polyclad

Technical Data Sheet

PCL-FR-370 Laminate/PCL-FRP-370 Prepreg

High Tg FR-4 Laminate and Prepreg
(Tg 175°C)

GENERAL INFORMATION

PCL-FR-370 is the high performance 175°C glass transition temperature (Tg) FR-4 system of choice for high layer count multilayer printed wiring board (PWB) applications. PCL-FR-370 laminate and prepreg products are manufactured with a unique high performance epoxy and tetrafunctional resin combination, reinforced with electrical grade (E-glass) glass fabric. This combination provides improved thermal performance in comparison to traditional FR-4 while retaining FR-4 processability. In addition to the improved thermal performance, the mechanical, chemical and moisture resistance properties all equal or exceed the performance of traditional FR-4 materials. The FR-370 resin system is also laser fluorescing and UV blocking for maximum compatibility with automated optical inspection systems (AOI), optical positioning systems and photoimagable soldermask imaging.

LAMINATE AVAILABILITY

PCL-FR-370 laminate is available in standard thicknesses as described in the standard product availability bulletin, using a variety of glass style constructions, from .002 inches (.05 mm) to .125 inches (3.2 mm). Single ply laminate is available in thicknesses from .002 inches (.05 mm) to .008 inches (.20 mm) and multiple ply laminate is available from .004 inches (.10 mm) to .125 inches (3.2 mm). Copper claddings are available from ¼ ounce (9 micron) to 3 ounce (103 microns). Polyclad's patented DSTFoil® copper foil, traditional copper foil and double treat clad products are available. Other thicknesses and copper claddings can be custom made to meet specific performance requirements. FR-370 laser-drillable laminate is also available, for product availability information refer to Polyclad's LG (laser-drillable glass) Product Availability Bulletin.

PREPREG AVAILABILITY

PCL-FRP-370 prepreg is available in a variety of standard E-glass styles as described in the standard product availability bulletin. PCL-FRP-370 prepreg is also available in glass styles compatible with laser drilling, for product availability information refer to Polyclad's LG (laser-drillable glass) Product Availability Bulletin. Other non-standard glass styles may be available to meet specific needs. When fully cured, FR-370 prepreg has the same performance attributes as FR-370 laminate. Standard flow and fill performance parameters designed to meet typical process and application requirements are available. Special performance and no/low flow variations can be custom made for specific applications.

PROCESSING AND STORAGE

FR-370 laminate and prepreg are compatible with standard FR-4 process techniques. General process recommendation technical bulletins are available from Polyclad. For specific processing guidelines please contact Polyclad Technical Services.

Storage of FR-370 laminate and prepreg is the same as FR-4 material. Prepreg should be stored at 68±3° F (18±2°C) and 30-50% relative humidity. Prepreg stored below recommended temperatures should be allowed to equilibrate to the above specified conditions for a minimum of eight hours prior to use. More detailed storage recommendation technical bulletins are available from Polyclad.

APPLICABLE SPECIFICATIONS AND RECOGNITIONS

Polyclad's UL file number is E45456. PCL-FR-370 laminate is UL listed under the generic designation PCL-FR- (a)(a)## and PCL-FRP-370 prepreg is listed under the generic designation PCL-FRP- (a)(a)##. FR-370 laminate and prepreg and PWBs constructed from them are all capable of achieving a UL 94-V0 flammability rating and the highest UL maximum continuous operating temperature for FR-4 grades of 130°C, and are interchangeable from a UL listing standpoint with all Polyclad FR-4 grades. Certain other more specific parts of Polyclad's UL listing may be applicable in specific cases. FR-370 laminate and prepreg can be certified to IPC-4101A, Specification for Base Materials for Rigid and Multilayer Printed Boards, Specification Sheets IPC-4101A/21, /24, and /26. Other industry or customer specific specifications, recognitions or designations may be applicable or certifiable to in certain cases. If you need additional information or have questions, please contact Polyclad Technical Services.

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POLYCLAD LAMINATE/PREPREG GRADE - PCL-FR-370/PCL-FRP-370

IPC-4101A SPECIFICATION SHEET(S) /21, /24, and /26

LAMINATE

Property		Typical Values/IPC-4101/24 Specification				Units	Test Method
		Thickness <0.50 mm (< 0.0197 in) 50% RC		Thickness ≥0.50 mm (≥ 0.0197 in) 40% RC			
		Typical Value	Specification	Typical Value	Specification	Metric (English)	IPC-TM-650 (or as noted)
Glass Transition Temperature (Tg) by DSC, spec minimum		175	150 - 200	175	150 - 200	°C	2.4.25
Decomposition Temperature (Td)		310	—	310	—	°C	ASTM D3850
CTE, Z-axis	A. Pre-Tg B. Post-Tg	— —	AABUS —	50 250	AABUS —	ppm/°C	2.4.24
CTE, X-, Y-axes	A. Pre-Tg B. Post-Tg	— —	AABUS —	15 17	AABUS —	ppm/°C	2.4.24
% Z-Axis Expansion (50 – 260C)				3.5	AABUS	%	2.4.24
Thermal Conductivity		—	—	0.36	—	W/mK	ASTM D5930
Thermal Stress 10 Sec @ 288°C (550.4°F), spec minimum	A. Unetched B. Etched	Pass Pass	Pass Visual Pass Visual	Pass Pass	Pass Visual Pass Visual	Rating	2.4.13.1
Permittivity, spec maximum (Laminate & prepreg as laminated)	A. @ 1 MHz B. @ 100 MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	4.60 4.50 4.40 4.35 4.30	5.40 — — — —	4.80 4.70 4.60 4.50 4.45	5.40 — — — —	—	2.5.5.3 2.5.5.9 2.5.5.5
Loss Tangent, spec maximum (Laminate & prepreg as laminated)	A. @ 1 MHz B. @ 100 MHz C. @ 1 GHz D. @ 2 GHz E. @ 5 GHz	0.0150 0.0155 0.0160 0.0170 0.0190	0.0350 — — — —	0.0145 0.0150 0.0155 0.0165 0.0180	0.0350 — — — —	—	2.5.5.3 2.5.5.9 2.5.5.5
Volume Resistivity, spec minimum	A. 96/35/90 B. After moisture resistance C. At elevated temperature	$3.0x10^7$ — $7.0x10^8$	10^6 — 10^3	— $3.0x10^7$ $7.0x10^8$	— 10^4 10^3	MΩ -cm	2.5.17.1
Surface Resistivity, spec minimum	A. 96/35/90 B. After moisture resistance C. At elevated temperature	$3.0x10^6$ — $2.0x10^9$	10^4 — 10^3	— $3.0x10^6$ $2.0x10^9$	— 10^4 10^3	MΩ	2.5.17.1
Dielectric Breakdown, spec minimum		—	—	60	40	kV	2.5.6
Arc Resistance, spec minimum		125	60	125	60	Seconds	2.5.1
Electric Strength, spec minimum (Laminate & prepreg as laminated)		52 (1300)	30 (750)	—	—	kV/mm (V/mil)	2.5.6.2
Comparative Tracking Index (CTI)		—	—	240 (CL=3)	—	Volts	UL-746A ASTM D3638
Peel Strength, spec minimum	A. Low profile copper foil and very low profile – all copper weights >17 microns B. Standard profile copper 1. After thermal stress 2. At 125°C (257°F) 3. After process solutions	105 (1.05) (6.0) 125 (1.25) (7.0) 125 (1.25) (7.0) 125 (1.25) (7.0)	70 (0.70) (4.0) 80 (0.80) (4.5) 70 (0.70) (4.0) 55 (0.55) (3.0)	105 (1.05) (6.0) 125 (1.25) (7.0) 125 (1.25) (7.0) 125 (1.25) (7.0)	70 (0.70) (4.0) 105 (1.05) (6.0) 70 (0.70) (4.0) 80 (0.80) (4.5)	N/mm (kg/M) (lb/inch)	2.4.8 2.4.8.2 2.4.8.3
Flexural Strength, minimum	A. Lengthwise direction B. Crosswise direction	— —	— —	518 (75,100) 415 (60,190)	415 (60,190) 345 (50,040)	Mpa (lb/inch ^{2})	2.4.4
Moisture Absorption, spec maximum		0.30	—	0.20	0.80	%	2.6.2.1
Flammability (Laminate & prepreg as laminated), spec minimum		V-0	V-1	V-0	V-1	Rating	UL-94

PREPREG

Property	Typical Value	IPC-4101 Specification	Unit	Test Method
Volatile Content Spec maximum	0.25	1.5	%	2.3.19
Shelf life, spec minimum (Condition 1 / Condition 2)	Meets requirements	180/90	Days	IPC-TM-650

Information contained in this data sheet represents typical or average values and does not constitute any warranty or guarantee.

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