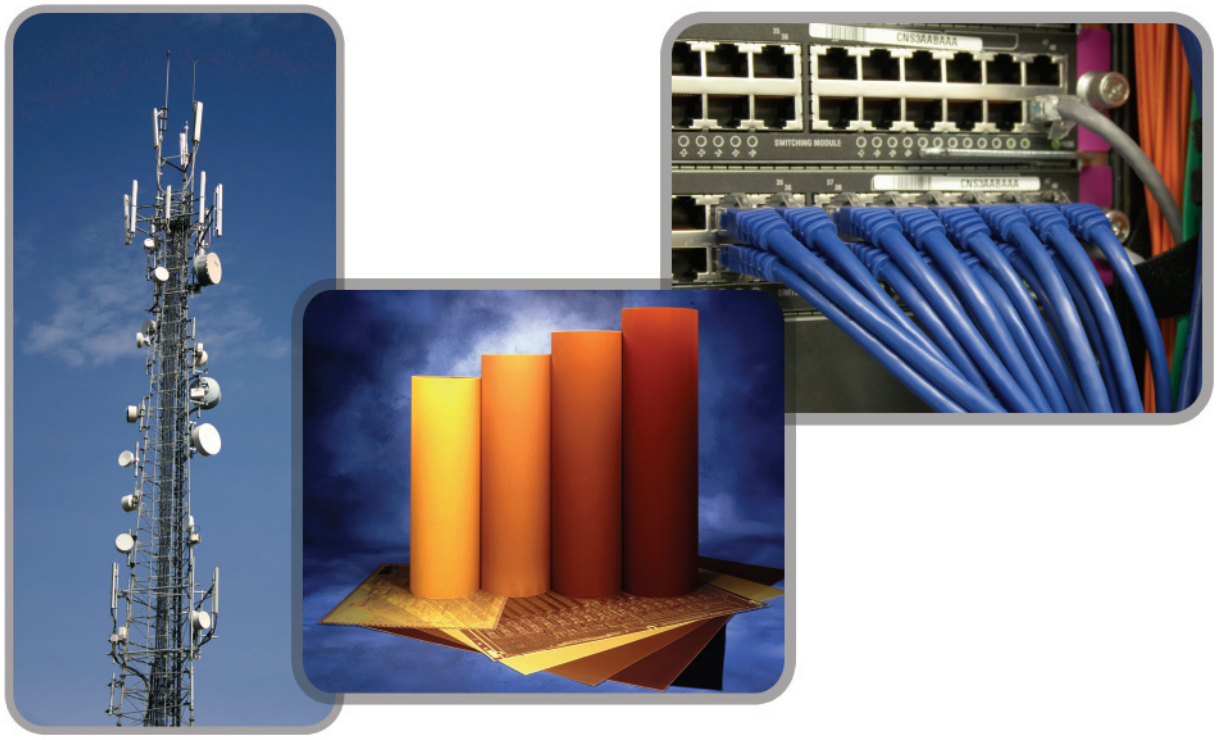
Nelco® Materials Selection Guide



Park Electrochemical Corp. is a global advanced materials company which develops and manufactures high-technology digital and RF/microwave printed circuit materials principally for the telecommunications and internet infrastructure and high-end computing markets and advanced composite materials, parts and assemblies for the aerospace and specialty markets. Park's core capabilities are in the areas of polymer chemistry formulation and coating technology. Park also specializes in the design and manufacture of complex composite aircraft and space vehicle parts. The Company's manufacturing facilities are located in Singapore, China, France, Connecticut, Kansas, Arizona, California and Washington.

Park provides a full range of prepreg and laminate systems providing superior thermal, mechanical and electrical performance in high layer count digital designs and RF / microwave applications. All Nelco® electronic materials are RoHS compliant and include:

- Materials for high-temperature lead-free assembly (up to 260°C reflow),
- Modified epoxies for high temperature and increased reliability applications,
- High speed / low loss materials for digital applications,
- BT, polyimide, cyanate ester substrates, and
- Specialized RF / Microwave dielectric substrates that operate at frequencies up to 77 GHz.

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FR-4 Substrates	Description	High Temp Lead-Free[2] Assembly Compatible	CAF[3] Resistant	Tg °C (DSC)	Dielectric[1] Constant (Dk)		Dissipation[1] Factor (Df)
					1 MHz	1 GHz	1 MHz
N4000-2	Multifunctional Epoxy	-	-	140	4.3	4.1	0.023
N4000-6	High Tg Multifunctional Epoxy	-	-	175	4.3	4.1	0.023
N4000-6 FC	Fast-Cure, High Tg Multifunctional Epoxy	-	-	175	4.3	4.1	0.023
N4000-7	Low CTE Multifunctional Epoxy	Yes	Yes	155	4.5	4.0	0.018
N4000-7 SI®	Low CTE Multifunctional Epoxy	Yes	Yes	155	4.0	3.6	0.016
N4000-7 EF®	165ºC Tg Halogen-Free Epoxy	Yes	Yes	165	4.1	4.0	0.013
N4000-11	Low CTE, High Tg Multifunctional Epoxy	Yes	Yes	175	4.3	4.1	0.016
N4000-29	Lead Free, High Tg Multifunctional Epoxy	Yes	Yes	185	4.5	4.3	0.016

High Performance					1 GHz	10 GHz	10 GHz
Mercurywave™ 9350	Microwave Performance, Modified Epoxy	Yes	-	≥200 (DMA)		3.7	0.004
N4000-12	High Speed, Low Loss, CAF Resistant System	Yes	Yes	190	3.7	3.6	0.008
N4000-13	High Speed, Low Loss Epoxy	Yes	Yes	210	3.7	3.6	0.008
N4000-13 & EP SI®	High Speed, Low Loss Epoxy	Yes	Yes	210	3.2	3.2	0.007
N4000-13 EP™	High Speed, Low Loss Epoxy	Yes	Yes	210	3.7	3.6	0.008
N4350-13 RF	Microwave Performance, Modified Epoxy	Yes	-	210	-	3.5	0.0065
N4380-13 RF	Microwave Performance, Modified Epoxy	Yes	-	210	-	3.8	0.007
N5000	BT Epoxy	Yes	Yes	185	3.6	3.6	0.010
N5000-30 & 32	Chip Packaging BT Epoxy (not available in Asia)	Yes	-	205	-	-	-
N7000-1	non-MDA Polyimide	Yes	-	260	3.9	3.8	0.008
N7000-2 HT / -3	non-MDA Toughened Polyimide	Yes	-	260	3.5	3.5	0.009
N7000-2 V0	UL 94 V-0 Toughened Polyimide	Yes	-	250	3.8	3.8	0.010
N8000	Cyanate Ester	Yes	-	250	3.6	3.5	0.007
N8000Q	Cyanate Ester with Quartz Fabric	Yes	-	250	3.3	3.2	0.006
N9000-13 RF	PTFE Blended Laminate	Yes	-	220	-	3.00-3.50	0.0040-0.0055
NH9000	Woven, Glass / Ceramic Loaded PTFE	Yes	-	-	-	2.94-4.50	0.0022-0.0030
NX9000	Woven, Glass-Reinforced PTFE	Yes	-	-	-	2.40-3.20	0.0016-0.0024
NY9000	Woven, Glass-Reinforced PTFE	Yes	-	-	-	2.08-2.33	0.0006-0.0011

Buried Capacitance™ (BC®) Materials

BC® materials are designed for smaller, more reliable assemblies. The following Nelco materials are available as a BC® option:

- N4000-6 and N4000-6 FC
- N4000-11 and N4000-29
- N4000-12
- N4000-13 and N4000-13 EP™

Laser Drillable Materials

LD® materials enhanced for optimal laser ablation. The following Nelco materials are typically manufactured with the LD® option:

- N4000-2
- N4000-6 and N4000-6 FC

[1] Dk and Df numbers provided are typical values calculated at 50% resin content except where noted. RF/Microwave material Dk and Df values are based on actual constructions.

[2] High-temperature lead free assembly compatibility is based on Td, T_{260} and 245ºC / 260ºC reflow testing . Actual results will vary based on assembly and board construction conditions.

[3] CAF resistance testing is based on specific coupon design and test protocols.

For details on this or other material testing, please visit www.parkelectro.com or contact your local Nelco representative.

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