PCL-FR-370/PCL-FRP-370

High Tg FR-4 Laminates and Prepregs
(Tg 175°C)

GENERAL INFORMATION

PCL-FR-370 laminates and PCL-FRP-370 prepregs are the high performance 175°C glass transition temperature (Tg) FR-4 system of choice for demanding multilayer printed wiring boards (PWB) applications. 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 this superior thermal performance, the mechanical, chemical and moisture resistance properties all equal or exceed the performance of traditional FR-4 materials. The 370 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 AVAILABLITY

PCL-FR-370 laminates are available in standard thicknesses, using a variety of glass style constructions, from .002 inches (.05 mm) to .125 inches (3.2 mm). Single ply laminates are available in thicknesses from .002 inches (.05 mm) to .008 inches (.20 mm) and multiple ply laminates are available from .004 inches (.10 mm) to .125 inches (3.2 mm). Standard copper claddings are available from 3/8 ounce (12 micron) to 3 ounce (103 microns). Polyclad's patented DSTFoil® copper foil cladding is standard but traditional copper foil and double treat clad products are available. Other thicknesses and copper claddings can be custom made to meet specific performance requirements.

PREPREG AVAILABILITY

PCL-FRP-370 prepregs are available in E-glass styles 106, 1080, 2313, 3313, 2116, 2165, 2157 and 7628. Other glass styles may be available to meet specific needs. When fully cured 370 prepreg has the same performance attributes as 370 laminate. Standard flow and fill performance parameters designed to meet typical process and application requirements are available in all the above glass styles. Special performance and no/low flow variations can be custom made for some glass styles for specific applications.

PROCESSING AND STORAGE

370 laminates and prepregs are compatible with and perform excellent using 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 226 laminates and prepregs is the same as for all FR-4 materials. Prepregs should be stored at 70±4° F (21±2°C) and 30-50% relative humidity. Prepregs stored below recommended temperatures should be allowed to equilibrate to the above specified conditions for 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). 370 laminates and prepregs 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. 370 Laminates and prepregs can be certified to IPC-4101, Specification for Base Materials for Rigid and Multilayer Printed Boards, Specification Sheets IPC-4101/21 and /24. 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.

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

IPC-4101 SPECIFICATION SHEET DESIGNATION(S) /21, /24, (/26 may require additional testing)

LAMINATE

Property		Typical Values/IPC-4101/24 Specification				Units	Test Method
		<.031 in (thickness <.78mm)		≥.031 in (thickness > .78mm)			
		Typical Value	IPC-4101 /24 Spec	Typical Value	IPC-4101 /24 Spec	English (metric)	IPC-TM-650 (or as noted)
Tg by DSC		175	150 min	175	150 min	(^{o}C)	2.4.25
Decomposition Temperature		310	—	310	—	(^{o}C)	ASTMD3850
Z CTE	A. Pre-Tg B. Post-Tg	— —	— —	50 250	— —	(PPM/^{o}C)	2.4.24
X, Y, CTE	A. Pre-Tg B. Post-Tg	— —	— —	15 17	— —	(PPM/^{o}C)	2.4.24
Thermal Conductivity		—	—	0.36	—	W/MK	ASTMD5930
Thermal Stress 20 Sec @288°C, spec minimum	A. Unetched B. Etched	Pass Pass	Pass Visual Pass Visual	Pass Pass	Pass Visual Pass Visual	Pass/Fail	2.4.13.1
Permittivity, spec maximum	A. @ 1MHz B. @100MHz C. @1GHz	4.6 4.5 4.3	5.4 — —	4.8 4.6 4.5	5.4 — —	—	2.5.5.9
Loss Tangent, spec maximum	A. @ 1MHz B. @100MHz C. @1GHz	0.015 0.015 0.015	0.035 — —	0.015 0.015 0.015	0.035 — —	—	2.5.5.9
Volume Resistivity, spec minimum	A. C-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^{6} 10^{3}	(MEGOHM-CM)	2.5.17.1
Surface Resistivity, spec minimum	A. C-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}	(MEGOHM)	2.5.17.1
Dielectric Breakdown, spec minimum		—	—	60	40	(KV)	2.5.6
Arc Resistance, spec minimum		125	60	125	60	Sec.	2.5.1
Electric Strength, spec minimum (Laminate or prepreg as laminated)		1300 ($5.1x10^{4}$)	750 ($2.9x10^{4}$)	—	—	VOLT/MIL (VOLT/MM)	2.5.6.2
CTI		—	—	205 (CL=3)	175-250	VOLTS	UL-746A ASTMD3638
Peel Strength, spec minimum	A. Low profile copper foil and very low profile – all copper weights >17 microns B. Standard profile copper foil 1. After thermal stress 2. At 125°C 3. After process solutions	6.0(105) 7.0(125) 7.0(125) 7.0(125)	4.0(70) 4.5(80) 4.0(70) 3.0(55)	6.0(105) 7.0(125) 7.0(125) 7.0(125)	4.0(70) 6.0(105) 4.0(70) 4.5(80)	Lbs/inch (Kg/M)	2.4.8
Flexural Strength, spec minimum	A. Length direction B. Cross direction	— —	— —	$7.5X10^{4}$ ($5.3X10^{7}$) $6.0X10^{4}$ ($4.2X10^{7}$)	$6.0X10^{4}$ ($4.2X10^{7}$) $5.0X10^{4}$ ($3.5X10^{7}$)	PSI (Kg/M^{2})	2.4.4
Young's Modulus by DMA		18.0	—	23.0	—	(GPA)	2.4.24.4
Poisons Ratio (X,Y)		—	—	0.16/0.18	—	—	ASTM
Moisture Absorption, spec maximum		0.30	0.80	0.20	0.35	%	2.6.2.1
Flammability		V0	V0	V0	V0	—	UL-94

PREPREG

Property	Typical Value	IPC-4101 Specification	Unit	Test Method
Volatile Content Spec maximum	0.25	0.75	%	2.3.19
Shelf life at 50% RH Maximum, 70°F (20°C) Maximum	Meets requirement	90 days (from date of delivery)	Days	—