

# TLE Tight Tolerance RF Substrate for Thin Dielectrics/Couplers

TLE laminates are engineered to provide electrical and mechanical properties to meet the requirements of complex microwave and high speed digital applications. The low Z-axis CTE provides excellent plated through hole reliability while the low thermal expansion properties in the X and Y plane ensure high reliability in surface mount applications. The Dk exhibits minimal change over temperature. TLE is typically offered with a 2.95 DK  $\pm$  0.05.

TLE laminates are dimensionally stable, exhibit virtually no moisture absorption during processing and are generally ordered clad on one or both sides with .5, 1 and 2 oz. electrodeposited copper.

TLE laminates exhibit flammability of V-0 and are tested in accordance with IPC-TM 650. A certificate of compliance containing test data accompanies each shipment.

### Benefits & Applications:

- Low CTE Value
  - Controlled Dimensional Stability
  - Low Dissipation Factor
  - Low, Stable Dielectric Constant
  - High Flexural Strength
  - UL 94 V-0 Rating
- 
- Microwave Radios
  - Satellite Antenna Systems
  - Passive Components

Designation	Dielectric Constant	Typical Thicknesses	
		Inches	mm
TLE-95	3.00 $\pm$ 0.05	0.0052	0.13
TLE-95	2.95 $\pm$ 0.05	0.0100 - 0.0190	0.25 - 0.48
		0.0200 - 0.0300	0.50 - 0.76
		$\geq$ 0.0310	$\geq$ 0.80

Available Sheet Sizes	
Inches	mm
12 x 18	305 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

Standard sheet size is 36" x 48" (914 mm x 1220 mm). Please call for availability of other sizes and claddings.

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

An example of our part number is: **TLE-95-0100-CH/CH - 18" x 24" (457 mm x 610 mm)**

TLE-95 Typical Values					
Property	Test Method	Unit	Value	Unit	Value
Dk @ 10 GHz	IPC-650 2.5.5.5		2.95		2.95
Df @ 10 GHz	IPC-650 2.5.5.5		0.0028		0.0028
Dielectric Breakdown	IPC-650 2.5.6	kV	>60	kV	>60
Dielectric Strength	ASTM D 149	V/mil	427	V/mm	16,800
Arc Resistance	IPC-650 2.5.1	Seconds	>180	Seconds	>180
Moisture Absorption	IPC-650 2.6.2.1	%	<0.02	%	<0.02
Flexural Strength (MD)	IPC-650 2.4.4	lbs/in	>35,000	N/mm <sup>2</sup>	>241
Flexural Strength (CD)	IPC-650 2.4.4	lbs/in	>30,000	N/mm <sup>2</sup>	>207
Peel Strength (1 oz. copper)	IPC-650 2.4.8	lbs/in	12	N/mm	>2.1
Thermal Conductivity	ASTM F 433	W/M*K	0.20	W/M*K	0.20
Surface Resistivity	IPC-650 2.5.17.1	Mohms	10 <sup>7</sup>	Mohms	10 <sup>7</sup>
Volume Resistivity	IPC-650 2.5.17.1	Mohms/cm	10 <sup>7</sup>	Mohms/cm	10 <sup>7</sup>
CTE (X axis)	ASTM D 3386 (TMA)	ppm/°C	9	ppm/°C	9
CTE (Y axis)	ASTM D 3386 (TMA)	ppm/°C	12	ppm/°C	12
CTE (Z axis)	IPC-650 2.4.41 / ASTM D 3386	ppm/°C	70	ppm/°C	70
Flammability	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.

