

## FR408 High Performance Laminate and Prepreg

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

[www.isola-group.com/products/FR408](http://www.isola-group.com/products/FR408)

### 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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# FR408 Data Sheet

**Tg 180, Td 360  
Dk 3.67, Df 0.0120  
/24 /121 /124**

### Features

- High Thermal Performance
  - ▶ Tg: 180°C (DSC)
  - ▶ Td: 360°C (TGA @ 5% wt loss)
- T260: 60 minutes
- T288: 15 minutes
- RoHS Compliant
- 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
- Core Material Standard Availability
  - ▶ Thickness: 0.002" (0.05 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, 35 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-4101D WAM1 /24 /121 /124
  - ▶ UL - File Number E41625
  - ▶ Qualified to UL's MCIL Program

# FR408 Specifications

Property		Typical Values			
		Typical Value	Specification	Units	Test Method
				Metric (English)	IPC-TM-650 (or as noted)
<b>Glass Transition Temperature (Tg) by DSC</b>		180	170-200	°C	2.4.25
<b>Decomposition Temperature (Td) by TGA @ 5% weight loss</b>		360	–	°C	ASTM D3850
<b>T260</b>		60	–	Minutes	ASTM D3850
<b>T288</b>		15	–	Minutes	ASTM D3850
<b>CTE, Z-axis</b>	A. Pre-Tg	60	AABUS	ppm/°C	2.4.24
	B. Post-Tg	228	–		
<b>CTE, X-, Y-axes</b>	A. Pre-Tg	13	AABUS	ppm/°C	2.4.24
	B. Post-Tg	14	–		
<b>Z-axis Expansion (50-260°C)</b>		3.5	–	%	2.4.24
<b>Thermal Conductivity</b>		0.4	–	W/mK	ASTM D5930
<b>Thermal Stress 10 sec @ 288°C (550.4°F)</b>	A. Unetched	Pass	Pass Visual	Rating	2.4.13.1
	B. Etched				
<b>Dk, Permittivity (Laminate &amp; prepreg as laminated) Tested at 56% resin</b>	A. @ 100 MHz (HP4285A)	3.69	5.4	–	2.5.5.3
	B. @ 1 GHz (HP4291A)	3.66	–		2.5.5.9
	C. @ 2 GHz (Bereskin Stripline)	3.67	–		2.5.5.5
	D. @ 5 GHz (Bereskin Stripline)	3.66	–		2.5.5.5
	E. @ 10 GHz (Bereskin Stripline)	3.65	–		2.5.5.5
<b>Df, Loss Tangent (Laminate &amp; prepreg as laminated) Tested at 56% resin</b>	A. @ 100 MHz (HP4285A)	0.0094	0.035	–	2.5.5.3
	B. @ 1 GHz (HP4291A)	0.0117	–		2.5.5.9
	C. @ 2 GHz (Bereskin Stripline)	0.0120	–		2.5.5.5
	D. @ 5 GHz (Bereskin Stripline)	0.0127	–		2.5.5.5
	E. @ 10 GHz (Bereskin Stripline)	0.0125	–		2.5.5.5
<b>Volume Resistivity</b>	A. 96/35/90	–	1.0x10 <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>	1.0x10 <sup>3</sup>		
<b>Surface Resistivity</b>	A. 96/35/90	–	1.0x10 <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>	1.0x10 <sup>3</sup>		
<b>Dielectric Breakdown</b>		>50	–	kV	2.5.6
<b>Arc Resistance</b>		120	60	Seconds	2.5.1
<b>Electric Strength (Laminate &amp; prepreg as laminated)</b>		55 (1400)	30 (750)	kV/mm (V/mil)	2.5.6.2
<b>Comparative Tracking Index (CTI)</b>		3 (175-249)	–	Class (Volts)	UL-746A ASTM D3638
<b>Peel Strength</b>	A. Low profile copper foil and very low profile – all copper weights >17 microns	1.14 (6.5)	0.70 (4.0)	N/mm (lb/inch)	2.4.8
	B. Standard profile copper	–	–		2.4.8.2
	1. After thermal stress	1.225 (7.0)	0.80 (4.5)		2.4.8.3
	2. At 125°C (257°F)	1.14 (6.5)	0.70 (4.0)		–
	3. After process solutions	0.90 (5.1)	0.55 (3.0)	–	–
<b>Flexural Strength</b>	A. Lengthwise direction	81,400	–	lb/inch <sup>2</sup>	2.4.4
	B. Crosswise direction	64,100			
<b>Tensile Strength</b>	A. Lengthwise direction	59,260	–	lb/inch <sup>2</sup>	–
	B. Crosswise direction	42,040			
<b>Young's Modulus</b>	A. Grain direction	3685	–	ksi	ww
	B. Fill direction	3044			
<b>Poisson's Ratio</b>	A. Grain direction	0.162	–	–	xx
	B. Fill direction	0.138			
<b>Moisture Absorption</b>		0.15	–	%	2.6.2.1
<b>Flammability (Laminate &amp; prepreg as laminated)</b>		V-0	–	Rating	UL 94
<b>Max Operating Temperature</b>		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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