

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 composites using a non-polar, low loss, thermoset resin. They are engineered for use in microwave and RF multilayer printed circuit boards and offer low dielectric constant & low loss, along with minimal change of dielectric constant with temperature, excellent dimensional stability and low Z-axis thermal expansion. Together, these features provide phase & impedance stability and mechanical reliability over a wide range of frequency and temperature.

25N and 25FR are offered with prepregs identical in chemical composition and physical properties with their copper clad laminates. When used for design and fabrication of multilayer packages, they provide for a more consistent finished package and optimal signal integrity.

Low dielectric constant (ϵ_r), low loss tangent (D_f), low thermal coefficient of dielectric constant (TCE_r), and excellent dielectric constant stability over frequency provided by 25N and 25FR support needs of a variety of applications ranging from wireless and digital applications, such as cellular telephones, down converters, low noise and other RF power amplifiers, antennas, couplers, filters and other advanced design circuits.

Fabrication and chemical processing 25N and 25FR materials is consistent with technique and production for standard high temperature, thermoset based printed circuit board substrates such as FR-4.

Features:

- Low Loss Ceramic-Filled Thermoset Resin
- Tight Dielectric Tolerance Control
- Excellent Dimensional Stability
- Excellent Price/Performance Ratio

Benefits:

- Greater Signal Integrity
- Wider Eye Patterns
- Excellent Dimensional Stability
- Utilizes Standard FR-4 Processes
- Excellent Thermal Properties

Typical Applications:

- Cellular Base Station Antennas, Power Amplifiers, Down Converters
- High Speed Backplanes

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Typical Properties:

25N/25FR

Property	Units	Value		Test Method
		25N	25FR	
1. Electrical Properties				
Dielectric Constant (may vary by thickness)				
@1 MHz	-			IPC TM-650 2.5.5.3
@ 10 GHz	-	3.38	3.58	IPC TM-650 2.5.5.5
Dissipation Factor				
@ 1 MHz	-			IPC TM-650 2.5.5.3
@ 10 GHz	-	0.0025	0.0035	IPC TM-650 2.5.5.5
Temperature Coefficient of Dielectric	-			
TC _{εr} @ 10 GHz (-40-150°C)	ppm/°C	-55	50	IPC TM-650 2.5.5.5
Volume Resistivity				
C96/35/90	MΩ-cm	1.98x10 ⁹	4.17x10 ⁸	IPC TM-650 2.5.17.1
E24/125	MΩ-cm			IPC TM-650 2.5.17.1
Surface Resistivity				
C96/35/90	MΩ	4.42x10 ⁸	8.9x10 ⁸	IPC TM-650 2.5.17.1
E24/125	MΩ			IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)	436	530	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV			IPC TM-650 2.5.6
Arc Resistance	sec			IPC TM-650 2.5.1
2. Thermal Properties				
Decomposition Temperature (Td)				
Initial	°C	402	380	IPC TM-650 2.4.24.6
5%	°C	431	393	IPC TM-650 2.4.24.6
T260	min			IPC TM-650 2.4.24.1
T288	min			IPC TM-650 2.4.24.1
T300	min			IPC TM-650 2.4.24.1
Thermal Expansion, CTE (x,y) 50-150°C	ppm/°C	15, 15	16, 18	IPC TM-650 2.4.41
Thermal Expansion, CTE (z) 50-150°C	ppm/°C	52	59	IPC TM-650 2.4.24
% z-axis Expansion (50-260°C)	%			IPC TM-650 2.4.24
3. Mechanical Properties				
Peel Strength to Copper (1 oz/35 micron)				
After Thermal Stress	lb/in (N/mm)	5	5	IPC TM-650 2.4.8
At Elevated Temperatures (150°)	lb/in (N/mm)			IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)			IPC TM-650 2.4.8
Young's Modulus	kpsi (MPa)			IPC TM-650 2.4.18.3
Flexural Strength (Machine/Cross)	kpsi (MPa)	30.2	35.0	IPC TM-650 2.4.4
Tensile Strength (Machine/Cross)	kpsi (MPa)	16.1	14	IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)			ASTM D-3410
Poisson's Ratio	-			ASTM D-3039
4. Physical Properties				
Water Absorption	%	0.09	0.09	IPC TM-650 2.6.2.1
Density, ambient 23°C	g/cm ³	1.7	1.8	ASTM D792 Method A
Thermal Conductivity	W/mK	0.45	0.45	ASTM E1461
Flammability	class	N/A	UL94-V0	UL-94
NASA Outgassing, 125°C, ≤10 ⁻⁶ torr	%			NASA SP-R-0022A
Total Mass Loss	%	0.17	0.24	NASA SP-R-0022A
Collected Volatiles	%	0.01	0.00	NASA SP-R-0022A
Water Vapor Recovered	%	0.02	0.07	NASA SP-R-0022A

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 Arlon laminates may vary, depending on the design and application.

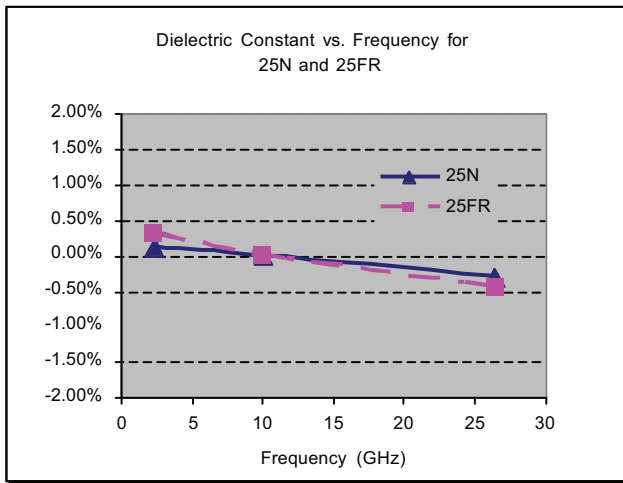


Figure 1

Demonstrates the Stability of Dielectric Constant across Frequency. This information was correlated from data generated by using a free space and circular resonator cavity. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, thus simplifying the final design process when working across EM spectrum. When transitioning from FR-4 designs to higher frequency, the stability of the Dielectric Constant of 25N/25FR over frequency ensures easy design transition and scalability of design.

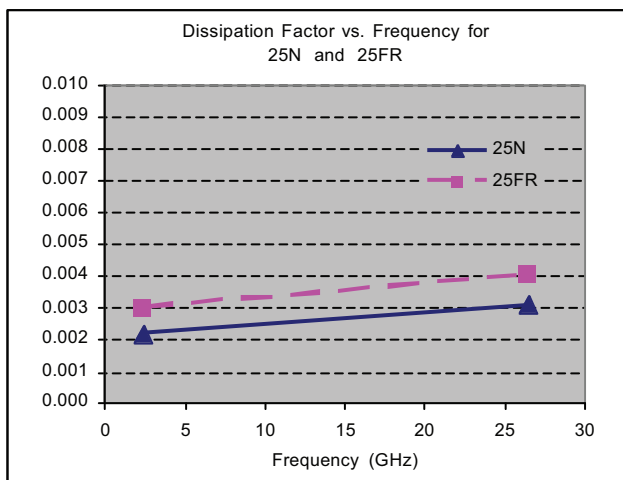


Figure 2

emonstrates the Stability of Dissipation Factor across Frequency. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, providing a stable platform for high frequency applications where signal integrity is critical to the overall performance of the application.

Material Availability:

25N and 25FR materials are available in rigid or 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 strip line circuitry. Laminates are supplied with 1/2, 1, or 2 ounce HTE electrodeposited copper on both sides. Contact customer service about other laminate options.

Prepregs are available in rolls or precut panels. The table on the right lists available prepreg styles and typical thicknesses.



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