

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-4101/98, /99, /126 and /129 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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CORP.

Nelco® N4000-29

Advanced Lead-Free, High-Tg Multifunctional Epoxy

| 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 @288°C until failure (max 10 min.) | Pass | | Pass | | IPC-TM-650.2.6.16 (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.

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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.parkelectro.com.

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