ARLON
MICROWAVE MATERIALS

AD1000

PTFE/Woven Fiberglass/Ceramic Filled Laminate For Microwave Printed Circuit Boards

Features:

- Only Woven Glass Reinforced PTFE/ Ceramic with Dk of 10.2 or greater
- Thermal Conductivity is "Best-in-Class"
- High copper peel strength allows for thinner etched line widths
- Lowest Loss Available
- Larger Panel Sizes
- Low Moisture Absorption

Benefits:

- Mechanically Robust
- Greater Dimensional Stability than Other 10 Dk Products
- Circuit Miniaturization Leads to Weight Savings
- Heat Dissipation and Management
- Greater Signal Integrity
- Cost-Effective Board Layout and Board Processing
- Low Loss in Humid Environments

Applications:

- Ideal for X-Band and Below
- Radar Modules and Manifolds
- Aircraft Collision Avoidance Systems (TCAS)
- Ground Based Radar Surveillance Systems
- Miniaturized Circuitry & Patch Antennas
- Power Amplifiers (PAs)
- Low Noise Amplifiers (LNAs)

AD1000 is a high dielectric constant substrate that permits circuit miniaturization, compared to traditional low loss materials. It is especially beneficial for power amplifiers, filters, couplers and other components using low impedance lines.

AD1000 is a woven glass reinforced laminate. This allows for Greater Dimensional Stability and Mechanical Robustness than other 10 Dk Products. Its large panel size is also advantageous for "multi-circuits per panel" processing.

AD1000 is considered a "soft substrate" and is relatively insensitive to vibrational stress. This allows miniaturized circuitry without requiring the complicated processing or special handling associated with brittle pure ceramic materials.

AD1000 is compatible with processing used for standard PTFE based printed circuit board substrates. In addition, the low Z-axis thermal expansion provided by the ceramic loading will improve plated through hole reliability, compared to typical PTFE based laminates.

AD1000 was specifically developed for Miniaturized Circuitry for compact devices (i.e., GPS Receivers), Patch Antennas (where smaller size is required), Satellite Communications Systems, Power Amplifiers (PAs), Low Noise Amplifiers (LNAs), Low Noise Block Downconverters (LNBs), Radar Modules and Manifolds, Aircraft Collision Avoidance Systems (TCAS), and Ground Based Radar Systems

Typical Properties: AD1000			
Property	**Test Method**	**Condition**	**Results**
Dielectric Constant @ 10 GHz	IPC TM-650 2.5.5.5	C23/50	10.2* (0.025" dielectric)
Dissipation Factor @ 10 GHz	DM-185-AR	C23/50	0.0023
Thermal Coefficient of Er (ppm/°C)	IPC TM-650 2.5.5.5	-10°C to +140°C	-380
Copper Peel Strength (lb/in)	IPC TM-650 2.4.8	After Thermal Stress	>12
Volume Resistivity (MΩ-cm)	IPC TM-650 2.5.17.1	C96/35/90	1.4×10^9
Surface Resistivity (MΩ)	IPC TM-650 2.5.17.1	C96/35/90	1.8×10^9
Arc Resistance (seconds)	ASTM D-495	D48/50	>180
Tensile Modulus (kpsi) (x,y)	ASTM D-638	A, 23°C	830, 680
Tensile Strength (kpsi) (x,y)	ASTM D-882	A, 23°C	5.1, 4.3
Compressive Modulus (kpsi)	ASTM D-995	A, 23°C	>425
Flexural Modulus (kpsi)	ASTM D-635	A, 23°C	>600
Dielectric Breakdown (kV)	ASTM D-882	D48/50	>45
Density (g/cm^3)	ASTM D-792 Method A	A, 23°C	3.2
Water Absorption (%)	IPC TM-650 2.6.2.2	E1/105 + D24/23	0.03
Coefficient of Thermal Expansion (ppm/°C) X Axis Y Axis Z Axis	IPC TM-650 2.4.24 TMA	0°C to 125°C	 8 10 20
Thermal Conductivity (W/mK)	ASTM E-1225	100°C	0.81
Outgassing Total Mass Loss (%) Collected Volatile Condensable Material (%) Water Vapor Recovered Visible Condensate (±)	NASA SP-R-0022A Maximum 1.00% Maximum 0.10%	125°C, $\leq 10^{-6}$ torr	 0.01 0.00 0.00 NO
Flammability	UL 94 Vertical Burn	C48/23/50, E24/125	Meets requirements of UL94-V0

**Dielectric Constant varies with laminate thickness, dielectric thickness, exclusive of metal cladding, except where indicated by test method.*

Material Availability:

AD1000 laminates are available in a range of thicknesses from 0.020" to 0.125" and are supplied with 1/2, 1 or 2 ounce electrodeposited (ED) copper on both sides. Other copper weights and rolled copper foil are available. AD1000 is available bonded to heavy metal ground planes. Aluminum, brass or copper plates also provide an integral heat sink and mechanical support to the substrate.

Other combinations of thickness and cladding may be available. Contact Arlon with any requests for non-standard materials. When ordering AD1000, please specify thickness, cladding, panel size, and any other special considerations. Available master sheet sizes include 36" x 48" and 36" x 72".

Thickness and Dielectric Constant Alternatives

Thickness (mils)	0.006 ±0.0005	0.0105 ±0.0010	0.015 ±0.0015	0.020 ±0.002	0.025 ±0.002	0.030 ±0.002	0.050 ±0.002	0.059 ±0.003	0.125 ±0.003	0.127 ±0.003	Thicker Laminates are Available
Dielectric Constant	7.8 ±0.30	9.1 ±0.35	9.7 ±0.35	10 ±0.35	10.2 ±0.35	10.35 ±0.35	10.2 or 10.6 ±0.35	10.7 ±0.35	10.2 ±0.35	10.9 ±0.35	

Alternative Thicknesses and Dielectric Constant (Dk) options are available. Please discuss your needs with Arlon's Applications Engineering Team.

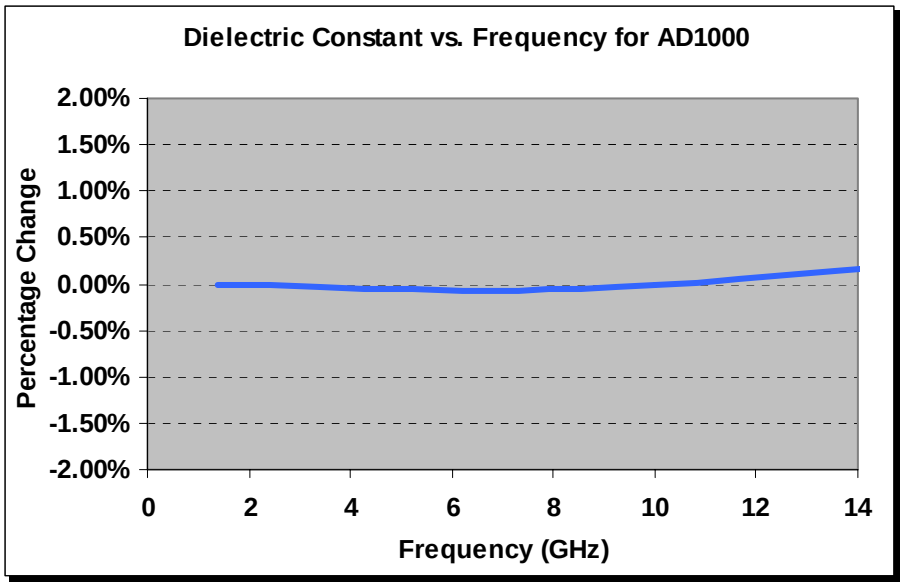

Figure 1

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. The stability of the Dielectric Constant of AD1000 over frequency ensures easy design transition and scalability of design.

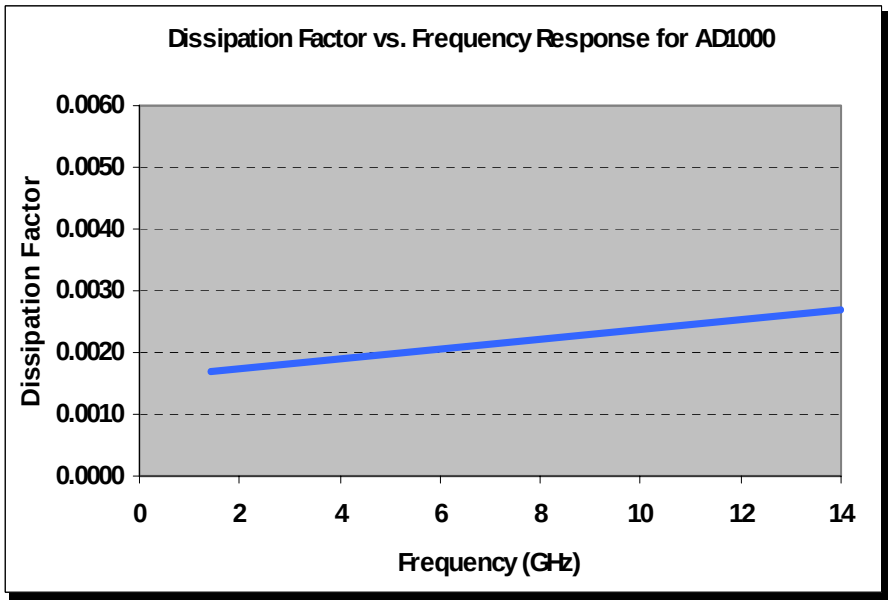

Figure 2

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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MATERIALS FOR ELECTRONICS

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2009 Rev D

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