



# FR406

## High Performance Epoxy Laminate and Prepreg

FR406 sets the industry standard for high performance epoxy materials.

This product is engineered to meet the demands of the multilayer printed circuit board industry, while maintaining standard FR-4 processing. FR406 offers improved dimensional control, superior chemical and thermal performance and product consistency.

### Product Attributes

Legacy Materials

#### ORDERING INFORMATION:

Contact your local sales representative or visit [www.isola-group.com](http://www.isola-group.com) for further information.

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# Data Sheet

Tg 170°C

Td 300°C

Dk 3.93

Df 0.0167

IPC-4101 - / 21 / 24 / 26

UL - File Number E41625

Last Updated August 27, 2018  
Revision No: B

### Product Features

- Industry Recognition
  - UL File Number: E41625
  - RoHS Compliant
- Performance Attributes
- Processing Advantages
  - FR-4 process compatible
  - UV blocking and AOI fluorescence
  - No post bake after pressing

### Product Availability

- Standard Material Offering: Laminate
  - 2 to 125 mil (0.05 to 3.2 mm)
  - Available in full size sheet or panel form
- Copper Foil Type
  - HTE Grade 3
  - RTF (Reverse Treat Foil)
- Copper Weight
  - ½ to 2 oz (18 to 70 µm) available
  - Heavier copper available
  - Thinner copper foil available
- Standard Material Offering: Prepreg
  - Roll or panel form
  - Tooling of prepreg panels
- Glass Fabric Availability
  - E-glass
  - Square weave glass

# FR406 Typical Values

Last Updated Aug 27, 2018

| Property   | Typical Value  | Units   | Test Method              |                       |
|--|--|---|--------------------------|-----------------------|
|  |  | Metric (English)                                    | IPC-TM-650 (or as noted) |                       |
| Glass Transition Temperature (Tg) by DSC               | 170  | °C  | 2.4.25C                  |                       |
| Decomposition Temperature (Td) by TGA @ 5% weight loss | 300  | °C  | 2.4.24.6                 |                       |
| Time to Delaminate by TMA (Copper removed)             | A. T260<br>B. T288   | 10<br>>2  | Minutes                  | 2.4.24.1              |
| Z-Axis CTE   | A. Pre-Tg<br>B. Post-Tg<br>C. 50 to 260°C, (Total Expansion)   | 60<br>250<br>3.5                                    | ppm/°C<br>ppm/°C<br>%    | 2.4.24C               |
| X/Y-Axis CTE   | Pre-Tg   | 13  | ppm/°C                   | 2.4.24C               |
| Thermal Conductivity                                   |  | 0.3-0.4   | W/mK                     | ASTM E1952            |
| Thermal Stress 10 sec @ 288°C (550.4°F)                | A. Unetched<br>B. Etched   | Pass  | Pass Visual              | 2.4.13.1              |
| Dk, Permittivity                                       | A. @ 100 MHz   | 4.00  | —                        | 2.5.5.3               |
|  | B. @ 1 GHz   | 3.95  |                          | 2.5.5.9               |
|  | C. @ 2 GHz   | 3.93  |                          | 2.5.5.5               |
|  | D. @ 5 GHz   | 3.92  |                          | 2.5.5.5               |
|  | E. @ 10 GHz  | 3.92  |                          | 2.5.5.5               |
| Df, Loss Tangent                                       | A. @ 100 MHz   | 0.0130  | —                        | 2.5.5.3               |
|  | B. @ 1 GHz   | 0.0161  |                          | 2.5.5.9               |
|  | C. @ 2 GHz   | 0.0167  |                          | 2.5.5.5               |
|  | D. @ 5 GHz   | 0.0172  |                          | 2.5.5.5               |
|  | E. @ 10 GHz  | 0.0172  |                          | 2.5.5.5               |
| Volume Resistivity                                     | A. C-96/35/90<br>B. After moisture resistance<br>C. At elevated temperature  | 9.0 x 10 <sup>7</sup><br>—<br>3.0 x 10 <sup>7</sup> | MQ-cm                    | 2.5.17.1              |
| Surface Resistivity                                    | A. C-96/35/90<br>B. After moisture resistance<br>C. At elevated temperature  | 3.0 x 10 <sup>8</sup><br>—<br>8.0 x 10 <sup>8</sup> | MQ                       | 2.5.17.1              |
| Dielectric Breakdown                                   |  | >50   | kV                       | 2.5.6B                |
| Arc Resistance   |  | 90  | Seconds                  | 2.5.1B                |
| Electric Strength (Laminate & laminated prepreg)       |  | 44 (1100)   | kV/mm (V/mil)            | 2.5.6.2A              |
| Comparative Tracking Index (CTI)                       |  | 3 (175-249)   | Class (Volts)            | UL 746A<br>ASTM D3638 |
| Peel Strength  | A. Low profile copper foil and very low profile copper foil all copper foil >17 µm [0.669 mil]<br>B. Standard profile copper<br>1. After thermal stress<br>2. At 125°C (257°F)<br>3. After process solutions | 1.19 (7.0)  | N/mm (lb/inch)           | 2.4.8C                |
|  |  | 1.60 (9.0)  |                          | 2.4.8.2A              |
|  |  | 1.19 (7.0)  |                          | 2.4.8.3               |
|  |  | 1.60 (9.0)  |                          | 2.4.8.3               |
| Flexural Strength                                      | A. Length direction<br>B. Cross direction  | 93.7<br>78.2  | ksi                      | 2.4.4B                |
| Tensile Strength                                       | A. Length direction<br>B. Cross direction  | 63.0<br>47.7  | ksi                      | ASTM D3039            |
| Young's Modulus  | A. Length direction<br>B. Cross direction  | 3684<br>3116  | ksi                      | ASTM D790-15e2        |
| Poisson's Ratio  | A. Length direction<br>B. Cross direction  | 0.191<br>0.154                                      | —                        | ASTM D3039            |
| Moisture Absorption                                    |  | 0.2   | %                        | 2.6.2.1A              |
| Flammability (Laminate & laminated prepreg)            |  | V-0   | Rating                   | UL 94                 |
| Max Operating Temperature                              |  | 130   | °C                       | UL 796                |

The data, while believed to be accurate and based on analytical methods considered to be reliable, is for information purposes only. Any sales of these products will be governed by the terms and conditions of the agreement under which they are sold.

<https://www.isola-group.com/products/all-printed-circuit-materials/fr406/>

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## NOTE

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Revision B: Corrected units for Flexural and Tensile Strength