

# TLY-5

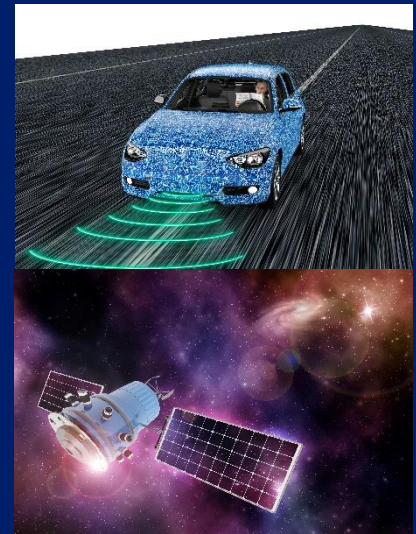
## Avionics & aerospace grade very low DK base material

### Benefits

- Dimensionally Stable
- Lowest Df
- High Peel Strength
- Low Moisture Absorption
- Uniform, Consistent Dk
- Laser Ablatable

### Applications

- Automotive Radar
- Satellite/Cellular Communications
- Power Amplifiers
- LNAs, LNBs, LNCs
- Aerospace
- Ka, E and W band Applications



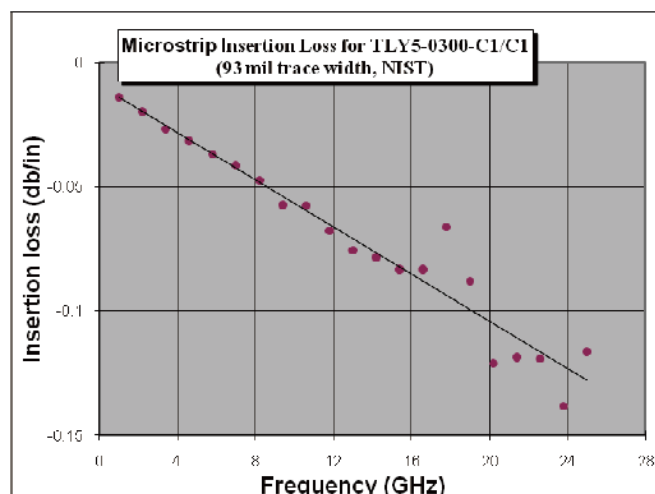
TLY-5 laminates are manufactured with very lightweight woven fiberglass and are much more dimensionally stable than chopped fiber reinforced PTFE composites. The woven matrix in the TLY-5 material yields a more mechanically stable laminate that is suitable for high volume manufacturing. The low dissipation factor enables successful deployment for automotive radar applications designed at 77 GHz as well as other antennas in millimeter wave frequencies.

Comparative OEM testing at 77 GHz of lightly reinforced TLY-5 vs. its closest chopped fiber reinforced competitor has shown “drop in”/equivalent insertion losses/dielectric properties. The primary benefit is much higher manufacturing yields. The dielectric constant range is 2.17 to 2.40. For most thicknesses, the dielectric constant can be specified anywhere within this range with a tolerance of +/- 0.02. In the low dielectric constant range, the dissipation factor is approximately 0.0009 at 10 GHz. Typical applications include satellite communications, automotive radar, filters, couplers, avionics and phased array antennas.

TLY-3FF is a new highly flexible laminate designed for applications that require laminates with some bend radius. TLY-3FF is much more flexible than standard TLY-5 fiberglass reinforced substrates. The flexibility of TLY-3FF is comparable to chopped fiber reinforced PTFE laminates yet it has a loss tangent that is lower than traditional chopped fiber reinforced laminates.

The fiberglass reinforced TLY-3FF has been engineered to provide the dimensional stability typical of the standard fiberglass reinforced TLY-5 Series yet offers the mechanical flexibility of chopped fiber reinforced laminates.

TLY-3FF has also been designed for improved laser via formation relative to traditional TLY-5 glass reinforced laminates.



Properties	Conditions	Typical Value	Unit	Test Method
<b>Electrical Properties</b>				
Dielectric Constant	@ 10 GHz	2.20 ± 0.02		IPC-650 2.5.5.5
Dissipation Factor	@ 10 GHz	0.0009		IPC-650 2.5.5.5
Volume Resistivity		10 <sup>10</sup>	Mohms/cm	IPC-650 2.5.17.1 (after elevated temp.)
		10 <sup>10</sup>	Mohms/cm	IPC-650 2.5.17.1 (after humidity)
Surface Resistivity		10 <sup>8</sup>	Mohms	IPC-650 2.5.17.1 (after elevated temp.)
		10 <sup>8</sup>	Mohms	IPC-650 2.5.17.1 (after humidity)
<b>Thermal Properties</b>				
Thermal Conductivity		0.22	W/M*K	ASTM F 433
CTE (25-260°C)	X	26	ppm/°C	ASTM D 3386 (TMA)
	Y	15		
	Z	217		
<b>Mechanical Properties</b>				
Peel Strength	1/2 oz. ED copper	1.96 (11)	N/mm (lbs/in)	IPC-650 2.4.8
	1 oz. CL1 copper	2.86 (16)	N/mm (lbs/in)	
	1 oz. C1 copper	3.04 (17)	N/mm (lbs/in)	
		2.32 (13)	N/mm (lbs/in)	
Flexural Strength	MD	96.91 (14,057)	N/mm <sup>2</sup> (psi)	IPC-650 2.4.4
	CD	89.32 (12,955)	N/mm <sup>2</sup> (psi)	
Young's Modulus	MD	9.65 X 10 <sup>3</sup> (1.4 X 10 <sup>6</sup> )	N/mm <sup>2</sup> (psi)	ASTM D 3039 / IPC-650 2.4.19
Poisson's Ratio	MD	0.21		ASTM D 3039 / IPC-650 2.4.19
Density	Specific Gravity	2.19	g/cm <sup>3</sup>	ASTM D 792
Dimensional Stability	MD, 10 mil	-0.038	mm/M (mils/in)	IPC-650 2.4.39
	CD, 10 mil	-0.038	mm/M (mils/in)	(avg. after bake & thermal stress)
<b>Chemical / Physical Properties</b>				
Moisture Absorption		0.02	%	IPC-650 2.6.2.1
NASA Outgassing	TML	0.01	%	
	CVCM	0.01	%	
	WVR	0.01	%	
UL-94 Flammability Rating		V-0		UL-94

#### Typical Thicknesses

Inch	mm	Inch	mm
0.0035	0.09	0.0200	0.51
0.0050	0.13	0.0300	0.76
0.0075	0.19	0.0310	0.79
0.0100	0.25	0.0600	1.52

#### Available Sheet Sizes

Inch	mm	Inch	mm
12 x 18	305 x 457	16 x 36	406 x 914
16 x 18	406 x 457	24 x 36	610 x 914
18 x 24	457 x 610	18 x 48	457 x 1220

\* 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.

\* TLY-5 can be manufactured in increments of 0.005" (0.125mm).

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

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

