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 encounter 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), antenna for warships that undergo extreme environments at sea and a substrate for altimeters that see a wide range of temperatures during flight.

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

Taconic is a world leader in RF laminates and high speed digital materials, offering a wide range of high frequency laminates and prepregs. These advanced materials are used in the fabrication of antennas, multilayer RF and high speed digital boards, interconnections and devices.

TLX exceeds PIM requirements in PCBs of -153 dBc (measured between 880 and 960 MHz, between 1710 and 1880 MHz and between 1920 and 2170 MHz at 20 W power) with CL1/CL1 cladding when processed with today's state-of-the-art processes and process parameters.

Benefits & Applications:

- **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**

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Commercial and Government Entity (CAGE) Code: 1C6Q9

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	
Flexural Strength (CD)	ASTM D 790	psi	20,600	N/mm^2	
Tensile Strength (MD)	ASTM D 902	psi	35,600	N/mm^2	
Tensile Strength (CD)	ASTM D 902	psi	27,500	N/mm^2	
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	
Young's Modulus (CD)	ASTM D 902	kpsi	1,200	N/mm^2	
Young's Modulus (MD)	ASTM D 3039	kpsi	1,630	N/mm^2	
Poisson's Ratio	ASTM D 3039		0.135	N/mm	
Peel Strength (1 oz. ed)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs./linear inch	15	N/mm	
Peel Strength (1 oz. RTF)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs./linear inch	17	N/mm	
Peel Strength (½ oz. ed)	IPC-650 2.4.8.3 (Elevated Temp.)	lbs./linear inch	14	N/mm	
Peel Strength (½ oz. ed)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs./linear inch	11	N/mm	
Peel Strength (1 oz. rolled)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)	lbs./linear inch	13	N/mm	2.1
Dimensional Stability (MD)	IPC-650 2.4.39 Sec. 5.4 (After Bake)	mils/in.	0.06	mm/M	
Dimensional Stability (CD)	IPC-650 2.4.39 Sec. 5.4 (After Bake)	mils/in.	0.08	mm/M	
Dimensional Stability (MD)	IPC-650 2.4.39 Sec. 5.5 (Thermal Stress)	mils/in.	0.09	mm/M	
Dimensional Stability (CD)	IPC-650 2.4.39 Sec. 5.5 (Thermal Stress)	mils/in.	0.10	mm/M	
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	
T_d (5% Weight Loss)	IPC-650 2.4.24.6 (TGA)	°C	553	°C	
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.

TLX High Volume Fiberglass Reinforced Microwave Substrate

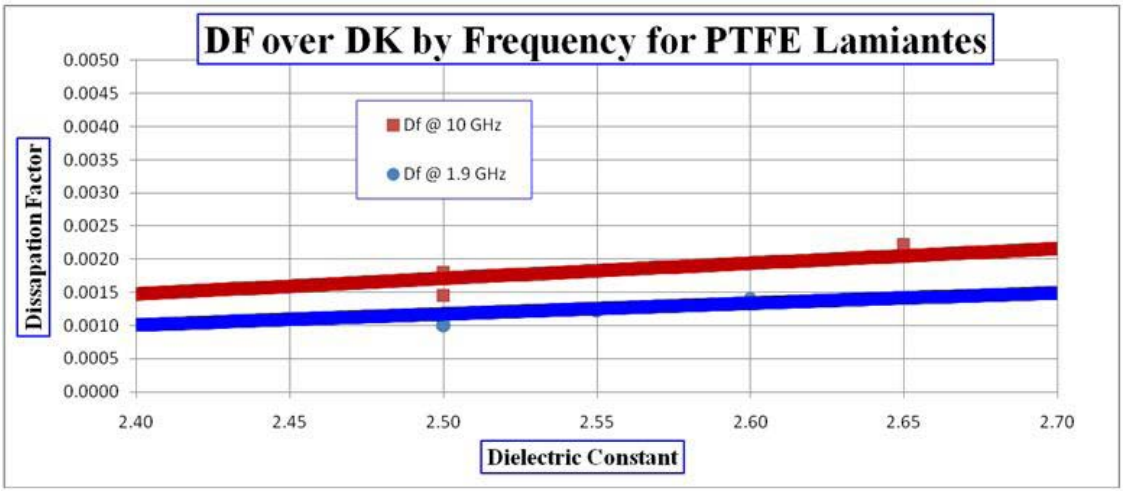
Dielectric Constant & Dissipation Factor Across Product Line:

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



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Copper Cladding							
Copper Designation	**Surface Roughness R_{MS} Treated side**		**Surface Roughness R_{MS} Untreated side**		**Description**	**Thickness**	
	Microinches	Microns	Microinches	Microns		Mils	Microns
RH	13	0.33	12	0.30	Rolled-Annealed ½ oz	0.7	17.5
R1	16	0.41	17	0.43	Rolled-Annealed 1 oz	1.4	35.0
CFH	19	0.50	13	0.33	Electrodeposited ½ oz	0.7	17.5
CF1	18	0.46	16	0.41	Electrodeposited 1 oz	1.4	35.0
CLH	18	0.46	22	0.56	Reverse Treated Electrodeposited ½ oz	0.7	17.5
CL1	16	0.41	26	0.66	Reverse Treated Electrodeposited 1 oz	1.4	35.0
CEH	19	0.50	14	0.36	High Ductility Very Low Profile Electrodeposited ½ oz	0.7	18.0
CE1	25	0.64	16	0.41	High Ductility Very Low Profile Electrodeposited 1 oz	1.4	35.0
CVH (CH)	19	0.50	14	0.36	Very Low Profile Electrodeposited ½ oz	0.7	17.5
CV1 (C1)	25	0.64	16	0.41	Very Low Profile Electrodeposited 1 oz	1.4	35.0
C2	27	0.70	14	0.36	Electrodeposited 2 oz	2.8	70.0

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[2] 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

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

RoHS WEEE Compliant

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