AGC
Your Dreams, Our Challenge

TACONIC

TLX High Volume Fiberglass Reinforced Microwave Substrate

TLX offers reliability in a wide range of RF applications. This material is versatile due to its 2.45 - 2.65 DK range and available thicknesses and copper cladding. It is suitable for low layer count microwave designs.

TLX PTFE fiberglass laminates are ideal for use in radar systems, mobile communications, microwave test equipment, microwave transmission devices and RF components.

TLX is a workhorse in the RF microwave substrate world where the fiberglass offers mechanical reinforcement wherever a substrate experiences severe environments such as:

- Resistance to creep for PWBs bolted to a housing that encounters high levels of vibration during space launch
- High temperature exposure in engine modules
- Radiation resistance in space (see NASA's website for low outgassing materials)
- Resistance to extreme environments at sea for warship antennas
- Resistance to a wide temperature range for altimeter substrates during flight.

The wide range of dielectric constants available enable the manufacture of couplers, splitters, combiners, amplifiers, antennas and other components.

Benefits & Applications:

- Excellent PIM Values in PCBs (measured at lower than -160 dBc*)
- Excellent Mechanical & Thermal Properties
- Low and Stable Dk
- Dimensionally Stable
- Low Moisture Absorption
- Tightly Controlled DK
- Low DF
- UL 94 VO Rating
- For Low Layer Count Microwave Designs

- Antennas
- Mixers, Splitters, Filters & Combiners
- Passive Components

*Measurement using manufactured PCB coupon with 20 watts per channel @ 800 and 1800 MHz.

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Dielectric Constant & Dissipation Factor Across Product Line:

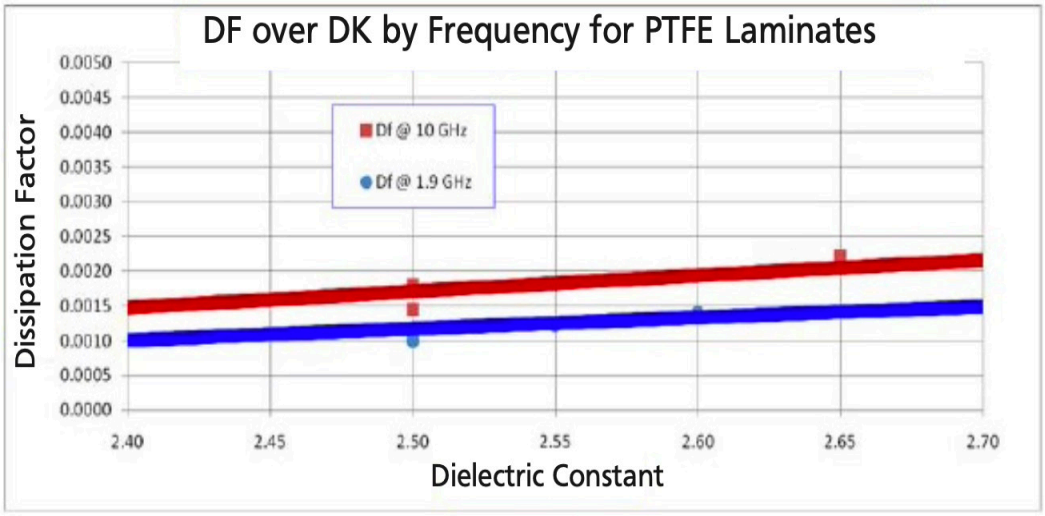
TLX Typical Values						
Property	Test Method	TLX-6	TLX-7	TLX-8	TLX-9	TLX-0
Dk @ 10 GHz	IPC-650 2.5.5.3	2.65	2.60	2.55	2.50	2.45
Df @ 1.9 GHz	IPC-650 2.5.5.5.1	0.0016	0.0014	0.0012	0.0010	0.0009
Df @ 10 GHz	IPC-650 2.5.5.5.1	0.0022	0.0020	0.0017	0.0015	0.0012

Outgassing Properties Across Product Line:

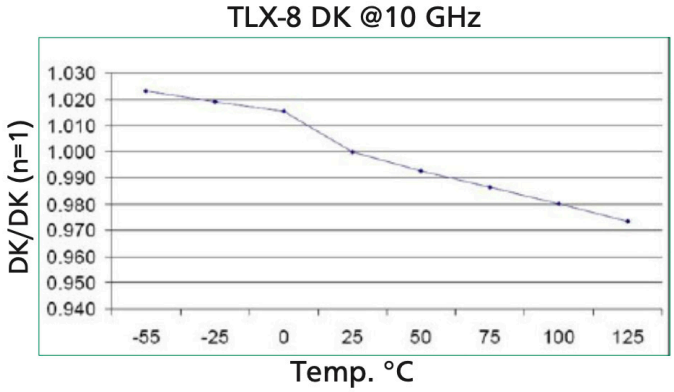
TLX Typical Values							
Property	Test Method	Units	TLX-6	TLX-7	TLX-8	TLX-9	TLX-0
Outgassing (% TML)	ASTM E 595	24 H 257 °F @ ≤ 5 x 10^{-5} Torr	0.09	0.02	0.03	0.02	0.06
Outgassing (% CVCM)	ASTM E 595	24 H 257 °F @ ≤ 5 x 10^{-5} Torr	<0.01	0.00	0.00	0.01	0.00
Outgassing (% WVR)	ASTM E 595	24 H 257 °F @ ≤ 5 x 10^{-5} Torr	0.06	0.01	0.01	0.00	0.00

As reported by NASA. See http://outgassing.nasa.gov/og_disclaimer.html

TLX has a long space heritage and is used wherever a woven fiberglass reinforcement is required.



TLX has ~ ± 2% variation in DK from -55 to 125 °C. If more temperature stability is required, TSM-DS3 should be considered.



TLX-8 Typical Values					
Property	Test Method	Unit	Value	Unit	Value
Dk @ 10 GHz	IPC-650 2.5.5.3		2.55		2.55
Df @ 1.9 GHz	IPC-650 2.5.5.5.1		0.0012		0.0012
Df @ 10 GHz	IPC-650 2.5.5.5.1		0.0017		0.0017
Dielectric Breakdown	IPC-650 2.5.6	kV	>45	kV	>45
Moisture Absorption	IPC-650 2.6.2.1	%	0.02	%	0.02
Flexural Strength (MD)	ASTM D 790	psi	28,900	N/mm^2	199
Flexural Strength (CD)	ASTM D 790	psi	20,600	N/mm^2	142
Tensile Strength (MD)	ASTM D 902	psi	35,600	N/mm^2	245
Tensile Strength (CD)	ASTM D 902	psi	27,500	N/mm^2	190
Elongation at Break (MD)	ASTM D 902	%	3.94	%	3.94
Elongation at Break (CD)	ASTM D 902	%	3.92	%	3.92
Young's Modulus (MD)	ASTM D 902	kpsi	980	N/mm^2	6757
Young's Modulus (CD)	ASTM D 902	kpsi	1,200	N/mm^2	8274
Young's Modulus (MD)	ASTM D 3039	kpsi	1,630	N/mm^2	11,238
Poisson's Ratio	ASTM D 3039		0.135		0.135
Peel Strength (1 oz. ED)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs/in	15	N/mm	2.63
Peel Strength (1 oz. RTF)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs/in	17	N/mm	2.98
Peel Strength (½ oz. ED)	IPC-650 2.4.8.3 (Elevated Temp.)	lbs/in	14	N/mm	2.45
Peel Strength (½ oz. ED)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs/in	11	N/mm	1.93
Peel Strength (1 oz. rolled)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs/in	13	N/mm	2.28
Thermal Conductivity	ASTM F433/ASTM 1530-06	W/M*K	0.19	W/M*K	0.19
Dimensional Stability (MD)	IPC-650 2.4.39 Sec. 5.4 (After Bake)	mils/in	0.06	mm/M	0.06
Dimensional Stability (CD)	IPC-650 2.4.39 Sec. 5.4 (After Bake)	mils/in	0.08	mm/M	0.08
Dimensional Stability (MD)	IPC-650 2.4.39 Sec. 5.5 (Thermal Stress)	mils/in	0.09	mm/M	0.09
Dimensional Stability (CD)	IPC-650 2.4.39 Sec. 5.5 (Thermal Stress)	mils/in	0.10	mm/M	0.10
Surface Resistivity	IPC-650 2.5.17.1 Sec. 5.2.1 (Elevated Temp.)	Mohm	6.605×10^8	Mohm	6.605×10^8
Surface Resistivity	IPC-650 2.5.17.1 Sec. 5.2.1 (Humidity Cond.)	Mohm	3.550×10^6	Mohm	3.550×10^6
Volume Resistivity	IPC-650 2.5.17.1 Sec. 5.2.1 (Elevated Temp.)	Mohm/cm	1.110×10^{10}	Mohm/cm	1.110×10^{10}
Volume Resistivity	IPC-650 2.5.17.1 Sec. 5.2.1 (Humidity Cond.)	Mohm/cm	1.046×10^{10}	Mohm/cm	1.046×10^{10}
CTE (X axis) (25-260 °C)	IPC-650 2.4 .41/ASTM D 3386	ppm/°C	21	ppm/°C	21
CTE (Y axis) (25-260 °C)	IPC-650 2.4 .41/ASTM D 3386	ppm/°C	23	ppm/°C	23
CTE (Z axis) (25-260 °C)	IPC-650 2.4 .41/ASTM D 3386	ppm/°C	215	ppm/°C	215
Density (Specific Gravity)	ASTM D 792	g/cm^3	2.25	g/cm^3	2.25
T_d (2% Weight Loss)	IPC-650 2.4.24.6 (TGA)	°C	535	°C	535
T_d (5% Weight Loss)	IPC-650 2.4.24.6 (TGA)	°C	553	°C	553
Flammability Rating	UL 94		V-0		V-0

All reported values are typical and should not be used for specification purposes. In all instances, the user shall determine suitability in any given application.

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Designation	Dk	Dielectric Thickness	
		Inches	mm
TLX-0	2.45 ± 0.04	0.0050 - 0.250	0.127 - 6.35
TLX-9	2.50 ± 0.04	0.0020 - 0.250	0.05 - 6.35
TLX-8	2.55 ± 0.04	0.0025 - 0.250	0.064 - 6.35
TLX-7	2.60 ± 0.04	0.0035 - 0.250	0.089 - 6.35
TLX-6	2.65 ± 0.04	0.0035 - 0.250	0.089 - 6.35

Available Sheet Sizes	
Inches	mm
12 x 18	304 x 457
16 x 18	406 x 457
18 x 24	457 x 610
16 x 36	406 x 914
24 x 36	610 x 914
18 x 48	457 x 1220
36 x 48	914 x 1220

TLX is noteworthy in that it is available as a very thin laminate for coupler-type applications.

TLX can be combined with any of AGC's available copper claddings.
The surface of TLX has been optimized for copper adhesion.

Please see our Product Selector Guide for Information on available copper cladding.

An example of our part number is:
TLX-9-0310-CH/CH - 18" x 24" (457 mm x 610 mm)

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