ROGERS CORPORATION

\\\ Datasheet

DiClad® Series Laminates

PTFE/Woven Fiberglass/Laminates

DiClad® laminates are woven fiberglass/PTFE composite materials for use as printed circuit board substrates. Precise control of the fiberglass/PTFE ratio, DiClad laminates offer a range of choices from the lowest dielectric constant and dissipation factor to a more highly reinforced laminate with better dimensional stability.

The woven fiberglass reinforcement in DiClad products provides greater dimensional stability than nonwoven fiberglass reinforced PTFE based laminates of similar dielectric constants. The consistency and control of the PTFE coated fiberglass cloth allows Rogers to offer a greater variety of dielectric constants and produces a laminate with better dielectric constant uniformity than comparable non-woven fiberglass reinforced laminates. The coated fiberglass plies in DiClad materials are aligned in the same direction. Crossplied versions of many of these materials are available as CuClad materials.

DiClad laminates are frequently used in filter, coupler, and low noise amplifier applications, where dielectric constant uniformity is critical. They are also used in power dividers and combiners, where low loss is important.

DiClad 527 laminates (Er=2.40–2.65) use a higher fiberglass/PTFE ratio to provide mechanical properties approaching conventional substrates. Other advantages include better dimensional stability and lower thermal expansion in all directions. The electrical properties of DiClad 527 laminates are tested at 1 MHz and 10 GHz, respectively.

\\\ Features and Benefits:

- Extremely Low Loss Tangent
- Excellent Dimensional Stability
- Product Performance Uniformity
- Electrical Properties are Highly Uniform Across Frequency
- Consistent Mechanical Performance
- Excellent Chemical Resistance

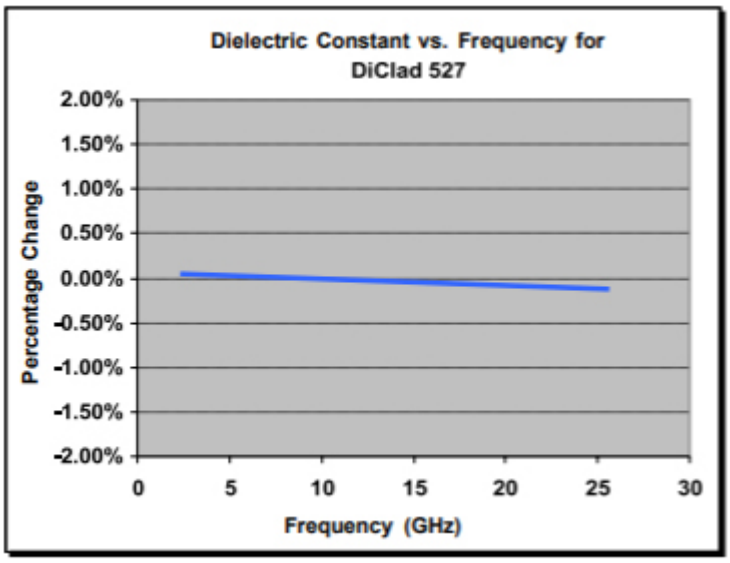
\\\ Typical Applications:

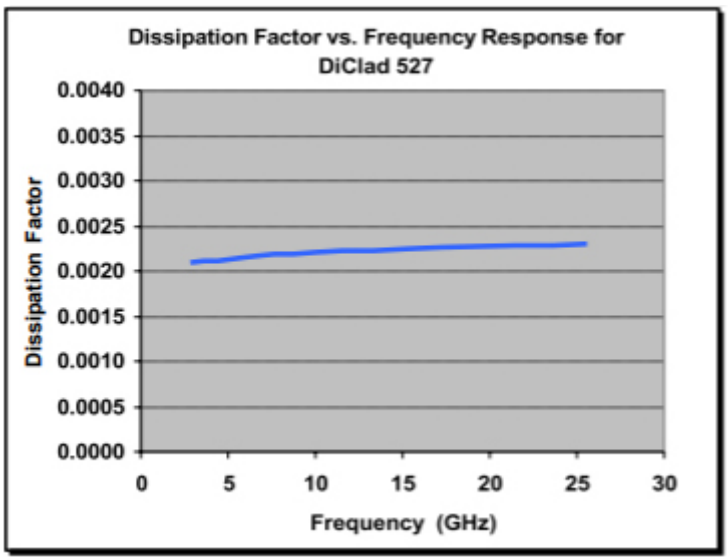
- Military Radar Feed Networks
- Commercial Phased Array Networks
- Low Loss Base Station Antennas
- Missile Guidance Systems
- Digital Radio Antennas
- Filters, Couplers, LNAs

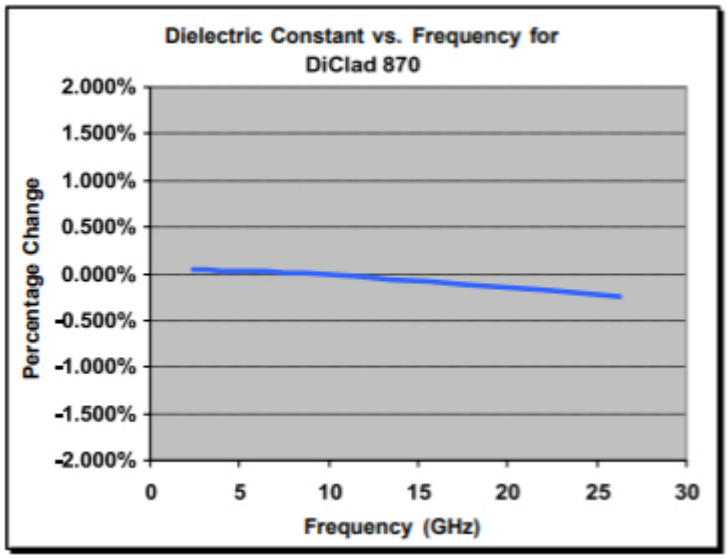
Standard Properties Table

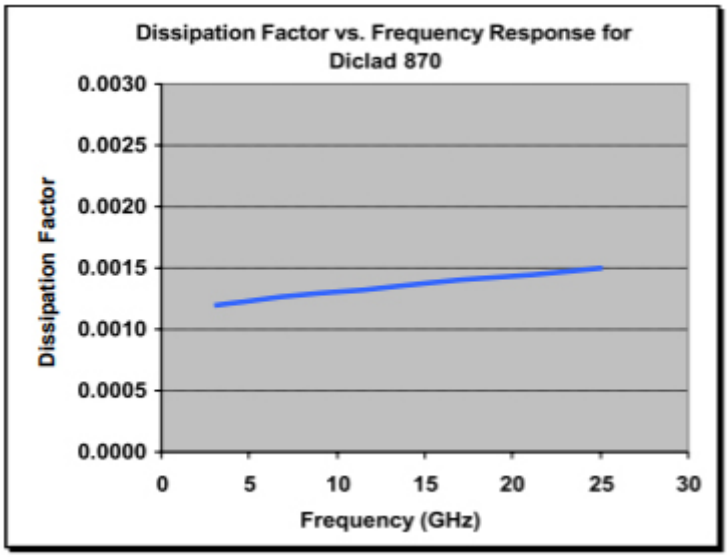
Properties	Typical Value[1] DiClad 527	DiClad 870	DiClad 880	Units	Test Conditions		Test Method
Electrical Properties							
Dielectric Constant	2.40-2.60	2.33	2.17, 2.20	-	23°C @ 50% RH	10 GHz	IPC TM-650 2.5.5.5
Dielectric Constant	2.40-2.60	2.33	2.17, 2.20	-	23°C @ 50% RH	1 MHz	IPC TM-650 2.5.5.3
Dissapation Factor	0.0017	0.0013	0.0009	-	23°C @ 50% RH	10 GHz	IPC TM-650 2.5.5.5
Dissapation Factor	0.0010	0.0009	0.0008	-	23°C @ 50% RH	1 MHz	IPC TM-650 2.5.5.3
Thermal Coefficient of Dielectric Constant	-153	-161	-160	ppm/°C	-10 to 140°C	10 GHz	IPC TM-650 2.5.5.5
Volume Resistivity	1.2×10^9	1.5×10^9	1.4×10^9	MΩ-cm	C96/35/90	-	IPC TM-650 2.5.17.1
Surface Resistivity	4.5×10^7	3.4×10^7	2.9×10^6	MΩ	C96/35/90	-	IPC TM-650 2.5.17.1
Dielectric Breakdown	>45	>45	>45	kV	D48/50	-	ASTM D-149
Arc Resistance	>180	>180	>180		-	-	ASTM D-495
Thermal Properties							
Coefficient of Thermal Expansion - x	14	17	25	ppm/°C	-	50°C to 150°C	IPC TM-650 2.4.41
Coefficient of Thermal Expansion - y	21	29	34	ppm/°C	-	50°C to 150°C	IPC TM-650 2.4.41
Coefficient of Thermal Expansion - z	173	217	252	ppm/°C	-	50°C to 150°C	IPC TM-650 2.4.24
Thermal Conductivity	0.26	0.26	0.25	W/(m·K)	-	-	ASTM E1461
Mechanical Properties							
Copper Peel Strength	14	14	14	Lbs/in	10s @288°C	35 µm foil	IPC TM-650 2.4.8
Young's Modulus	517, 706	485, 346	267, 202	kpsi	23°C @ 50% RH	-	ASTM D-638
Tensile Strength (MD, CMD)	19.0, 15.0	14.9, 11.2	8.1, 7.5	kpsi	23°C @ 50% RH	-	ASTM D-882
Compressive Modulus	359	327	237	kpsi	23°C @ 50% RH	-	ASTM D-695
Flex Modulus	537	437	357	kpsi	23°C @ 50% RH	-	ASTM D-3039
Physical Properties							
Flammability	V-0	V-0	V-0	-	-	C48/23/50 & C168/70	UL 94
Moisture Absorption	0.03	0.02	0.02	%	E1/105+D24/23		IPC TM-650 2.6.2.2
Density	231	2.26	2.23	g/cm³	C24/23/50	Method A	ASTM D792
NASA Outgassing — Total Mass Lost	0.02	0.02	0.01	%	125°C, ≤ 10-6 torr		NASA SP-R-0022A
NASA Outgassing — Collected Volatiles	0.00	0.00	0.01	%			
NASA Outgassing — Water Vapor Recovered	0.01	0.01	0.0	%			

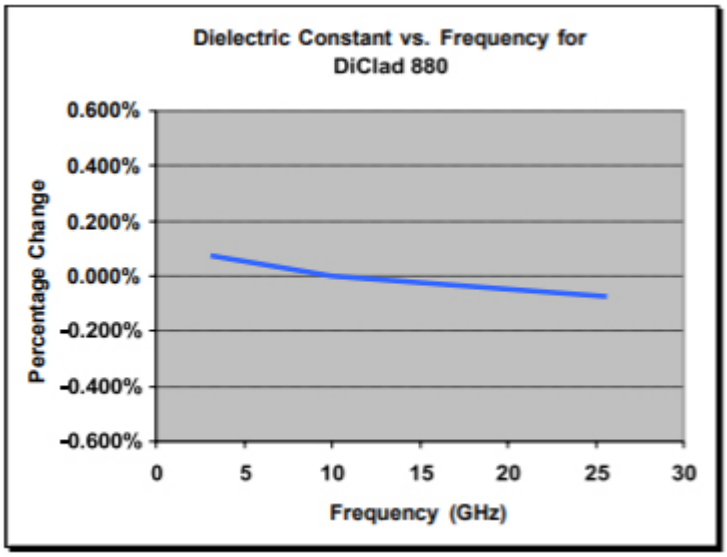
[1] Typical values are a representation of an average value for the population of the property. For specifi cation values contact Rogers Corp.

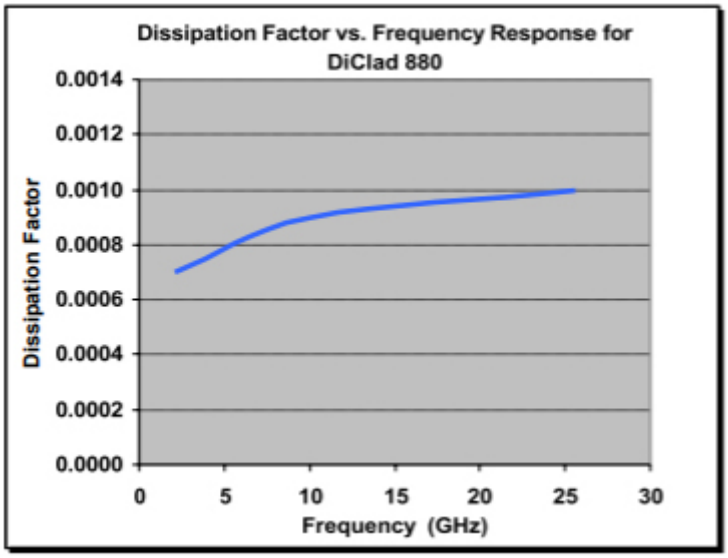












Column 1 Figures

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 AD1000 laminate over frequency ensures easy design transition and scalability of design.

Column 2 Figures

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

Standard Offerings

Standard Thicknesses	Standard Panel Sizes	Standard Claddings	
DiClad 527: 0.020″ (0.508mm) +/- 0.0020″ 0.030″ (0.762mm) +/- 0.0020″ 0.060″ (1.524mm) +/- 0.0020″	**DiClad 527:** 12″ X 18″ (305 X 457mm) 18″ X 12″ (457 X 305mm) 18″ X 24″ (457 X 610mm) 24″ X 18″ (610 X 457mm)	**DiClad 527:** Electrodeposited Copper Foil 1/2 oz. (18µm) 1 oz. (35µm)	
DiClad 870: 0.031″ (0.79mm) +/- 0.0020″ 0.093″ (2.36mm) +/- 0.0030″ 0.125″ (3.18mm) +/- 0.0060″	**DiClad 870:** 8″ X 12″ (203 X 305mm) 18″ X 24″ (475 X 610mm)	**DiClad 870:** Electrodeposited Copper Foil 1/2 oz. (18µm) 1 oz. (35µm)	Rolled Copper Foil 1/2 oz. (18µm) 1 oz. (35µm)
DiClad 870: 0.020″ (0.508mm) +/- 0.0020″ 0.030″ (0.762mm) +/- 0.0020″ 0.060″ (1.524mm) +/- 0.0020″	**DiClad 880:** 12″ X 18″ (305 X 457mm) 18″ X 12″ (457 X 305mm) 18″ X 24″ (457 X 610mm) 24″ X 18″ (610 X 457mm)	**DiClad 880:** Electrodeposited Copper Foil 1/2 oz. (18µm) 1 oz. (35µm)	Reverse Treated Electrodeposited Copper Foil 1/2 oz. (18µm) 1 oz. (35µm)

*Contact Customer Service or Sales Engineering to inquire about other available product configurations including additional thicknesses, panel sizes and claddings.

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