



Tetrafunctional Epoxy Laminate and Prepreg

Isola Laminate Systems' 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.

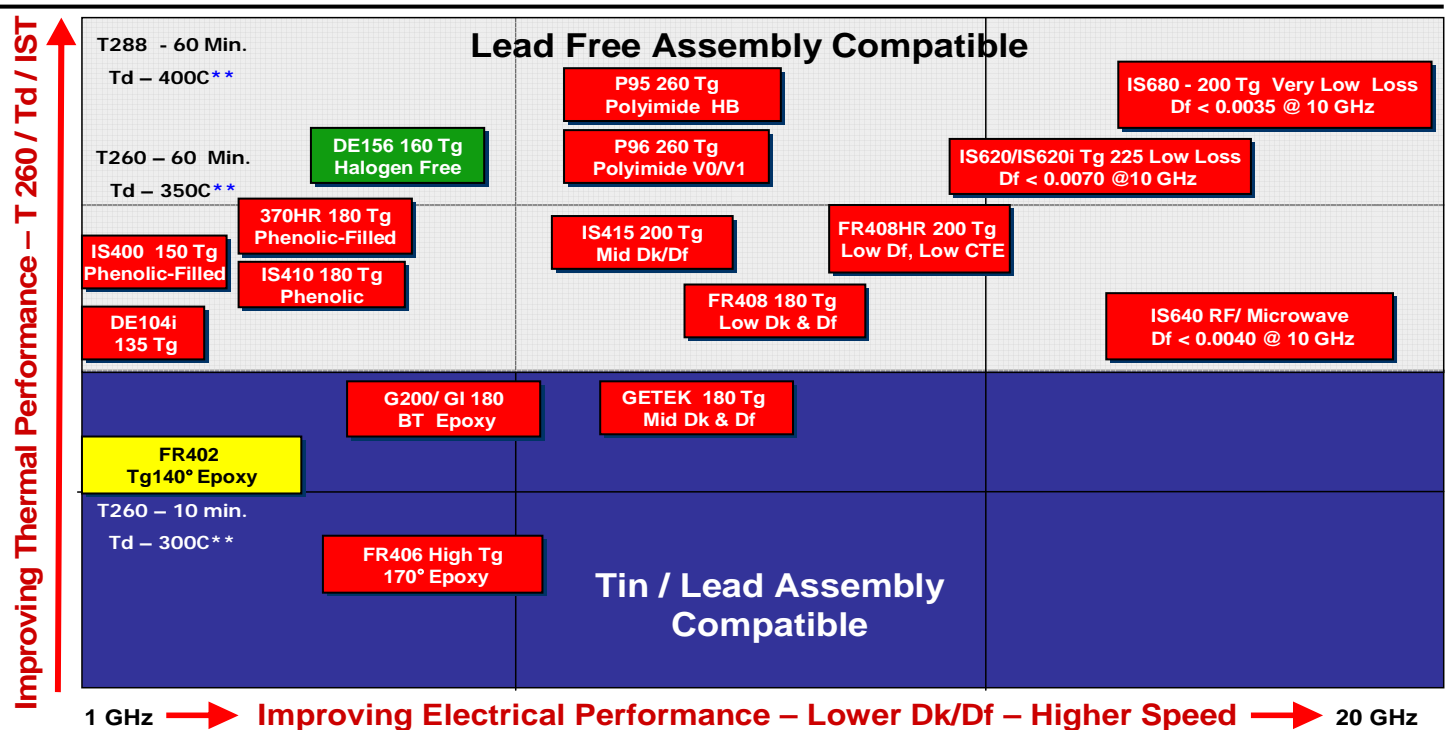
Industry Approvals

- IPC-4101C /21
- UL Recognized – FR-4, File Number E41625
(Part of Isola's FR-4 Family)

- High Tg — 140 °C**
Superior performance through multiple thermal Excursions Resistance to measing Extended capabilities
- UV Blocking and AOI Compatible**
Increased throughput and accuracy Compatible with all AOI equipment
- FR-4 System**
Processes as a standard FR-4
- Availability**
Thickness: 0.002" [.05 mm] to 0.125" [3.2 mm]
Available in sheet or panel form
Copper Foil Cladding: Grade 3 (HTE), 1/2, 1 and 2 oz.
Foil Options: Double treat, reverse treat
Prepregs: Available in roll or panel form
Glass Styles: available on standard styles



Isola - Product Position
Thermal Performance vs Signal Integrity



Speed is a function of design such as line length etc.

** Laminate Data - IST performance is a function of Hole diameter, board thickness, plating parameters and laminate attributes.

FR402 Typical Laminate Properties

		English			Metric			Test Method		
		Value	Specification	Units	Value	Specification	Units	IPC-TM-650 (or as noted)		
Glass Transition Temperature (Tg) by DSC, spec minimum		140	110-150	°C	140	110-150	°C	2.4.25		
Decomposition Temperature (Td) by TGA		@ 5% weight loss		320	—	°C	320	—	°C	ASTM D3850
T260		30		min	30		min			
T288		>5		min	>5		min	2.4.25		
CTE, Z-axis		Pre-Tg	50	AABUS	ppm/°C	50	AABUS	ppm/°C	2.4.24	
		Post-Tg	250	—	ppm/°C	250	—	ppm/°C		
CTE, X-, Y-axes		Pre-Tg	15	AABUS	ppm/°C	15	AABUS	ppm/°C	2.4.24	
		Post-Tg	17	—	ppm/°C	17	—	ppm/°C		
Z-Axis Expansion (50 – 260C) %		4.2	AABUS	%	4.2	AABUS	%	2.4.24		
Thermal Stress 10 Sec @ 288°C (550.4°F), spec minimum		Unetched	Pass	Pass Visual	Rating	Pass	Pass Visual	Rating	2.4.13.1	
		Etched	Pass	Pass Visual	Rating	Pass	Pass Visual	Rating		
Dk (Permittivity, Laminate & prepreg as laminated) 1 Mhz (Fluid cell) 500Mhz and 1Ghz (HP4291)		1 Mhz	4.60	5.4	—	4.60	5.4	—	2.5.5.3	
		500 Mhz	4.27	—	—	4.27	—	—	2.5.5.9	
		1 Ghz	4.25	—	—	4.25	—	—	2.5.5.5	
Df (Loss Tangent, Laminate & prepreg as laminated) 1 Mhz (Fluid cell) 500Mhz and 1Ghz (HP4291)		1 Mhz	0.016	0.035	—	0.016	0.035	—	2.5.5.3	
		500 Mhz	0.015	—	—	0.015	—	—	2.5.5.9	
		1 Ghz	0.015	—	—	0.015	—	—	2.5.5.5	
Volume Resistivity, spec minimum		96/35/90	4.0X10 ⁸	1X10 ⁴	M° -cm	4.0X10 ⁸	1X10 ⁴	M° -cm	2.5.17.1	
		After moisture resistance at elevated temperature	7.0X10 ⁷	1X10 ⁵	M° -cm	7.0X10 ⁷	1X10 ⁵	M° -cm		
Surface Resistivity, spec minimum		96/35/90	3.0X10 ⁶	1X10 ⁴	M°	3.0X10 ⁶	1X10 ⁴	M°	2.5.17.1	
		After moisture resistance At elevated temperature	6.0X10 ⁶	1X10 ⁶	M°	6.0X10 ⁶	1X10 ⁶	M°		
Thermal Conductivity		0.36	—	W/mK	0.36	—	W/mK	ASTM D5930		
Dielectric Breakdown, spec minimum		>50	40	kV	>50	40	kV	2.5.6		
Arc Resistance, spec minimum		120	60	Seconds	120	60	Seconds	2.5.1		
Electric Strength, spec minimum (Laminate & prepreg as laminated)		1100	736	V/mil	48000	29000	V/mm	2.5.6.2		
Peel Strength, spec minimum		profile – all copper weights >17 microns Standard profile copper -----1. After thermal stress 2. At 125°C (257°F) 3. After process solutions	8	4	(lb/inch)	105	70	N/mm	2.4.8	
										2.4.8.2
			9	6		145	105		2.4.8.3	
			8	4		125	70			
			9	4.5		145	80			
Moisture Absorption, spec maximum		0.3	0.8	%	0.3	0.8	%	2.6.2.1		
CTI			3	175-249	volts					
HWI			0							
HAI			3							
Max Operating Temp			130							
DSR			yes							

ORDERING INFORMATION:

Contact your local sales representative or the Customer Service Department in Chandler, AZ
 Isola Group 3100 W Ray Road, Chandler, AZ 85226
 Phone: 480-893-6527
 For further information visit www.isola-usa.com

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