

# TLY-5Z



Your Dreams, Our Challenge

## Low DK/Low Z-Axis Expansion/Low Density Laminates

### Benefits

- Low Z Axis CTE
- Plated Through Hole Stability
- Low Density (1.92 g/cm<sup>3</sup>)
- Attractive Price/Performance Ratio
- Excellent Peel Strength
- Compatible with Flat Copper

### Applications

- Aerospace Components
- Low Weight Antennas for Aircraft
- RF Passive Components



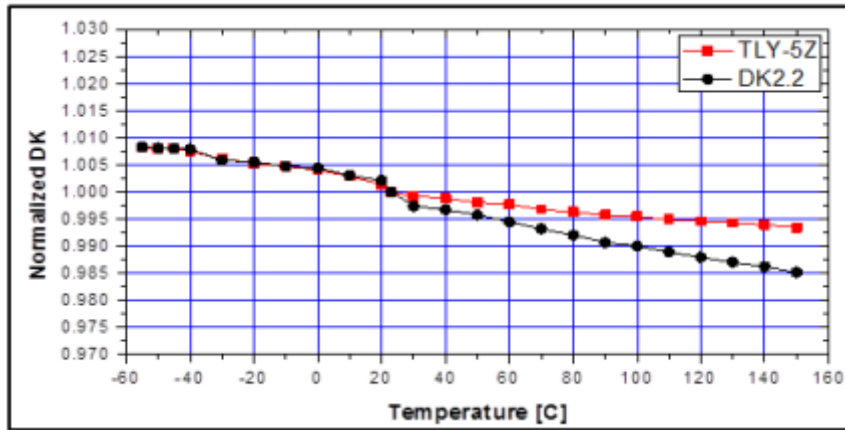
TLY-5Z laminates are advanced, glass-filled, PTFE composites with woven fiberglass reinforcement. The glass-filled structure was designed for low density applications such as aerospace having optimally low weight requirements. This results in a dimensionally stable composite which is otherwise not possible with nonreinforced PTFEs. The low density approach also makes for a composite with a low Z axis expansion which is also not otherwise possible with PTFE-rich composites. TLY-5Z is much more thermally stable with respect to z axis expansion induced stress on plated through holes than conventional low dielectric constant PTFE composites.

TLY-5Z is also an attractive choice from a cost perspective. The glass-filled structure is a cost effective solution versus standard PTFE-rich copper clad laminates. TLY-5Z can be used in high volume commercial microwave applications where PTFE-rich substrates would be cost prohibitive. TLY5Z can be used in PWB designs which would be extremely difficult to manufacture or thermally unreliable with conventional PTFE-rich substrates. Often, plated through holes in conventional PTFE-rich substrates suffer from drilling defects and must be plated with thick copper to have any hope of reliability. These PWBs may suffer from thermal cycle induced cracks. TLY-5Z has half the thermal expansion of PTFE-rich substrates, offers improved drilling and can be thermally cycled. Ground stitching along transmission lines can be readily accomplished and they will be thermally reliable. TLY-5Z offers a much better option for complex multilayer stripline design than older PTFE-rich substrates. TLY-5Z can support Substrate Integrated Waveguide (SIW) applications with many mode suppression vias.

TLY-5Z can be combined with the flattest of coppers such as the new ULP ultra low profile copper foils.

TLY-5Z shows reduced temperature coefficient of dielectric constant (Tck) relative to conventional 2.2 dielectric constant materials.

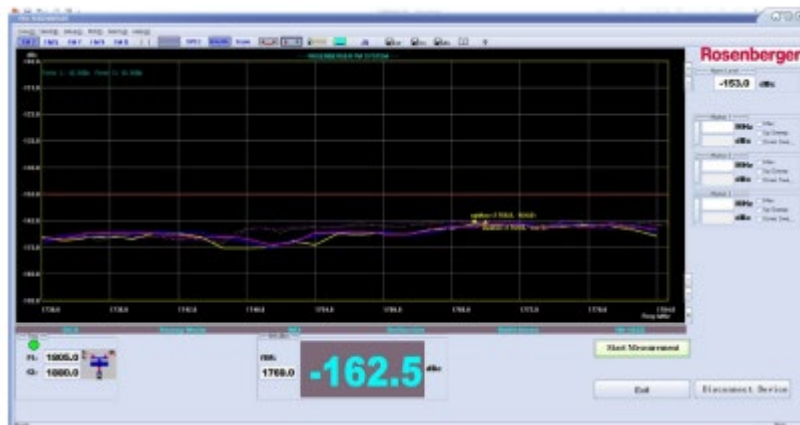
Conventional 2.2 DK PTFE Substrates



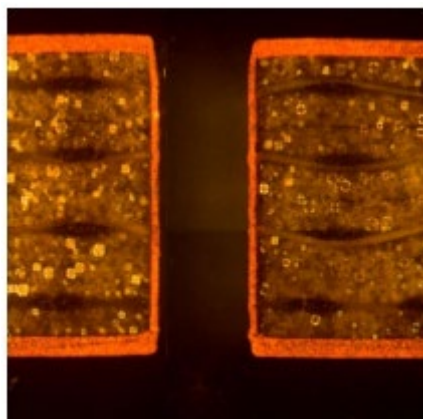
PIMD / PIM

PIMD (Passive Intermodulation Distortion) occurs in complex communications systems where multiple frequencies induce unwanted harmonic distortion. PIM can result from many sources other than the copper clad laminates. However, laminates such as AGC's TLY and TLY-5Z exceed PIM requirements of PCBs of -153 dBc (measured between 880 and 960 MHz, from 1710 to 1880 MHz and from 1920 to 2100 MHz). Data was collected using 20 Watt signal carriers and reverse treated copper (CL1).

TLY-5Z's improved PTH reliability results in consistent PIMD levels in PWB designs with plated through holes even after repeated thermal cycling.



PIMD example of TLY-5Z-0300-CL1/CL1



PTH example after thermal cycle

Properties	Conditions	Typical Value	Unit	Test Method
<b>Electrical Properties</b>				
Dielectric Constant	@ 10 GHz	2.20 ± 0.04		IPC-650 2.5.5.5.1 Mod.
Dissipation Factor	@ 10 GHz	0.0015		IPC-650 2.5.5.5.1 Mod.
Volume Resistivity		10 <sup>9</sup>	Mohms/cm	IPC-650 2.5.17.1
Surface Resistivity		10 <sup>8</sup>	Mohms	IPC-650 2.5.17.1
<b>Thermal Properties</b>				
Thermal Conductivity		0.2	W/M*K	IPC-650 2.4.50
CTE (25-260°C)	X	30	ppm/°C	IPC-650 2.4.41
	Y	40		
	Z	130		
<b>Mechanical Properties</b>				
Peel Strength	1 oz. copper	1.3 (7)	N/mm (lbs/in)	IPC-650 2.4.8
Tensile Strength	MD	63 (9,137)	N/mm <sup>2</sup> (psi)	IPC-650 2.4.18.3
	CD	66 (9,572)	N/mm <sup>2</sup> (psi)	
Tensile Modulus	MD	1,260 (182,748)	N/mm <sup>2</sup> (psi)	
	CD	1,140 (165,344)	N/mm <sup>2</sup> (psi)	
Elongation	MD	6.0	%	IPC-650 2.4.18.3
	CD	6.9	%	
Flex Strength	MD	71 (10,300)	N/mm <sup>2</sup> (psi)	ASTM D790
	CD	80 (11,600)	N/mm <sup>2</sup> (psi)	
Flex Modulus	MD	2,600 (377,100)	N/mm <sup>2</sup> (psi)	ASTM D790
	CD	2,980 (432,213)	N/mm <sup>2</sup> (psi)	
Density	Specific Gravity	1.92	g/cm <sup>3</sup>	IPC-650 2.3.5
Dimensional Stability	MD	-0.05	% (10 mil)	IPC-650 2.4.39 (Bake)
		-0.05	% (30 mil)	
CD	-0.17	% (10 mil)		
	-0.11	% (30 mil)		
Dimensional Stability	MD	-0.07	% (10 mil)	IPC-650 2.4.39 (Stress)
		-0.07	% (30 mil)	
	CD	-0.22	% (10 mil)	
		-0.14	% (30 mil)	
<b>Chemical / Physical Properties</b>				
Moisture Absorption		0.03	%	IPC-650 2.6.2.1
Hardness	Durometer	68		ASTM D2240
UL-94 Flammability Rating		V-0		UL-94

#### Typical Thicknesses

Inches	mm
0.0100	0.25
0.0200	0.51
0.0300	0.76
0.0600	1.52

#### Available Sheet Sizes

Inches	mm
12 x 18	305 x 457
16 x 18	406 x 457
18 x 24	457 x 610

- \* 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-5Z can be manufactured in increments of 0.0100"(0.25mm).
- \* 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.

