

## TECHNICAL DATA SHEET

### FR-5

(DR5 Epoxy Laminate)

FR5 Laminate is a glass fabric reinforcement in a high temperature epoxy resin binder. The natural color is typically yellow-green-tan blend. This grade is similar to G10/FR4 but has a higher operating temperature and superior mechanical properties at elevated temperatures. It maintains good properties at both dry and humid conditions. It certifies to NEMA FR5. Expansion coefficient of FR5 laminate in the xy plane is approximately 14 ppm/XC (25XC to 130XC). The expansion coefficient of epoxy resin in the z axis is approximately 4% at a range of 50XC to 288XC. The glass transition temperature (T<sub>g</sub>) of FR5 is typically between 170-180°C. Continuous operating temperature for FR5 is typically 140 degrees C. High T<sub>g</sub> laminate is best suitable for multilayer PCB with higher layer count. Automotive producers also considered FR5 glass epoxy laminate to be the best material due to its improved T<sub>g</sub> glass transition temperature for automotive applications.

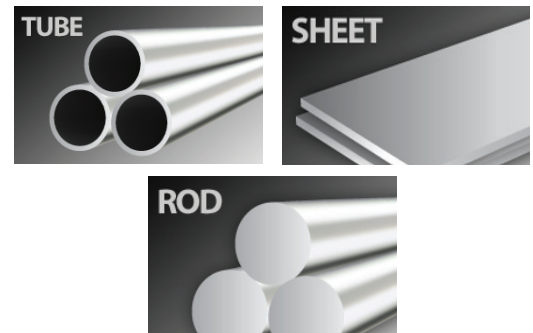
#### Benefits

Extremely high mechanical strength at elevated temperatures  
 Good dielectric loss  
 Good electric strength in dry and humid conditions  
 Good chemical resistance  
 Low moisture absorption

#### Applications

Electrical Equipment  
 Antennal Isolators  
 Circuit Board Holders  
 Aerospace  
 Test Boards  
 End Plates  
 Solder Frames

#### SHAPES AVAILABLE



#### FR5 Typical Properties Values

Specific Gravity/Density 1.85 g/cm<sup>3</sup>  
 Water Absorption -.125" < .10 %  
 Temperature Index 180 \ 356 °C \ °F  
 Rockwell Hardness 115 M scale  
 Bond Strength > 2,200 \ 1,000 lbs \ kgs  
 Flexural Strength-LW-A-.125" > 75,000 \ 520 PSI \ MPa  
 Flexural Strength-LW-E 1/150 > 40,000 \ 280 PSI \ MPa  
 Izod Impact Strength-LW > 10 ft-lbs/in  
 Izod Impact Strength-CW > 8 ft-lbs/in  
 Compressive Strength-Flatwise > 65,000 \ 448 PSI \ MPa  
 Dielectric Breakdown-A > 50 kV  
 Dielectric Breakdown-D48/50 > 50 kV  
 Permittivity-A 4.8  
 Permativity-D24/23 4.8  
 Dissipation Factor-A 0.017  
 Dissipation Factor-D24/23 0.018