

Park Advanced Circuitry Materials

Nelco® N4350-13 RF Nelco® N4380-13 RF

Microwave Performance, Modified Epoxy

The Nelco® N4350-13 RF and N4380-13 RF series are enhanced epoxy resin systems specifically engineered to provide a unique solution for design applications that demand outstanding thermal properties, tight dielectric constant tolerances and low signal loss properties. These next generation modified epoxies combine tightly controlled RF electrical properties with the mechanical reliability and competitive advantages of FR-4.

Key Features

Tg >210°C, outstanding thermal, electrical and signal loss properties

- Lead-free assembly compatibility
- Suitable for high-layer count, sophisticated PWB, RF and Antenna designs

CAF* Resistant

- Providing long term reliability in end products

Tightly controlled electrical properties

- Consistency in performance-sensitive applications
- Suitable for designs that would otherwise require PTFE or ceramic-loaded hydrocarbon materials
- Can be used for both the RF and the digital layers in hybrid multilayer applications

N4000-13 based material

- Industry standard material providing years of usage data
- Well-known excellent electrical and loss properties
- Does not use expensive and abrasive ceramic fillers

High-Tg FR-4 processing

- Ease of processing through more conventional processes.
- 90 min press at 193°C and 275-350 psi.
- Most epoxy prepregs will adhere

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-4101/29 specifications
- All Nelco materials are RoHS compliant.



Applications

- 802.11 a, b and g Antennas
- Automotive
- Power Amplifiers
- Hybrid RF Multilayers
- Telecommunications
- High Speed Computing
- Commercial RF Applications
- Lead-Free Assembly Substrates

Global Availability

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Park's UL file number: E36295



Nelco® N4350-13 RF / N4380-13 RF

Microwave Performance, Modified Epoxy

| Property / Condition | Value (U.S. Units) | | | Value (Metric Units) | | | Test Method |
|--|--------------------|-----------------|------------|----------------------|---------------------|---------------------|---------------------|
| | N4350-13 | N4380-13 | U.S. Units | N4350-13 | N4380-13 | Metric | |
| Mechanical Properties | | | | | | | |
| 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] | | | | 10 - 14 | 10 - 14 | ppm / °C | IPC-TM-650.2.4.41 |
| Z Axis Expansion [50°C to 260°C] | | | | 3.5 | 3.5 | % | IPC-TM-650.2.4.24 |
| Thermal Conductivity | | | | 0.350 | 0.350 | W / mK | ASTM E1461 |
| Specific Heat | | | | 1.20 | 1.30 | J / gK | ASTM E1461 |
| Electrical Properties | | | | | | | |
| Dielectric Constant | | | | | | | |
| @ 10 GHz (Stripline) | 3.57 | 3.8 | | 3.57 | 3.8 | | IPC-TM-650.2.5.5.5 |
| Dissipation Factor | | | | | | | |
| @ 10 GHz (Stripline) | 0.009 | 0.009 | | 0.009 | 0.009 | | IPC-TM-650.2.5.5.5 |
| Volume Resistivity | | | | | | | |
| C - 96 / 35 / 90 | | | | 10 ⁸ | 10 ⁸ | MΩ - cm | IPC-TM-650.2.5.17.1 |
| E - 24 / 125 | | | | 10 ⁷ | 10 ⁷ | MΩ - cm | IPC-TM-650.2.5.17.1 |
| Surface Resistivity | | | | | | | |
| C - 96 / 35 / 90 | 10 ⁷ | 10 ⁷ | MΩ | 10 ⁷ | 10 ⁷ | MΩ | IPC-TM-650.2.5.17.1 |
| E - 24 / 125 | 10 ⁷ | 10 ⁷ | MΩ | 10 ⁷ | 10 ⁷ | MΩ | IPC-TM-650.2.5.17.1 |
| Electric Strength | 1200 | 1200 | V / mil | 4.7x10 ⁴ | 4.7x10 ⁴ | 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 | 123 | 123 | seconds | 123 | 123 | seconds | IPC-TM-650.2.5.1 |
| Thermal Properties | | | | | | | |
| Glass Transition Temperature (T _g) | | | | | | | |
| DSC (°C) | 410 | 410 | °F | 210 | 210 | °C | IPC-TM-650.2.4.25c |
| TMA (°C) | 392 | 392 | °F | 200 | 200 | °C | IPC-TM-650.2.4.24c |
| DMA (°C) (Tan δ Peak) | 464 | 464 | °F | 240 | 240 | °C | IPC-TM-650.2.4.24.3 |
| Degradation Temp (TGA) (5% wt. loss) | 662 | 662 | °F | 350 | 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 | | Pass | Pass | | (modified) |
| T ₂₆₀ | >50 | >50 | minutes | >50 | >50 | minutes | IPC-TM-650.2.4.24.1 |
| T ₂₈₈ | >8 | >8 | minutes | >8 | >8 | minutes | IPC-TM-650.2.4.24.1 |
| Chemical / Physical Properties | | | | | | | |
| Moisture Absorption | 0.1 | 0.1 | wt. % | 0.1 | 0.1 | wt. % | IPC-TM-650.2.6.2.1 |
| Methylene Chloride Resistance | 0.7 | 0.7 | % wt. chg. | 0.7 | 0.7 | % wt. chg. | IPC-TM-650.2.3.4.3 |
| Density [50% resin content] | | | | 1.77 | 1.77 | g / cm ³ | Internal Method |

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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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