

## PTFE/Woven Fiberglass/Ceramic Filled Laminate for Microwave Printed Circuit Boards

### Features:

- Ceramic Filled PTFE
- Dielectric Constant (4.5)
- High Thermal Conductivity
- Large Panel Size

### Benefits:

- Superior PTH Adhesion
- Readily Replaces FR-4
- Heat Dissipation and Management
- Multiple Boards per Panel; Larger Circuit Formats are Achievable

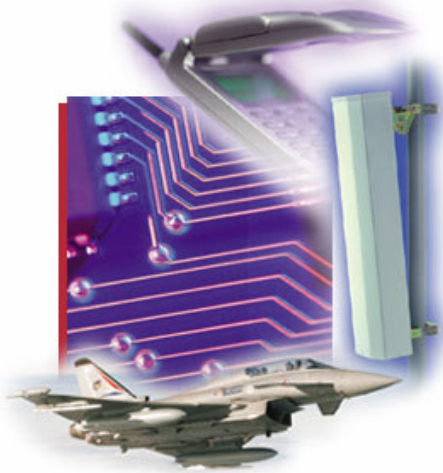
### Typical Applications:

- Circuit Board Miniaturization
- Replacement of FR-4 in Higher Frequency Applications
- Wideband Antenna Applications
- Multimedia Transmission Systems

Arlon's AD450 is a woven fiberglass reinforced, ceramic filled, PTFE based composite material for use as a printed circuit board substrate. It can be specified to replace Arlon AR450, a composite with similar electrical properties, but based on non-woven fiberglass reinforcement. The shift to woven fiberglass provides better dielectric constant and thickness uniformity, better dimensional stability as well as reduced manufacturing costs.

The electrical properties of AD450 suggest it can readily replace FR-4 in applications where higher frequencies and expectations for increased fidelity with broadband signal are beyond the performance offered by FR-4. With a dielectric constant of 4.5, most FR-4 designs can be readily transferred. Its higher thermal conductivity and lower CTE also promote its use in higher power designs, where temperature extremes and heat rejection are primary considerations.

AD450 is compatible with processing used for standard PTFE based printed circuit board substrates. In addition, its low Z-axis thermal expansion will improve plated through hole reliability, compared to typical PTFE based laminates.



## Typical Properties: AD450

Property	Test Method	Condition	Result
Dielectric Constant @ 200 MHz	IPC TM-650 2.5.5.6	C23/50	4.50
Loss Tangent @ 10 GHz	IPC TM-650 2.5.5.5	C23/50	0.0035
Thermal Coefficient of Er	IPC TM-650 2.5.5.5	-10°C to +140°C	-233.5
Copper Peel Strength (lb/in)	IPC TM-650 2.4.8	A, TS	>12
Volume Resistivity (MΩ-cm)	IPC TM-650 2.5.17.1	C96/35/90	$1.2 \times 10^9$
Surface Resistivity (MΩ)	IPC TM-650 2.5.17.1	C96/35/90	$4.5 \times 10^7$
Arc Resistance (seconds)	ASTM D-495	D48/50	>180
Tensile Modulus (kpsi)	ASTM D-638	A, 23°C	>700
Tensile Strength (kpsi)	ASTM D-882	A, 23°C	>20
Compressive Modulus (kpsi)	ASTM D-695	A, 23°C	>350
Flexural Modulus (kpsi)	ASTM D-790	A, 23°C	>540
Dielectric Breakdown (kV)	ASTM D-149	D48/50	>45
Density (g/cm <sup>3</sup> )	ASTM D-792 Method A	A, 23°C	2.45
Water Absorption (%)	IPC TM-650 2.6.2.2	E1/105 + D24/23	0.07
Coefficient of Thermal Expansion (ppm/°C) X Axis Y Axis Z Axis	IPC TM-650 2.4.24 TMA	0°C to 100°C	8 11 42
Thermal Conductivity (W/mK)	ASTM E-1225	100°C	0.38
Outgassing Total Mass Loss (%) Collected Volatile Condensable Material (%) Water Vapor Recovered	NASA SP-R-0022A Maximum 1.00% Maximum 0.10%	125°C, ≤10 <sup>-6</sup> torr	0.01 0.01 0.00
Flammability	UL 94 Vertical Burn	C48/23/50, E24/125	UL94-V0

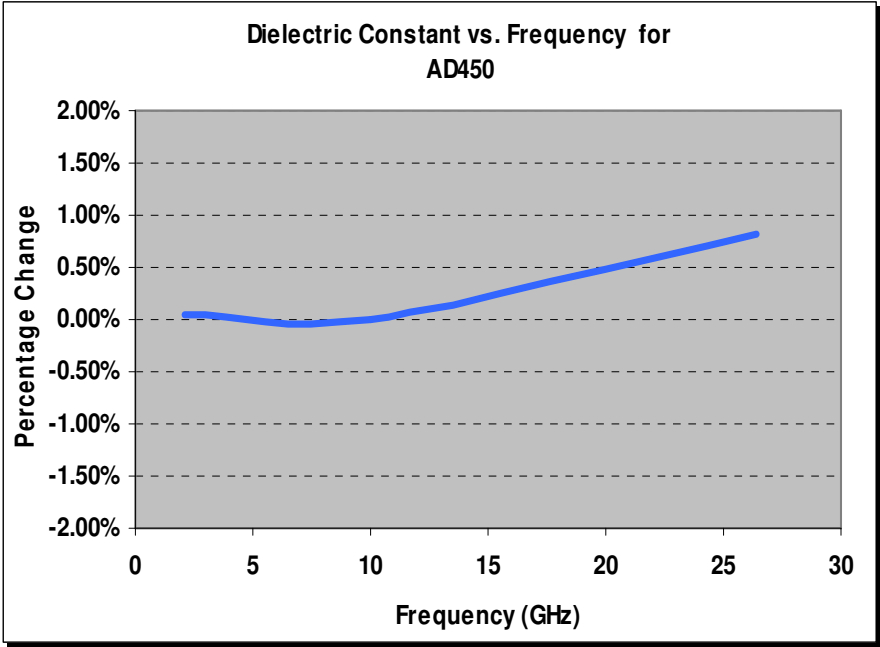
### **Material Availability:**

AD450 laminate is available in 0.020", 0.030", and 0.060" thicknesses (other thicknesses may be available by contacting Arlon's customer service). AD450 is supplied with 1/2, 1 or 2 ounce electrodeposited (ED) copper on both sides. Other copper weights and rolled copper foil are available. AD450 is also available bonded to heavy metal ground planes. Aluminum, brass or copper plate can provide an integral heat sink and mechanical support to the substrate.

When ordering AD450 product, please specify thickness, copper cladding, panel size, and any other special considerations.

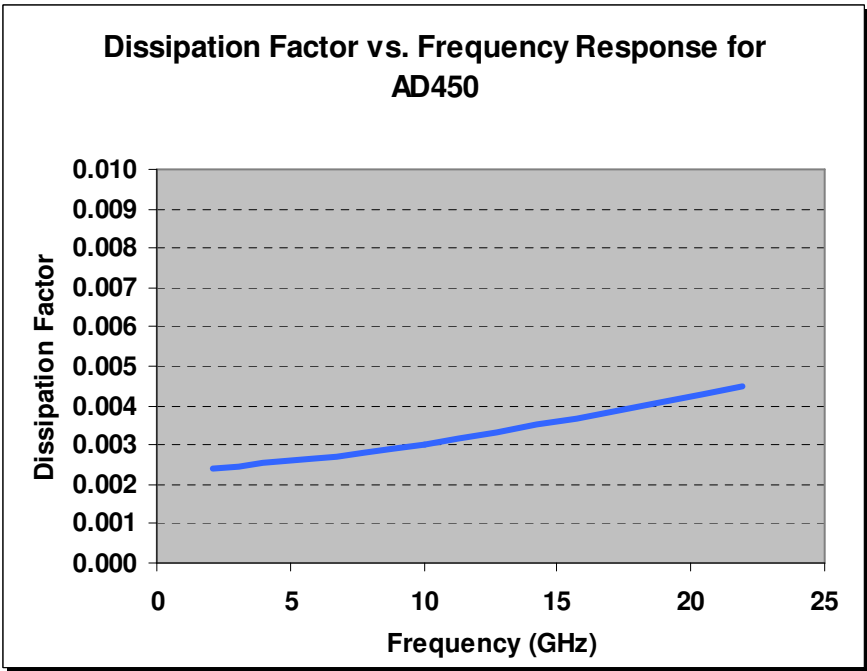
*Results listed above are typical properties; they are not to be used as specification limits. The above information creates no expressed or implied warranties. The properties of Arlon laminates may vary, depending on the design and application.*

# AD450 Laminate



**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 AD450 over frequency ensures easy design transition and scalability of design.



**Figure 2**

Demonstrates 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.

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