-4 dielectric substrate. The use of advanced, proprietary resin technology has resulted in a product with exceptional thermal stability, a very low Z-CTE, and CAF resistance that far exceeds traditional multifunctional epoxy resin technology.

The PWB process latitude of N4000-11 is almost identical to traditional high Tg FR-4 products. The rheology of this product has been optimized to avoid the potential problems associated with non-dicy cured systems. Users can expect the consistent, controlled flow and superior via topography required in today's complex PWB designs.

This advanced material is designed for use in high layer count, high density multilayer boards, backplanes, and surface mount multilayers for assembly of BGA's, MCM-Ls, and other CSP's. End use applications include network storage, wireless communications infrastructure, IT switching and high end servers. It is particularly appropriate for applications requiring lead-free assembly and PCB designs requiring very low Z-axis CTE and CAF resistance.

As with all Nelco materials, the N4000-11 is vacuum laminated and available in a wide variety of alternative constructions, copper weights and glass styles. It is also available in standard Copper, double treat and RTFOIL® Laminate.

This material set is offered in a broad range of laminate and prepreg constructions and manufactured in Asia, North America, and Europe.

Product Application Environments

- Lead-Free Assembly Substrate
- Large Format Backplanes
- Tight Tolerance Via to Via Applications
- High I/O Count BGA Substrates
- Extreme Layer count Multilayers
- Lead-Free DCA Applications
- Next Generation HDI Buildup layers (-11 LD)
- High Temperature Underhood Automotive
- Telecommunications Infrastructure
- Sophisticated Data Storage Applications

Vacuum Lamination Parameters

Full Cure In Press	75 min. @ 185°C
Heat Up Rate (°C/min.)	4 - 7
Critical Range (°C)	70 - 130
Cool Down Rate (°C/min.)	< 4
Pressure (kg/cm ²) / (psi) *	15 - 20 / 200 - 300

Set platen 3 - 6° C higher than cure temp. & control heat up rate through critical temperature range.

*Large panel sizes, high layer count and/or thick panels require higher pressure depending on heat and pressure distribution during lamination.

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Property / Condition	Value (U.S. Units)		Value (Metric Units)		Test Method
Mechanical Properties					
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 - 14	ppm / °C	12 - 14	ppm / °C	IPC-TM-650.2.4.41
Z Axis Expansion [50°C to 260°C]	3.2	%	3.2	%	IPC-TM-650.2.4.41
Young's Modulus (X / Y)	4.4 / 3.7	psi x 10 ⁶	29.9 / 25.1	GN / m ²	ASTM D3039
Poisson's Ratios (X / Y)	0.16 / 0.14		0.16 / 0.14		ASTM D3039
Thermal Conductivity	0.4 - 0.6	W / mK	0.4 - 0.6	W / mK	ASTM E1461-92
Specific Heat	1.20 - 1.40	J / gK	1.20 - 1.40	J / gK	ASTM E1461-92
Electrical Properties					
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)	3.8		3.8		IPC-TM-650.2.5.5.5
Dissipation Factor (50% resin content)					
@ 1 MHz (TFC / LCR Meter)	0.016		0.016		IPC-TM-650.2.5.5.3
@ 2.5 GHz (Stripline)	0.020		0.020		IPC-TM-650.2.5.5.5
Volume Resistivity					
C - 96 / 35 / 90	10 ⁷	MΩ - cm	10 ⁷	MΩ - cm	IPC-TM-650.2.5.17.1
E - 24 / 125	10 ⁷	MΩ - cm	10 ⁷	MΩ - cm	IPC-TM-650.2.5.17.1
Surface Resistivity					
C - 96 / 35 / 90	10 ⁶	MΩ	10 ⁶	MΩ	IPC-TM-650.2.5.17.1
E - 24 / 125	10 ⁶	MΩ	10 ⁶	MΩ	IPC-TM-650.2.5.17.1
Electric Strength	1300	V / mil	5.1x10 ⁴	V / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	kV	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	124	seconds	124	seconds	IPC-TM-650.2.5.1
Thermal Properties					
Glass Transition Temperature (T _g)					
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)	360	°C	360	°C	IPC-TM-650.2.3.40
Pressure Cooker - 2 hour					IPC-TM-650.2.6.16
(10 second solder dip @ 288°C)	Pass		Pass		(modified)
T ₂₆₀	30	minutes	30	minutes	IPC-TM-650.2.4.24.1
Chemical / Physical Properties					
Moisture Absorption	0.15	wt. %	0.15	wt. %	IPC-TM-650.2.6.2.1
Methylene Chloride Resistance	0.8	% wt. chg.	0.8	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.96	g / cm ³	1.96	g / cm ³	Internal Method

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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*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.

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