



FR402

Tetrafunctional Epoxy Laminate and Prepreg

FR402 consists of a modified tetrafunctional epoxy resin system engineered for multilayer applications that require performance characteristics exceeding those of difunctional epoxies.

The formulation of FR402 is designed to enhance throughput and accuracy of laser based Automated Optical Inspection (AOI) equipment. FR402 offers superior resistance to chemical and thermal degradation.

Product Attributes

Legacy Materials

ORDERING INFORMATION:

Contact your local sales representative or contact info@isola-group.com for further information.

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Data Sheet

Tg 140°C

Td 320°C

Dk 4.25

Df 0.015

IPC-4101 - / 21

UL - File Number E41625

Last Updated June 22, 2020
Revision No: C

Product Features

- Industry Recognition
 - UL File Number: E41625
 - RoHS Compliant
- Processing Advantages
 - FR-4 process compatible
 - UV blocking and AOI fluorescence

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

Property	Typical Value	Units	Test Method
		Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC	140	°C	2.4.25C
Decomposition Temperature (Td) by TGA @ 5% weight loss	315	°C	2.4.24.6
Time to Delaminate by TMA (Copper removed)	A. T260 B. T288	30 >5	Minutes 2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	50 250 4.2	ppm/°C ppm/°C % 2.4.24C
X/Y-Axis CTE	Pre-Tg	15	ppm/°C 2.4.24C
Thermal Conductivity	.36	W/mK	ASTM E1952
Thermal Stress 10 sec @ 288°C (550.4°F)	A. Unetched B. Etched	Pass	Pass Visual 2.4.13.1
Dk, Permittivity	A. @ 100 MHz B. @ 500 MHz C. @ 1 GHz	4.60 4.27 4.25	— 2.5.5.3 2.5.5.9 2.5.5.5
Df, Loss Tangent	A. @ 100 MHz B. @ 500 MHz	0.016 0.015	— 2.5.5.3 2.5.5.9
Dk, Permittivity	@ 1 GHz	0.015	— 2.5.5.5
Volume Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	4.0 x 10 ⁸ — 7.0 x 10 ⁷	MΩ-cm 2.5.17.1
Surface Resistivity	A. C-96/35/90 B. After moisture resistance C. At elevated temperature	3.0 x 10 ⁶ — 6.0 x 10 ⁶	MΩ 2.5.17.1
Dielectric Breakdown	>50	kV	2.5.6B
Arc Resistance	120	Seconds	2.5.1B
Electric Strength (Laminate & laminated prepreg)	29 (1100)	kV/mm (V/mil)	2.5.6.2A
Comparative Tracking Index (CTI)	3 (175-249)	Class (Volts)	UL 746A ASTM D3638
Peel Strength	A. Low profile copper foil and very low profile copper foil all copper foil >17 μm [0.669 mil] B. Standard profile copper 1. After thermal stress 2. At 125°C (257°F) 3. After process solutions	1.05 (8.0) 1.45 (9.0) 1.25 (8.0) 1.45 (9.0)	N/mm (lb/inch) 2.4.8C 2.4.8.2A 2.4.8.3 2.4.8.3
Flexural Strength	A. Length direction B. Cross direction	92.0 62.3	ksi 2.4.4B
Tensile Strength	A. Length direction B. Cross direction	60.0 43.2	ksi ASTM D3039
Young's Modulus	A. Length direction B. Cross direction	3500 3000	ksi ASTM D790-15e2
Moisture Absorption	0.3	%	2.6.2.1A
Flammability (Laminate & laminated prepreg)	V-0	Rating	UL 94
Relative Thermal Index (RTI)	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/fr402/>

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NOTE

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Revisions:

A: Initial release - 4/17

B: Corrected units for Flexural and Tensile Strength - 8/18

C: Change MOT to RTI 5/19