

## Low-Loss Glass Fiber Yarn (L-Glass™)

In response to the rapid development of high-speed digital electronic systems, AGY has introduced L-Glass™ fiber, a new low-loss glass fiber yarn for printed wiring board (PWB) applications.



# AGY L-Glass™ Fiber

## Improved Dielectric Performance for High Speed Electronics

L-Glass fiber is a new low-loss glass fiber yarn that has been developed for printed wiring board (PWB) applications. The low dielectric constant (Dk) and low dissipation factor (Df) properties of L-Glass fibers are ideally suited for designs requiring increased signal speeds and better signal integrity than traditional E-Glass/epoxy substrate materials.

Substrate materials that provide low dielectric constant and low dissipation factor properties have become an essential element of high-speed digital systems such as mobile communications base stations, high-end routers and servers and high speed storage networks. As these systems move to higher processing speeds, substrates with low-loss properties are needed to ensure the speed and integrity of the signals.

L-Glass fiber is a cost-effective alternative to current systems. The low-loss properties make it ideal for applications operating at the highest signal speeds and provide designers a compelling alternative to traditional materials.

### APPLICATIONS

- Mobile communications infrastructure
- High-speed routers/servers
- High-speed storage networks
- IC packaging
- Backplanes



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Low-loss laminates for high-speed applications have traditionally been produced in one of two ways. In one method, a higher performing epoxy resin system is used in conjunction with E-Glass. This approach limits the achievable Dk and Df properties.

The second method combines very low Dk/Df resins, such as PTFE, with ceramic filler and a much lower E-Glass content. While these systems can achieve much lower Df/Dk properties, they suffer from high material and processing costs. The low glass loading also reduces the dimensional stability of the laminate.

The use of L-Glass fiber overcomes these limitations by allowing epoxy resin systems to achieve much lower Dk/Df properties, and the PTFE-based systems to use a higher glass loading.

At 10 GHz L-Glass fiber has a dielectric constant of 4.86 and a dissipation factor of 0.0050 whereas E-Glass has a dielectric constant of 6.81 and a dissipation factor of 0.0060 at 10 GHz. The coefficient of thermal expansion (CTE) of L-Glass fiber is 3.9 ppm/°C compared to 5.4 ppm/°C for E-Glass. This makes L-Glass fiber an attractive material for use in IC packaging, where CTE mismatches with silicon are magnified due to the thermal environment and can cause defects.

AGY's L-Glass fibers are available in a variety of yarn counts, that will allow production of low-loss fabrics analogous to styles 106, 1080, 1280, 2113/2313, 3313, and 2116. Additional yarn counts can be produced as needed to meet market demands.

## PROPERTIES

		L-Glass	E-Glass
Dielectric Constant, $\epsilon'$ , (Dk)	1 GHz	4.79 <sup>+</sup>	7.30 <sup>**</sup>
	10 GHz	4.86 <sup>#</sup>	6.81 <sup>**</sup>
Dissipation Factor, $\tan \delta$ , (Df)	1 GHz	< 0.001 <sup>+</sup>	0.0058 <sup>**</sup>
	10 GHz	0.0050 <sup>#</sup>	0.0060 <sup>**</sup>
Density (bulk annealed)	g/cm <sup>3</sup>	2.30	2.63
Refractive Index (fiber)		1.480	1.558
Softening Point	°C	740	846
Coefficient of Thermal Expansion	ppm/°C	3.90	5.40
Tensile Load to Failure	N	8.54 <sup>@</sup>	8.94 <sup>@</sup>
Elastic Modulus	GPa	62.10 <sup>^</sup>	77.20
Specific Elastic Modulus	x10 <sup>6</sup> m	2.80 <sup>^</sup>	3.10

NOTES: + Measured using HP LCR meter and HP 16453A fixture per IPC -TM-650 (2.5.5.9)  
 # Measured using Long Stripline technique per IPC-TM-650 (2.5.5.5.1)  
 \*\* Average data for E-Glass measured by IPC 3-12d Task Group  
 @ Average tensile load to failure for L-Glass fiber (D510) vs. E-Glass (D450)  
 ^ Determined by sonic pulse echo technique on bulk annealed samples

## AVAILABLE PRODUCTS

US Units	SI Units	Volumetric Equivalent E-Glass Products
LCD1020 1/0 1.0Z	LC5-4.9 1x0 Z40	ECD900 (EC5-5.5)
LCD510 1/0 1.0Z	LC5-10 1x0 Z40	ECD450 (EC5-11)
LCDE340 1/0 1.0Z	LC6-15 1x0 Z40	ECDE300 (EC6-17)
LCE255 1/0 1.0Z	LC7-19 1x0 Z40	ECE225 (EC7-22)

Sizing: 620-1 ▪ Bobbin: 7636



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