IsoClad® Series
Laminates Data Sheet

PTFE/Nonwoven Fiberglass Laminates

Features:
- Nonwoven Fiberglass Reinforcement
- Low Dielectric Constant
- Extremely Low Loss

Benefits:
- Less Rigid than Woven Fiberglass
- Highly Isotropic in X, Y and Z Directions

Typical Applications:
- Conformal Antennas
- Stripline and Microstrip Circuits
- Missile Guidance Systems
- Radar and Electronic Warfare Systems

IsoClad laminates are nonwoven fiberglass/PTFE composites for use as printed circuit board substrates. The nonwoven reinforcement allows these laminates to be used more easily in applications where the final circuit will be bent to shape. Conformal or "wrap-around" antennas are a good example.

IsoClad products use longer random fibers and a proprietary process to provide greater dimensional stability and better dielectric constant uniformity than competitive nonwoven fiberglass/PTFE laminates of similar dielectric constants.

IsoClad 917 laminates (Er=2.17, 2.20) use a low ratio of fiberglass/PTFE to achieve the lowest dielectric constant and dissipation factor available in a combination of PTFE and fiberglass.

IsoClad 933 laminates (Er=2.33) use a higher fiberglass/PTFE ratio for a more highly reinforced combination that offers better dimensional stability and increased mechanical strength.

Typical Properties: IsoClad				
Property	**Test Method**	**Condition**	**IsoClad 917**	**IsoClad 933**
Dielectric Constant @ 10 GHz	IPC TM-650 2.5.5.5	C23/50	2.17, 2.20	2.33
Dissipation Factor @ 10 GHz	IPC TM-650 2.5.5.5	C23/50	0.0013	0.0016
Thermal Coefficient of Er (ppm/°C)	IPC TM-650 2.5.5.5 Adapted	-10°C to +140°C	-157	-132
Peel Strength (lbs.per inch)	IPC TM-650 2.4.8	After Thermal	10	10
Volume Resistivity (MΩ-cm)	IPC TM-650 2.5.17.1	C96/35/90	1.5×10^{10}	3.5×10^{8}
Surface Resistivity (MΩ)	IPC TM-650 2.5.17.1	C96/35/90	1.0×10^{9}	1.0×10^{8}
Arc Resistance (seconds)	ASTM D-495	D48/50	>180	>180
Tensile Modulus (kpsi)	ASTM D-638	A, 23°C	133, 120	173, 147
Tensile Strength (kpsi)	ASTM D-882	A, 23°C	4.3, 3.8	6.8, 5.3
Compressive Modulus (kpsi)	ASTM D-695	A, 23°C	182	197
Flexural Modulus (kpsi)	ASTM D-790	A, 23°C	213	239
Dielectric Breakdown (kv)	ASTM D-149	D48/50	>45	>45
Density (g/cm^3)	ASTM D-792 Method A	A, 23°C	2.23	2.27
Water Absorption (%)	MIL-S-13949H 3.7.7 IPC TM-650 2.6.2.2	E1/105 + D24/23	0.04	0.05
Coefficient of Thermal Expansion (ppm/°C) X Axis Y Axis Z Axis	IPC TM-650 2.4.24 Mettler 3000 Thermomechanical Analyzer	0°C to 100°C	 46 47 236	 31 35 203
Thermal Conductivity (W/mK)	ASTM E-1225	100°C	0.263	0.263
Outgassing Total Mass Loss (%) Collected Volatile Condensable Material (%) Water Vapor Regain (%) Visible Condensate (±)	 Maximum 1.00% Maximum 0.10%	 125°C, ≤10^{-6} torr	 0.02 0.00 0.02 NO	 0.03 0.00 0.02 NO
Flammability	UL 94 Vertical Burn IPC TM-650 2.3.10	C48/23/50, E24/125	Meets requirements of UL94-V0	Meets requirements of UL94-V0

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

Material Availability

Grade	Available Thicknesses	Standard Panel Sizes	Available Cladding
IsoClad 917	0.031” (0.79mm) ±0.0020” 0.062” (1.57mm) ±0.0040”	12"x18" (305mm X 457mm) 24"x18" (610mm X 457mm)	½ oz. (18µm), 1 oz. (35µm) electrodeposited copper Foil
IsoClad 933	0.015" (0.38mm) ±0.0020" 0.031” (0.79mm) ±0.0020” 0.062” (1.57mm) ±0.0040”	12"x18" (305mm X 457mm) 24"x18" (610mm X 457mm)	½ oz. (18µm), 1 oz. (35µm) electrodeposited copper Foil

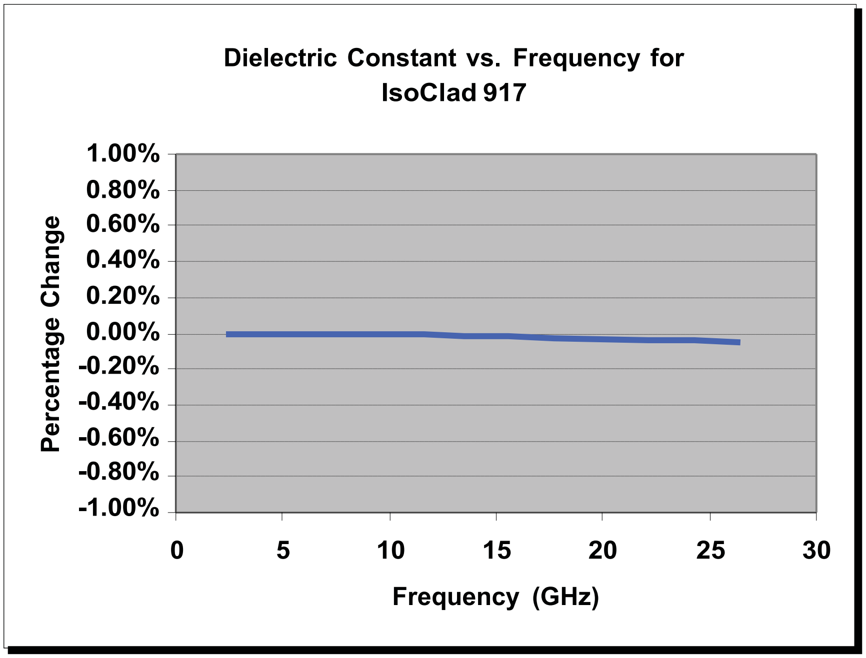

Figure 1

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 Rogers’ laminates across frequency, thus simplifying the final design process when working across EM spectrum. The stability of the dielectric constant of IsoClad over frequency insures easy design transition and scalability of design.

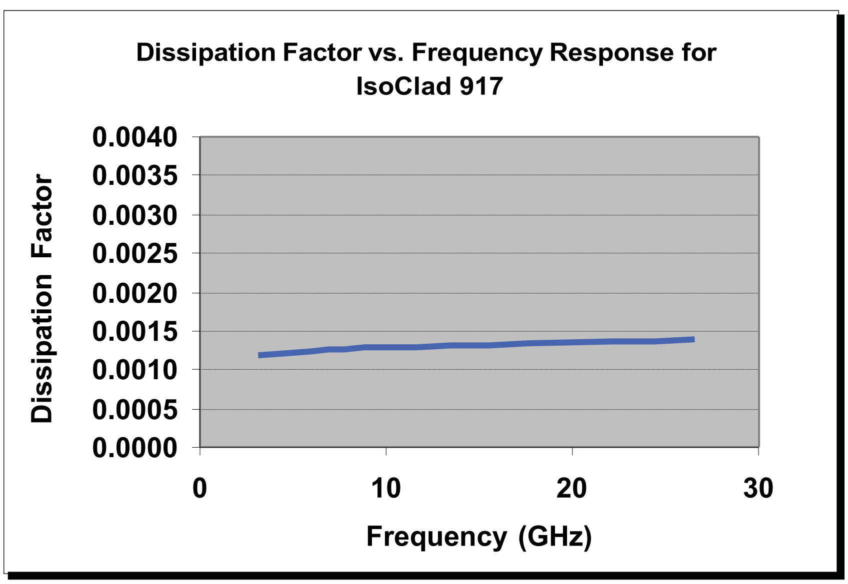

Figure 2

Demonstrates the stability of dissipation factor across frequency. This characteristic demonstrates the inherent robustness of Rogers’ laminates across frequency, providing a stable platform for high frequency applications where signal integrity is critical to the overall performance of the application.

The information in this data sheet is intended to assist you in designing with Rogers' circuit materials. 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 materials for each application.

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