

## **ULTRALAM® 2000**

### **Woven Glass Reinforced Microwave Laminate**

#### **Features:**

- Glass fibers oriented in X/Y plane. Improves dimensional stability, lowers thermal expansion and is ideal for applications where registration is critical.
- Stable electrical properties versus frequency for repeatable designs and is suitable for broadband applications. Provides uniformity within panel and panel to panel.
- Excellent chemical resistance. Minimizes damage to material during fabrication and assembly processes.
- Low loss extends useful frequency range to K-band.
- Excellent mechanical properties.
- Fabricates with standard PTFE processing.

#### **Some Typical Applications:**

- Antennas for Wireless Communications Systems
- Cellular Base Stations
- LAN Systems
- Automotive Electronics
- Satellite TV Receivers
- Microwave & RF Components
- Radar Systems
- Mobile Communication Systems
- Microwave Test Equipment

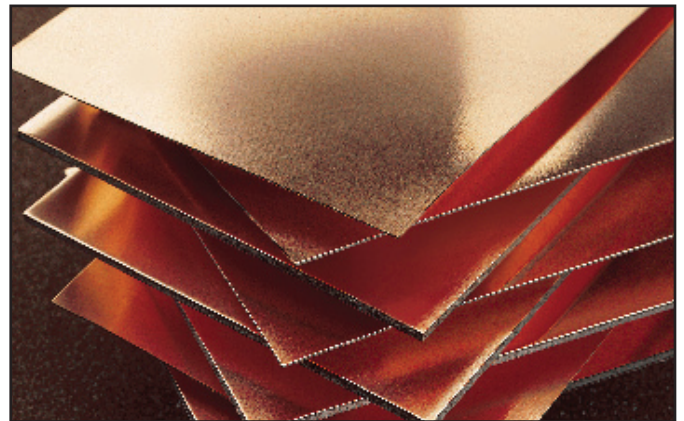
ULTRALAM® 2000 woven glass reinforced PTFE microwave laminate is designed for high reliability stripline and microstrip circuit applications.

Glass reinforcing fibers are oriented in the X/Y plane of the laminate. This orientation maximizes dimensional stability and minimizes etch shrinkage where circuit feature registration is critical.

The dielectric constant of ULTRALAM 2000 material is controlled to  $\pm 0.04$  from the nominal, within the range of 2.4 to 2.6. It is uniform within each panel, from panel to panel and dissipation factor extends the useful frequency range into K-band (17 to 27 GHz).

ULTRALAM 2000 laminate may be cut, sheared and machined to shape. It has excellent resistance to all solvents and reagents, hot or cold, normally used in etching and plating printed circuits.

Cladding options include  $\frac{1}{2}$  to 2 oz./ft<sup>2</sup> (17 to 70  $\mu\text{m}$  thick), rolled or electrodeposited copper.



The information in this data sheet is intended to assist you in designing with Rogers' circuit material laminates. It is not intended to and does not create any warranties express or implied, including any warranty of merchantability or fitness for a particular purpose or that the results shown on this data sheet will be achieved by a user for a particular purpose. The user should determine the suitability of Rogers' circuit material laminates for each application.

**The world runs better with Rogers.®**

PROPERTY	TYPICAL VALUE	DIRECTION	UNITS [1]	CONDITIONS	TEST METHOD
Dielectric Constant, $\epsilon_r$	2.4 - 2.6	Z		23°C	IPC-TM-2.5.5.5
Dissipation Factor, $\tan \delta$	0.0022 max.	Z		23°C	IPC-TM-2.5.5.5
Volume Resistivity	$2.0 \times 10^7$	Z	Mohm cm	C96/23/95	IPC-TM-2.5.5.5 2.5.17.1
Surface Resistivity	$4.1 \times 10^7$	X,Y	Mohm	C96/23/95	IPC-TM-650 2.5.17.1
Dielectric Breakdown	>50	X,Y	kV	D48/50	ASTM D149
Arc Resistance	185	X,Y	sec.		IPC-TM-650 2.5.1
Tensile Modulus	11.7 (1700) 9.0 (1300)	X Y	GPa (kpsi)	A	ASTM D638
Tensile Strength	147 (21.3) 136 (19.7)	X Y	MPa (kpsi)	A	ASTM D638
Compressive Modulus	11.0 (1600) 9.0 (1300)	X Y	GPa (kpsi)	A	ASTM D695
Compressive Strength	>70 (>10.2) 58 (8.4)	X Y	MPa (kpsi)	A	ASTM D695
Flexural Strength	170 (24.6) 104 (15.1)	X Y	MPa	A	ASTM D790
Water Absorption	0.03		%	D48/50	ASTM D570
Coefficient of Thermal Expansion	15 200	X,Y Z	ppm/°C	25 to 150°C	ASTM E831
Density	2.2		gm/cm <sup>2</sup>		ASTM D792
Copper Peel Strength	3.25 (18.6) 2.38 (13.6) 3.01 (17.2)	X,Y	N/mm (lb/in)	After solder float	IPC-TM-650 2.4.8
Flammability Rating	94-VO				UL

[1] S1 units given first, with other frequently used units in parentheses.

STANDARD THICKNESS:	STANDARD PANEL SIZE:	STANDARD COPPER CLADDING:
0.004" (0.101mm) 0.0190" (0.482mm) 0.0101" (0.256mm) 0.030" (0.762mm) 0.0147" (0.373mm) 0.060" (1.524mm)	18" X 12" (457 X 305mm) 18" X 24" (457 X 610mm) 18" X 36" (457 X 915mm) 18" X 48" (457 X 1.219m)	¼ oz. (8 µm) electrodeposited copper foil. ½ oz. (17µm), 1 oz. (35µm), 2 oz. (70µm) electro-deposited and rolled copper foil.

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