



FR408HR

High Performance Laminate and Prepreg

FR408HR is a proprietary high-performance 230°C (DMA) glass transition temperature (Tg) FR-4 system for multilayer Printed Wiring Board (PWB) applications where maximum thermal performance and reliability are required.

FR408HR laminate and prepreg products are manufactured with Isola's patented high performance multifunctional resin system, reinforced with electrical grade (E-glass) glass fabric. This system delivers a 30% improvement in Z-axis expansion and offers 25% more electrical bandwidth (lower loss) than competitive products in this space. These properties coupled with superior moisture resistance at reflow, result in a product that bridges the gap from both a thermal and electrical perspective.

The FR408HR system is also laser fluorescing and UV blocking for maximum compatibility with Automated Optical Inspection (AOI) systems, optical positioning systems and photo-imagable solder mask imaging.

Product Attributes

High Thermal Reliability , High Speed Digital , High Density Interconnect

Typical Market Applications

Aerospace & Defense , Computing, Storage & Peripherals , Networking & Communication Systems , Medical, Industrial & Instrumentation

ORDERING INFORMATION:

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High Thermal Reliability

Data Sheet

Tg 190°C

Td 360°C

Dk 3.68

Df 0.0092

IPC-4101 - / 98 / 99 / 101 / 126

UL - File Number E41625

Last Updated September 18, 2020
Revision No: C

Product Features

- Industry Recognition
 - UL File Number: E41625
 - RoHS Compliant
- Performance Attributes
 - CAF resistant
 - Lead-free assembly compatible
 - 0.8 mm pitch capable
 - 6x 260°C reflow capable
 - 6x 288°C solder float capable
- Processing Advantages
 - UV blocking and AOI fluorescence
 - Via filling capability
 - Multiple lamination cycles

Product Availability

- Standard Material Offering: Laminate
 - Available in full size sheet or panel form
- Copper Foil Type
 - HTE Grade 3
 - VLP-2 (2 micron), 1 oz and below
 - 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
 - Mechanically spread glass

FR408HR Typical Values

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Property	Typical Value	Units	Test Method
		Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC	190	°C	2.4.25C
Decomposition Temperature (Td) by TGA @ 5% weight loss	360	°C	2.4.24.6
Time to Delaminate by TMA (Copper removed)	A. T260 B. T288	60 >30	Minutes 2.4.24.1
Z-Axis CTE	A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)	55 230 2.8	ppm/°C ppm/°C % 2.4.24C
X/Y-Axis CTE	Pre-Tg	16	ppm/°C 2.4.24C
Thermal Conductivity		0.4	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. @ 1 GHz C. @ 2 GHz D. @ 5 GHz E. @ 10 GHz	3.72 3.69 3.68 3.64 3.65	— 2.5.5.3 2.5.5.9 Bereskin Stripline Bereskin Stripline Bereskin Stripline
Df, Loss Tangent	A. @ 100 MHz B. @ 1 GHz C. @ 2 GHz D. @ 5 GHz E. @ 10 GHz	0.0072 0.0091 0.0092 0.0098 0.0095	— 2.5.5.3 2.5.5.9 Bereskin Stripline Bereskin Stripline Bereskin Stripline
Volume Resistivity	A. After moisture resistance B. At elevated temperature	4.4 x 10 ⁷ 9.4 x 10 ⁷	MΩ-cm 2.5.17.1
Surface Resistivity	A. After moisture resistance B. At elevated temperature	2.6 x 10 ⁶ 2.1 x 10 ⁸	MΩ 2.5.17.1
Dielectric Breakdown		>50	kV 2.5.6B
Arc Resistance		137	Seconds 2.5.1B
Electric Strength (Laminate & laminated prepreg)		70 (1741)	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. After process solutions	1.14 (6.5) 0.96 (5.5) 0.90 (5.1)	N/mm (lb/inch) 2.4.8C 2.4.8.2A 2.4.8.3
Flexural Strength	A. Length direction B. Cross direction	72.5 58.0	ksi 2.4.4B
Tensile Strength	A. Length direction B. Cross direction	54.5 38.7	ksi ASTM D3039
Young's Modulus	A. Length direction B. Cross direction	3695 3315	ksi ASTM D790-15e2
Poisson's Ratio	A. Length direction B. Cross direction	0.137 0.133	— ASTM D3039
Moisture Absorption		0.061	% 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/fr408hr/>

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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: Removed Low Dk glass option - 11/18

D: Change MOT to RTI 5/19