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.

Arlon Microwave Materials…Challenge Us

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## Typical Properties: AD1000

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Condition</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Constant @ 10 GHz</td>
<td>IPC TM-650 2.5.5.5</td>
<td>C23/50</td>
<td>10.2* (0.025&quot; dielectric)</td>
</tr>
<tr>
<td>Dissipation Factor @ 10 GHz</td>
<td>DM-185-AR</td>
<td>C23/50</td>
<td>0.0023</td>
</tr>
<tr>
<td>Thermal Coefficient of Er (ppm/°C)</td>
<td>IPC TM-650 2.5.5.5</td>
<td>-10°C to +140°C</td>
<td>-380</td>
</tr>
<tr>
<td>Copper Peel Strength (lb/in)</td>
<td>IPC TM-650 2.4.8</td>
<td>After Thermal Stress</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Volume Resistivity (MΩ-cm)</td>
<td>IPC-650 2.5.17.1</td>
<td>C96/35/90</td>
<td>1.4 x 10^9</td>
</tr>
<tr>
<td>Surface Resistivity (MΩ)</td>
<td>IPC-650 2.5.17.1</td>
<td>C96/35/90</td>
<td>1.8 x 10^9</td>
</tr>
<tr>
<td>Arc Resistance (seconds)</td>
<td>ASTM D-495</td>
<td>D48/50</td>
<td>&gt;180</td>
</tr>
<tr>
<td>Tensile Modulus (kpsi) (x,y)</td>
<td>ASTM D-638</td>
<td>A, 23°C</td>
<td>830, 680</td>
</tr>
<tr>
<td>Tensile Strength (kpsi) (x,y)</td>
<td>ASTM D-882</td>
<td>A, 23°C</td>
<td>5.1, 4.3</td>
</tr>
<tr>
<td>Compressive Modulus (kpsi)</td>
<td>ASTM D-995</td>
<td>A, 23°C</td>
<td>&gt;425</td>
</tr>
<tr>
<td>Flexural Modulus (kpsi)</td>
<td>ASTM D-635</td>
<td>A, 23°C</td>
<td>&gt;600</td>
</tr>
<tr>
<td>Dielectric Breakdown (kV)</td>
<td>ASTM D-882</td>
<td>D48/50</td>
<td>&gt;45</td>
</tr>
<tr>
<td>Density (g/cm³)</td>
<td>ASTM D-792 Method A</td>
<td>A, 23°C</td>
<td>3.2</td>
</tr>
<tr>
<td>Water Absorption (%)</td>
<td>IPC TM-650 2.6.2.2</td>
<td>E1/105 + D24/23</td>
<td>0.03</td>
</tr>
<tr>
<td>Coefficient of Thermal Expansion (ppm/°C)</td>
<td>IPC TM-650 2.4.24</td>
<td>0°C to 125°C</td>
<td></td>
</tr>
<tr>
<td>X Axis</td>
<td>TMA</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Y Axis</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Z Axis</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Thermal Conductivity (W/mK)</td>
<td>ASTM E-1225</td>
<td>100°C</td>
<td>0.81</td>
</tr>
<tr>
<td>Outgassing</td>
<td>NASA SP-R-0022A</td>
<td>Maximum 1.00%</td>
<td>125°C, ≤10⁻⁶ torr</td>
</tr>
<tr>
<td>Total Mass Loss (%)</td>
<td>Maximum 0.10%</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Collected Volatile Condensable Material (%)</td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Water Vapor Recovered</td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Visible Condensate (±)</td>
<td>NASA SP-R-0022A</td>
<td>125°C, ≤10⁻⁶ torr</td>
<td>0.01</td>
</tr>
<tr>
<td>Flammability</td>
<td>UL 94 Vertical Burn</td>
<td>C48/23/50, E24/125</td>
<td>Meets requirements of UL94-V0</td>
</tr>
</tbody>
</table>

*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".

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*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.*
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**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.
CONTACT INFORMATION:

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