

### High Frequency, Low Loss Thermoset Laminates and Prepreg for Double Sided, Multilayer and Mixed Dielectric Printed Circuit Boards

Arlon 25N® and 25FR® are woven fiberglass reinforced, ceramic-filled composite materials engineered for use in microwave and RF multilayer printed circuit boards. Combining a non-polar thermoset resin system with a controlled-expansion ceramic filler, 25N® and 25FR® offer low dielectric constant and loss combined with a low Thermal Coefficient of Dielectric Constant ( $TC\epsilon_p$ ) for signal stability over a wide ambient temperature range. Designed for use in multilayer packages, 25N® and 25FR® offer prepregs that are identical in chemical composition and physical properties with their copper clad laminates for a completely homogeneous finished package for optimal signal integrity.

The low dielectric constant ( $\epsilon_p$ ) and loss properties, low thermal coefficient of dielectric constant ( $TC\epsilon_p$ ), and excellent physical stability characteristics offered by 25N and 25FR materials make them ideal for wireless and digital applications such as cellular telephones, down converters, low noise amplifiers, antennas — and other advanced design circuits.

Processing for 25N and 25FR materials is consistent with processing for standard high temperature thermoset based printed circuit board substrates.

#### Availability:

25N and 25FR materials are available in rigid, thin copper-clad laminates or B-stage bonding plies (prepregs), making them ideal for single- and double-sided PWBs and complex multilayer circuits including dual offset stripline circuitry. Laminates are supplied with 1/2, 1, or 2 ounce electrodeposited copper on both sides. Other copper weights and rolled copper foil are available. Prepreg is available in rolls or precut panels.

Standard Laminate Thickness	25N	25FR	Tolerance
	0.0060	0.0060	± 0.0007
	0.0080	0.0080	± 0.0010
	0.0100	0.0100	± 0.0010
	0.0120	0.0120	± 0.0015
	0.0180	0.0180	± 0.0020
	0.0200	0.0200	± 0.0020
	0.0240	0.0240	± 0.0020
	0.0300	0.0300	± 0.0030
	0.0600	0.0580	± 0.0040
Prepreg	1080	0.0039	0.0039
	2112	0.0058	0.0058

## Typical Properties: 25N and 25FR Low Loss Laminates

Properties	Test Method	Condition	25N	25FR
Dielectric Constant @10GHz	IPC TM-650 2.5.5.5	C23/50	3.38	3.58
Dissipation Factor @10GHz	IPC TM-650 2.5.5.5	C23/50	0.0025	0.0035
Thermal Coefficient of E <sub>r</sub> (ppm/°C)	IPC TM-650 2.5.5.5 Adapted	-10°C to +140°C	-87	50
Peel Strength (lbs per inch)	IPC TM-650 2.4.8	After Thermal Stress	5	5
Volume Resistivity (MΩ-cm)	IPC TM-650 2.5.17.1	A	1.98 E9	4.17 E8 (12 mil)
Surface Resistivity (MΩ)	IPC TM-650 2.5.17.1	A	4.42 E8	8.9 E8 (12 mil)
Tensile Strength (kpsi)	ASTM D-882	A, 23°C	16.1	14
Flexural Strength (psi)	ASTM D-790	A, 23°C	30195	35024
Specific Gravity (g/cm <sup>3</sup> )	ASTM D-792 Method A	A, 23°C	1.7	1.8
Water Absorption (%)	IPC TM-650 2.6.2.1	E1/105 + D24/23	0.09	0.09
Coefficient of Thermal Expansion (ppm/°C)	IPC TM-650 2.4.24	Before Tg		
X Axis			15	16
Y Axis			15	18
Z Axis			52	59
Thermal Conductivity (W/mK)	ASTM E-1225	100°C	0.45	0.45
Outgassing	ASTM E-595-90			
Total Mass Loss (%)	Maximum 1.00%	125°C, ≤ 10 <sup>-6</sup> torr	0.17	0.24
Collected Volatile	Maximum 0.10%		0.01	0.00
Condensable Material (%)				
Water Vapor Recovered (%)			0.02	0.07
Visible Condensate (±)				
Flammability UL File E 80166	UL 94 Vertical Burn IPC TM-650 2.3.10	C48/23/50, E24/125	N/A	UL94V-0

*Data based on 0.060" dielectric thickness, exclusive of metal cladding except where indicated by test method. Results listed above are typical properties; they are not to be used as specification limits. The above information creates no expressed or implied warranties. The properties of 25N and 25FR laminates may vary depending on the application.*

*The information and data contained herein are believed reliable, but all recommendations or suggestions are made without guarantee. You should thoroughly and independently test materials for any planned applications and determine satisfactory performance before commercialization. Furthermore, no suggestion for use, or material supplied shall be construed as a recommendation or inducement to violate any law or infringe any patent.*

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