



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.

www.isola-group.com/products/FR402

ORDERING INFORMATION:

Contact your local sales representative or visit www.isola-group.com for further information.

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High Performance

FR402 Data Sheet

Tg 140, Td 320
Dk 4.25, Df 0.015
/21

Features

- High Thermal Performance
 - ▶ Tg – 140°C (DSC)
 - ▶ Td – 320°C (TGA @ 5% wt loss)
 - ▶ Superior performance through multiple thermal excursions
 - ▶ Resistance to measling
 - ▶ Extended capabilities
- T260: 30 minutes
- T288: >5 minutes
- RoHS Compliant
- UV Blocking and AOI Compatible
 - ▶ Increased throughput and accuracy
 - ▶ Compatible with all AOI equipment
- Standard FR-4 Processing
- Standard Availability
 - ▶ Thickness: 0.002" (.05 mm) to 0.125" (3.2 mm)
 - ▶ Available in full size sheet or panel form
- Prepreg Standard Availability
 - ▶ Roll or panel form
 - ▶ Tooling of prepreg panels available
- Copper Foil Type Availability
 - ▶ Standard HTE Grade 3
 - ▶ RTF (Reverse Treat Foil)
- Copper Weights
 - ▶ ½, 1 and 2 oz (18, 38 and 70 µm) available
 - ▶ Heavier copper available upon request
 - ▶ Thinner copper foil available upon request
- Glass Fabric Availability
 - ▶ Standard E-glass
 - ▶ Square weave glass fabric available
- Industry Approvals
 - ▶ IPC-4101C /21
 - ▶ UL – File Number E41625

FR402 Specifications

Property		Typical Values			
		Typical Value	Specification	Units	Test Method
				Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC		140	170-200	°C	2.4.25
Decomposition Temperature (Td) by TGA @ 5% weight loss		320	170-200	°C	ASTM D3850
T260		30	–	Minutes	2.4.25
T288		>5	–	Minutes	2.4.25
CTE, Z-axis	A. Pre-Tg	50	AABUS	ppm/°C	2.4.24
	B. Post-Tg	250	–		
CTE, X-, Y-axes	A. Pre-Tg	15	AABUS	ppm/°C	2.4.24
	B. Post-Tg	17	–		
Z-axis Expansion (50-260°C)		4.2	–	%	2.4.24
Thermal Conductivity		0.36	–	W/mK	ASTM D5930
Thermal Stress 10 sec @ 288°C (550.4°F)	A. Unetched	Pass	Pass Visual	Rating	2.4.13.1
	B. Etched				
Dk, Permittivity (Laminate & prepreg as laminated) Tested at 50% resin	A. @ 1 MHz (Fluid cell)	4.60	5.4	–	2.5.5.3
	B. @ 500 MHz (HP4291)	4.27			2.5.5.9
	C. @ 1 GHz (HP4291)	4.25			2.5.5.5
Df, Loss Tangent (Laminate & prepreg as laminated) Tested at 50% resin	A. @ 1 MHz (Fluid cell)	0.016	0.035	–	2.5.5.3
	B. @ 500 MHz (HP4291)	0.015			2.5.5.9
	C. @ 1 GHz (HP4291)	0.015			2.5.5.5
Volume Resistivity	A. 96/35/90	4.0x10 ⁸	1.0x10 ⁴	MΩ-cm	2.5.17.1
	B. After moisture resistance	–	–		
	C. At elevated temperature	7.0x10 ⁷	1.0x10 ³		
Surface Resistivity	A. 96/35/90	3.0x10 ⁶	1.0x10 ⁴	MΩ	2.5.17.1
	B. After moisture resistance	–	–		
	C. At elevated temperature	6.0x10 ⁶	1.0x10 ⁶		
Dielectric Breakdown		>50	–	kV	2.5.6
Arc Resistance		120	60	Seconds	2.5.1
Electric Strength (Laminate & prepreg as laminated)		29 (1100)	48 (736)	kV/mm (V/mil)	2.5.6.2
Comparative Tracking Index (CTI)		3 (175-249)	–	Class (Volts)	UL-746A ASTM D3638
Peel Strength	A. Low profile copper foil and very low profile – all copper weights >17 microns	1.05 (8.0)	0.70 (4.0)	N/mm (lb/inch)	2.4.8
	B. Standard profile copper	–	–		2.4.8.2
	1. After thermal stress	1.45 (9.0)	1.05 (6.0)		2.4.8.3
	2. At 125°C (257°F)	1.25 (8.0)	0.70 (4.0)		–
	3. After process solutions	1.45 (9.0)	0.80 (4.5)	–	
Flexural Strength	A. Lengthwise direction	92,000	–	lb/inch ²	2.4.4
	B. Crosswise direction	62,300			
Tensile Strength	A. Lengthwise direction	60,000	–	lb/inch ²	–
	B. Crosswise direction	43,150			
Moisture Absorption		0.3	0.8	%	2.6.2.1
Flammability (Laminate & prepreg as laminated)		V-0	V-0	Rating	UL 94
Max Operating Temperature		130	UL Cert	°C	–

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.

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