ELL 101, ELL 102, ELL 103

Extreme Low Loss Materials

Laminate & Prepreg

AGC
Your Dreams, Our Challenge

Benefits

- Advanced Electrical Performance
- Stable dielectric performance over a wide frequency and temperature range
- High Conductive Anodic Filament (CAF) resistance
- Available in a variety of prepregs and constructions

Applications

- Telecommunications
- Core Routers
- High Speed Switching / Routing Systems
- Cloud Storage
- Aerospace
- Automotive radar
- AI

ELL high speed / extreme low loss materials offer advanced electric performance and high reliability for use in the next generation of internet infrastructure. It is designed for use in high frequency core routers, high speed switches, supercomputers and applications where low signal attenuation and high data transfer rates are critical. The extreme low loss of ELL also makes it an excellent material for RF and hybrid designs.

Excellent Electrical Properties

- Extreme low loss
- Stable Dk/Df over frequency and temperature.
- Low DK
- Available with 1st Generation and 2nd Generation low Dk fiberglass.
- ELL with first generation low Dk glass (ELL101) has demonstrated the SI performance suitable for 112 Gb designs. Equivalent to competitive materials using second generation low Dk glass.

Thermal and Mechanical Properties

- Lead-free assembly compatibility
- Good Peel Strength on ultra-low profile copper
- Outstanding thermal reliability: T_{300} >60 minutes.

Excellent CAF Performance

- All constructions utilize super spread weaves and fiberglass finishes optimized for CAF performance.

Name Definition

- ELL 101 = ELL resin system on NE fabric.
- ELL 102 = ELL resin system on NER fabric.
- ELL 103 = ELL resin system on L2 fabric.

Regulatory

- Compliant with ROHS, REACH, California Prop 65 and the “Conflict Minerals Act”
- Meets UL 94-V0 and IPC-4103/540 specifications

Properties	Conditions	Typical Value	Unit	Test Method
Electrical Properties				
Dielectric Constant	ELL 101 @ 10 GHz	3.05		IPC-TM-650.2.5.5.5
	ELL 102/103 @ 10 GHz	3.03		
Dissipation Factor	ELL 101 @ 10 GHz	0.0012		
	ELL 102/103 @ 10 GHz	0.0009		
Volume Resistivity	C - 96 / 35 / 90	8.9×10^7	MΩ - cm	IPC-TM-650.2.5.17.1
	E – 24 / 125	1.1×10^8		
Surface Resistivity	C - 96 / 35 / 90	4.7×10^6	MΩ	IPC-TM-650.2.5.17.1
	E - 24 / 125	2.3×10^8		
Electric Strength		65 (1.7×10^3)	kV/mm (V/mil)	IPC-TM-650.2.5.6.2
Thermal Properties				
*Glass Transition Temperature (Tg)	DMA(°C) (Tan d Peak)	190	°C	IPC-TM-650.2.4.24.3
Degradation Temperature (TGA)	Degradation Temp (TGA) (5% wt. loss)	376	°C	IPC-TM-650.2.3.40
T-288 / T-300	Time to delamination @ 288°C / 300°C	>120 / >60	minutes	IPC-TM-650.2.4.24.1
Thermal Conductivity		0.475	W/mK	ASTM E1461
Mechanical Properties				
Peel Strength	1 oz (35µ) Cu	0.49 (2.8)	N/mm (lb/inch)	IPC-TM-650.2.4.8
	After Solder Float	0.54 (3.1)	N/mm (lb/inch)	IPC-TM-650.2.4.8
X / Y CTE	-40°C to + 125°C	12 /12	ppm/°C	IPC-TM-650.2.4.41
Z Axis CTE Alpha 1 / Alpha 2 (55% RC)	50°C to Tg / Tg to 260°C	65 /156	ppm/°C	IPC-TM-650.2.4.24
Z Axis Expansion (43% RC)	50°C to 260°C	1.8	%	IPC-TM-650.2.4.24
Young's Modulus (X / Y)		15.2 / 1.65 (2.2 / 2.4)	GN/m^2 ($psi \times 10^6$)	ASTM D3039
Poisson's Ratios (X / Y)		0.149/0.159		
Chemical / Physical Properties				
Moisture Absorption		0.036	wt. %	IPC-TM-650.2.6.2.1
Outgas	TML / CVCM / WVR	0.34 / <0.01 / <0.01	wt. %	IPC-TM650 2.6.4B; ASTM E595

* DMA is the preferred method for measuring Tg - other methods are less accurate.

- 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
- ELL series can be manufactured in laminate thickness from 1.2 mil (0.031 mm) and up.
- ELL is available in most common panel sizes.
- Please contact AGC for availability of any other constructions, copper weights and glass styles including ultra-low profile copper and RTFOIL®

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