PRODUCT INFORMATION

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# S-3 HDI™ Yarn

## Low CTE, High Modulus Glass Fiber Yarn for IC Substrate PCB Applications

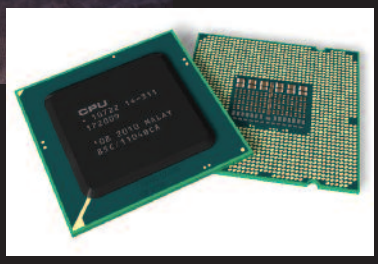
AGY's S-3 HDI™ yarns are specifically designed to meet the demanding performance requirements of IC substrate PCBs.

### Product Application

The use of smartphones and tablet PCs continues to grow globally. In addition, the functionality of these devices continues to increase, which has created the need for smaller and highly specialized PCBs. IC substrates are utilized as the connection between the IC chips and the PCB, and represent state-of-the-art miniaturization in PCB design. Often referred to as chip scale package, package-on-package, or multi-chip package solutions, these PCBs are routinely found in smartphones and tablet PCs.

### Product Description

S-3 HDI yarns are produced using a proprietary, patent pending glass composition designed for the specific requirements of low coefficient of thermal expansion (CTE) and high tensile modulus. S-3 HDI yarns are available in a wide range of fiber micronage and yield/tex, including ultra-fine yarns for the thinnest substrates.



| Features | Benefits |
|---|---|
| CTE = 3.5 ppm/OC vs. 5.4 ppm/OC for E-Glass | Minimizes CTE mismatch with silicon chips, improving substrate reliability |
| Tensile Modulus = 86 GPa vs. 72 GPa for E-Glass | Enables thin substrates with minimum warpage at elevated temperatures |
| Low hollow fibers | Excellent conductive anodic filamentation (CAF) resistance |
| Wide range of fiber micronage and yield/tex | Wide range of possible substrate thicknesses |
| Highly homogeneous glass quality | Consistent performance in PCB applications |
| Treated with electronics grade starch/ oil sizing | Fabric surface smoothness with high-speed air-jet weaving |

## PRODUCT INFORMATION

AGY has been a provider of fine yarns to the electronics industry for a significant number of years and using the experience gained has now a range of fine, extra fine as well as ultrafine yarns to meet the demands of the printed circuit board industry. Today AGY offers E-Glass yarns into a number of fabric styles and weights, from fabrics used in desktop computers to light weight fabrics used in mobile devices used today and tomorrow.

Meeting the demands for the electronics market has also meant that AGY has developed a number of glass fibers to meet the demands in a range of applications, from high strength and low coefficient of thermal expansion to low dielectric loss. AGY's unique manufacturing footprint allows the manufacture of these high performance fibers in a way to meet the demand of customers during low volume startup right through to high volume manufacturing with the right volumes at the right time. AGY, being an independent glass fiber producer, can work with any of the fabric producers supplying the electronics industry globally.

### PROPERTIES

| | Units | S-3 HDI™ | E-Glass |
|---|---|---|---|
| Dielectric Constant, ε', (Dk) | @1 GHz<br>@10 GHz | 5.4<br>5.3 | 7.0<br>6.9 |
| Dissipation Factor, Tan ∂, (Df) | @1 GHz<br>@10 GHz | 0.006<br>0.007 | 0.005<br>0.007 |
| Density | g/cm$^3$ | 2.45 | 2.54 |
| Softening Point | °C | 940 | 846 |
| Coefficent of Thermal Expansion | ppm/°C | 3.5 | 5.4 |
| Tensile Load to Failure (D450 fiber) | N | 9.5 | 8.9 |
| Tensile Modulus | GPa | 83 | 75 |

### AVAILABLE PRODUCTS AND TYPICAL USES

| YARN | | Typical IPC Fabric Styles | Typical Substrate Thickness (°m) |
|---|---|---|---|
| US Units | SI Units | | |
| SCE255 1/0 1.0Z | SC7-22 1x0 Z40 | 2116 | 100 |
| SCD450 1/0 1.0Z | SC5-11 1x0 Z40 | 1078 | 50 |
| SCC1200 1/0 1.0Z | SC4.5-4.1 1x0 Z40 | 1037 | 30 |
| SCBC1500 1/0 1.0Z | SC4-3.3 1x0 Z40 | 1027 | 20 |
| SCBC3000 1/0 0.7Z | SC4-1.7 1x0 Z28 | 1017 | 15 |

All products with sizing 620-1 on 7636 bobbin

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