Nelco® N4000-29

Advanced Lead-Free, High-Tg Multifunctional Epoxy

Park's N4000-29 is an advanced, lead-free, low-CTE, high Tg (185°C by DSC) multifunctional epoxy dielectric substrate. This material has been designed for use not only in standard multilayer PWB designs, but for today's toughest, high-performance, lead-free applications.

Key Features

Low Z-axis expansion
- Reduced expansion improves through-hole reliability
- Excellent for high layer count assemblies
- Designed to withstand multiple reflow excursions and repair operations

High Tg, excellent thermal stability and moisture resistance
- Improved lead-free assembly compatibility
- Proven IST testing results
- Exceptional peel strength
- Suitable for high-layer count, sophisticated PWB designs

CAF Resistant
- Providing long term reliability in end products

Proprietary resin chemistry
- Extremely low Z-CTE.
- Improved thermal stability, CAF and moisture resistance when compared to traditional FR-4

Superior electrical properties
- Supporting advanced technology PWB designs

Optimized FR-4 processing
- Superior rheology providing consistent controlled flow and superior via topography.
- 75 min press at 185°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, /28, /98, /99 and /126 specifications*
- RoHS compliant.

* material also meets the specifications of IPC-4101/26 and /83 unfilled slash sheets.

Applications

- Advanced 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
- High Temperature Underhood Automotive
- Telecommunications Infrastructure
- Sophisticated Data Storage Applications

Global Availability

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Park's UL file number: E36295

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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	10.1	lb / inch	1.81	N / mm	IPC-TM-650.2.4.8
At Elevated Temperature	8.9	lb / inch	1.56	N / mm	IPC-TM-650.2.4.8.2a
After Exposure to Process Solutions	9.7	lb / inch	1.73	N / mm	IPC-TM-650.2.4.8
X / Y CTE [-40°C to +125°C]	12 - 15	ppm / °C	12 - 15	ppm / °C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 [50°C to Tg]	55	ppm / °C	55	ppm / °C	IPC-TM-650.2.4.24
Z Axis CTE Alpha 2 [Tg to 260°C]	265	ppm / °C	265	ppm / °C	IPC-TM-650.2.4.24
Z Axis Expansion [50°C to 260°C]	3.0	%	3.0	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)	3.6 / 2.9	psi x 10^6	22.6 / 18.2	GN / m^2	ASTM D3039
Poisson's Ratios (X / Y)	0.18 / 0.16		0.18 / 0.16		ASTM D3039
Thermal Conductivity	0.46	W / mK	0.46	W / mK	ASTM E1461-92
Specific Heat	0.92	J / gK	0.92	J / gK	ASTM E1461-92
Electrical Properties					
Dielectric Constant (50% resin content)					
@ 1 MHz (TFC / LCR Meter)	4.5		4.5		IPC-TM-650.2.5.5.3
@ 1 GHz (RF Impedance)	4.3		4.3		IPC-TM-650.2.5.5.9
@ 10 GHz (Split Post Cavity)	4.2		4.2		
@ 10 GHz (Stripline)	4.0		4.0		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 (Split Post Cavity)	0.015		0.015		
@ 10 GHz (Split Post Cavity)	0.017		0.017		
Volume Resistivity					
C - 96 / 35 / 90	10^7	MΩ - cm	10^7	MΩ - cm	IPC-TM-650.2.5.17.1
E - 24 / 125	10^8	MΩ - cm	10^8	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	10^7	MΩ	10^7	MΩ	IPC-TM-650.2.5.17.1
Electric Strength	1100	V / mil	$4.2x10^4$	V / mm	IPC-TM-650.2.5.6.2
Dielectric Breakdown	>50	kV	>50	kV	IPC-TM-650.2.5.6
Arc Resistance	129	seconds	129	seconds	IPC-TM-650.2.5.1
Thermal Properties					
Glass Transition Temperature (T_g)					
DSC (°C)	>185	°C	>185	°C	IPC-TM-650.2.4.25c
TMA (°C)	>175	°C	>175	°C	IPC-TM-650.2.4.24c
Degradation Temp (TGA) (5% wt. loss)	350	°C	350	°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}	>60	minutes	>60	minutes	IPC-TM-650.2.4.24.1
T_{288}	15	minutes	15	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	0.01	% wt. chg.	0.01	% wt. chg.	IPC-TM-650.2.3.4.3
Density [50% resin content]	1.99	g / cm^3	1.99	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, 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.

*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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