

TLX-8

High Volume Fiberglass Reinforced Microwave Substrate

Benefits

- Low and Stable Dk
- Excellent Mechanical & Thermal Properties
- Dimensionally Stable
- Low Moisture Absorption
- Low DF
- UL 94 V-0 Rating
- For Low Layer Count Microwave Designs

Applications

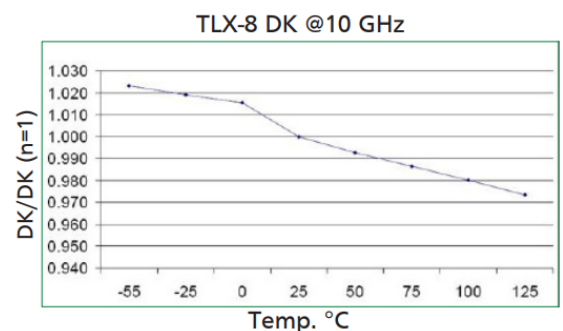
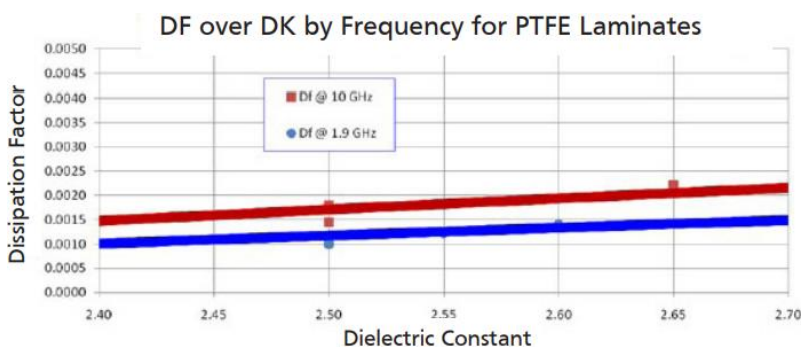
- Antennas
- Mixers, Splitters, Filters & Combiners
- Passive Components



TLX-8 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-8 PTFE fiberglass laminates are ideal for use in radar systems, mobile communications, microwave test equipment, microwave transmission devices and RF components. TLX-8 is a workhorse in the RF microwave substrate world where the fiberglass offers mechanical reinforcement. wherever a substrate experience severe environment 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.



TLX-8 has a long space heritage and is used wherever a woven fiberglass reinforcement is required.

TLX-8 has $\pm 2\%$ variation in DK from -55 to 125 °C. If more temperature stability is required, TSM-DS3 should be considered.

Properties	Conditions	Typical Value	Unit	Test Method
Electrical Properties				
Dielectric Constant	@ 1MHz	2.55 ± 0.04		IPC-650 2.5.5.3
Dissipation Factor	@ 10 GHz	0.0018		IPC-650 2.5.5.5.1(Modified)
Outgassing	% TML	0.03	4 H 257 °F @ ≤ 5 x 10 ⁻⁵ Torr	ASTM E 595
	% CVCM	0.00		
	% WVR	0.01		
Surface Resistivity		6.605 x 10 ⁸	Mohm	IPC-650 2.5.17.1 Sec. 5.2.1 (Elevated Temp.)
		3.550 x 10 ⁶	Mohm	IPC-650 2.5.17.1 Sec. 5.2.1 (Humidity Cond.)
Volume Resistivity		1.110 x 10 ¹⁰	Mohm-cm	IPC-650 2.5.17.1 Sec. 5.2.1 (Elevated Temp.)
		1.046 x 10 ¹⁰	Mohm-cm	IPC-650 2.5.17.1 Sec. 5.2.1 (Humidity Cond.)
Dimensional Stability	MD	0.06	mm/M	IPC-650 2.4.39 Sec. 5.4 (After Bake)
	CD	0.08	mm/M	
	MD	0.09	mm/M	IPC-650 2.4.39 Sec. 5.5 (Thermal Stress)
	CD	0.10	mm/M	
Thermal Properties				
Thermal Conductivity	Unclad	0.19	W/M*K	ASTM F 433/ASTM 1530-06
CTE (25-260 °C)	X	21	ppm/°C	IPC-650 2.4 .41/TMA
	Y	23		
	Z	215		
T _d	2% Weight Loss	535	°C	IPC-650 2.4.24.6 (TGA)
	5% Weight Loss	553	°C	
Mechanical Properties				
Peel Strength	1 oz. ED	2.63 (15)	N/mm (lb/in)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)
	1 oz. RTF	2.98 (17)	N/mm (lb/in)	
	½ oz. ED	2.45 (14)	N/mm (lb/in)	IPC-650 2.4.8.3 (Elevated Temp.)
	½ oz. ED	1.93 (11)	N/mm (lb/in)	IPC-650 2.4.8 Sec. 5.2.2 (Thermal Stress)
	1 oz. rolled	2.28 (13)	N/mm (lb/in)	
Young's Modulus	MD	6,757 (980)	N/mm ² (psi)	ASTM D 902
	CD	8,274 (1,200)	N/mm ² (psi)	
	MD	11,238 (1,630)	N/mm ² (psi)	ASTM D 3039
Chemical / Physical Properties				
Moisture Absorption		0.02	%	IPC-650 2.6.2.1
Dielectric Breakdown		45	KV	IPC-650 2.5.6 (ASTM D 149)
Flammability Rating		V-0		UL-94

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

Typical Thickness			
Inches	mm	Inches	mm
0.0050	0.13	0.0300	0.76
0.0100	0.25	0.0600	1.52
0.0200	0.51	0.1100	2.79

Available Copper Cladding						
Designation	Weight	Copper Thickness	Rz ISO Treated Side		Description	
ULPH	½ oz./sq. ft.	~ .0007"	~ 18 µm	67µin	1.7 µm	Ultra low profile / Electrodeposited
ULP1	1 oz./sq. ft.	~ .0014"	~ 35 µm	59µin	1.5 µm	Ultra low profile / Electrodeposited
CH	½ oz./sq. ft.	~ .0007"	~ 18 µm	236µin	6 µm	Very low profile / Electrodeposited
C1	1 oz./sq. ft.	~ .0014"	~ 35 µm	236µin	6 µm	Very low profile / Electrodeposited
C2	2 oz./sq. ft.	~ .0028"	~ 70 µm	433µin	11 µm	Very low profile / Electrodeposited
CLH	½ oz./sq. ft.	~ .0007"	~ 18 µm	200µin	5.1 µm	Reverse Treated / Electrodeposited
CL1	1 oz./sq. ft.	~ .0014"	~ 35 µm	200µin	5.1 µm	Reverse Treated / Electrodeposited

Available Sheet Sizes

Inches	mm	Inches	mm
12 x 18	305 x 457	24 x 36	610 x 914
16 x 18	406 x 457	18 x 48	457 x 1,220
18 x 24	457 x 610	36 x 48	914 x 1,220
16 x 36	406 x 914		

* All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a company representative directly.

* Standard panel size is 18" x 24" (457 mm x 610 mm).

* Minimum available thickness is from 0.0025" (0.063 mm).

* Please contact AGC for availability of additional thicknesses, other sizes & any other type of cladding.

