



## Dielectric Solution for Improved Signal Performance

FR408 is a high-performance FR-4 epoxy laminate & prepreg systems designed for advanced circuitry applications. Its low dielectric constant and low dissipation factor make it an ideal candidate for broadband circuit designs requiring faster signal speeds or improved signal integrity. FR408 also brings the board reliability with its high Tg. FR408 is compatible with most FR-4 processes. This feature allows the use of FR408 without adding complexity to current fabrication techniques.

### Industry Approvals

- IPC-4101B /24 /121 /124
- UL Recognized – FR-4, File Number E41625
- Qualified to UL's MCIL Program

### High Thermal Performance

- Tg of 180 C (DSC)
- Td of 360 C (@ 5% weight loss)

### Improved Dielectric Properties

- Dk <3.65 2 – 10 GHz >42% resin content
- DF <0.013 2 – 10 GHz >42% resin content

### UV Blocking and AOI Fluorescence

- High throughput and accuracy during PCB fabrication and assembly

### Superior Processing

- Closest to conventional FR-4 processing of all high speed materials

### Standard Availability

- Thickness: 0.002" [.05 mm] to 0.093" [2.4 mm]
- Available in sheet or panel form

### Copper Foil Cladding: Grade 3 (HTE), 1/2, 1 and 2 oz.

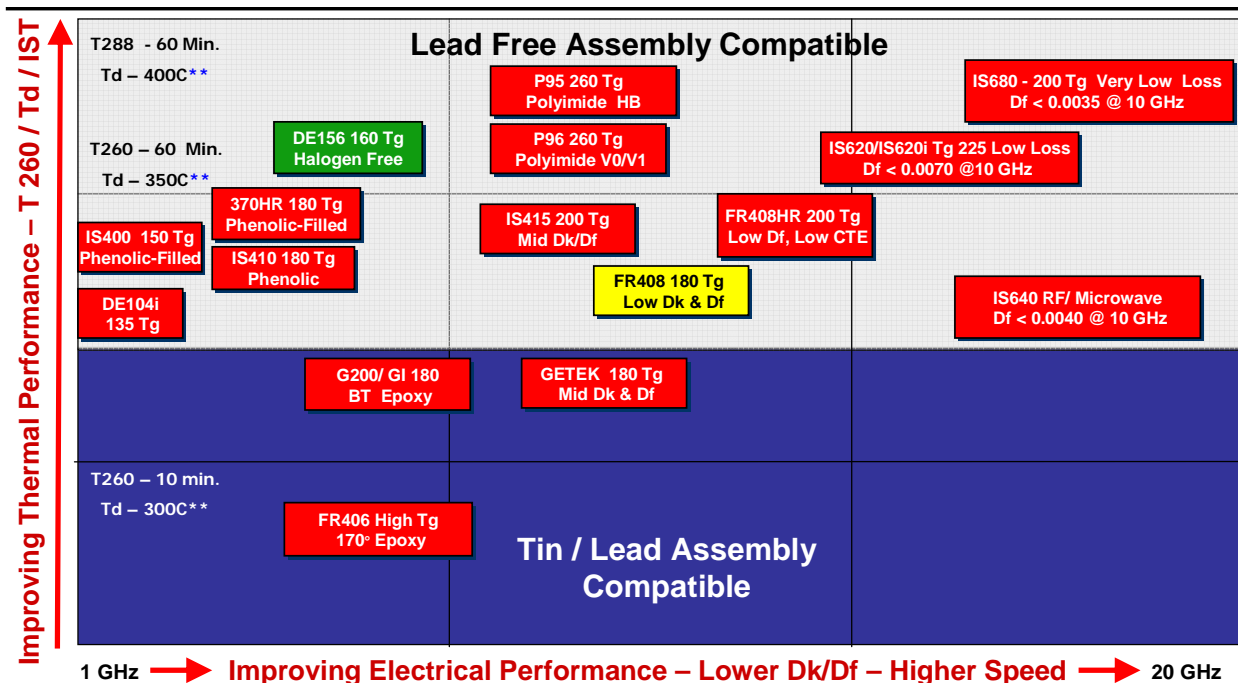
- Heavy foils available on request
- Foil Options: Reverse treat

### Prepregs: Available in roll or panel form

- Glass Styles: 106, 1080, 2113, 3070, 2116, 3313, 1652, 7628



## 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.

FR408					
Property	Typical Values				
	Typical Value	Specification	Units	Test Method	
			Metric (English)	IPC-TM-650 (or as noted)	
Glass Transition Temperature (Tg) by DSC, spec minimum	180	170-200	°C	2.4.25	
Decomposition Temperature (Td) @ 5% wt loss	360	—	°C	ASTM D3850	
CTE, Z-axis	A. Pre-Tg PCB (.059 laminate)	65 (<55)	AABUS	ppm/°C	2.4.24
	B. Post-Tg	220	—		
CTE, X-, Y-axes	A. Pre-Tg	13	AABUS	ppm/°C	2.4.24
	B. Post-Tg	14	—		
% Z-Axis Expansion (50-260C)	3.5	—	%	2.4.24	
Thermal Conductivity	0.4	—	W/mK	ASTM D5930	
Thermal Stress 10 Sec @ 288°C (550.4°F), spec min	A. Unetched	pass	Pass Visual	Rating	2.4.13.1
	B. Etched	pass	Pass Visual		
Permittivity, spec maximum (Laminate & prepreg as laminated)	A. @ 100 MHz HP4285A	3.81	5.4	—	2.5.5.3
	B. @ 1 GHz HP4291A	3.78	—		2.5.5.9
	C. @ 2 GHz Bereskin Stripline	3.77	—		2.5.5.5
	D. @ 5 GHz Bereskin Stripline	3.75	—		2.5.5.5
	E. @ 10 GHz Bereskin Stripline	3.75	—		2.5.5.5
Loss Tangent, spec maximum (Laminate & prepreg as laminated)	A. @ 100 MHz HP4285A	0.0092	0.035	—	2.5.5.3
	B. @ 1 GHz HP4291A	0.0112	—		2.5.5.9
	C. @ 2 GHz Bereskin Stripline	0.0116	—		2.5.5.5
	D. @ 5 GHz Bereskin Stripline	0.0122	—		2.5.5.5
	E. @ 10 GHz Bereskin Stripline	0.0120	—		2.5.5.5
Volume Resistivity, spec minimum	A. 96/35/90	—	1.0 x10 <sup>6</sup>	MΩ -cm	2.5.17.1
	B. After moisture resistance	4.6x10 <sup>7</sup>	—		
	C. At elevated temperature	2.8x10 <sup>8</sup>	1.0 x10 <sup>3</sup>		
Surface Resistivity, spec minimum	A. 96/35/90	—	1.0 x 10 <sup>4</sup>	MΩ	2.5.17.1
	B. After moisture resistance	2.81x10 <sup>6</sup>	—		
	C. At elevated temperature	2.64x10 <sup>8</sup>	1.0 x 10 <sup>3</sup>		
Dielectric Breakdown, spec minimum	>50	—	kV	2.5.6	
Arc Resistance, spec minimum	120	60	Seconds	2.5.1	
Electric Strength, spec minimum (Laminate & prepreg as laminated)	55	30	kV/mm	2.5.6.2	
	1400	750	(V/mil)		
Comparative Tracking Index (CTI)	3 (175 - 249)	-	Class (volts)	UL-746A ASTM D3638	
Peel Strength, Spec Minimum	A. Low profile copper foil and very low profile – all copper weights >17 microns	6.5(1.14)	4.0(0.70)	lb/inch(N/mm)	2.4.8
	B. Standard profile copper	—	—	lb/inch(N/mm)	2.4.8.2
	1. After thermal stress	7(1.225)	4.5(0.8)		2.4.8.3
	2. At 125°C (257°F)	6.5(1.14)	4.0(0.70)		
	3. After process solutions	5.1(0.9)	3.0(0.55)		
Flexular Strength, minimum	A. Lengthwise direction	79,000	—	lb/inch <sup>2</sup>	
	B. Crosswise direction	58,000	—		
Moisture Absorption, spec maximum	0.15	—	%	2.6.2.1	
Flammability (Laminate & prepreg as laminated), spec min	V0	—	Rating	UL-94	
HWI	2	—	—	—	
Max Operating Temperature	130 (150)	UL Cert (tested)	Deg C	—	
DSR	yes	—	—	—	
TensileStrength, minimum	A. Lengthwise direction	50,000	—	lb/inch <sup>2</sup>	
	B. Crosswise direction	37,000	—		
Poisson's Ratio	A. Lengthwise direction	0.16	—		
	B. Crosswise direction	0.13	—		
Youngs Modulus	A. Lengthwise direction	3.4	—		
	B. Crosswise direction	3.0	—		
Taylors Modulus	A. Lengthwise direction	3.7	—		
	B. Crosswise direction	3.0	—		

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.

#### ORDERING INFORMATION:

Contact your local sales representative or the Customer Service Department in Chandler, AZ  
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 For further information visit [www.isola-group.com](http://www.isola-group.com)

