

DuPont™ Pyralux® LF

Acrylic-Based Copper-Clad Laminate

Flexible Circuit Materials

Product Description

DuPont™ Pyralux® LF Copper-Clad Laminates feature DuPont™ Kapton® polyimide film bonded to copper foil, on one or both sides, with a proprietary C-staged modified acrylic adhesive. These copper-clad laminates are recommended for use to produce high reliability, high density circuitry in flexible, rigid-flex, and all-flexible multilayer constructions. All copper-clad laminates are available with rolled-annealed (RA) or electro-deposited (ED) copper foil. Double-treated copper foil (nodules of electro-deposited copper on both sides of the copper foil) is also available to eliminate surface preparation steps prior to resist or overlay lamination.

Key Features and Benefits

- Excellent bond strength affords high reliability
- High thermal resistance to facilitate processing
- Able to withstand multiple lamination cycles
- Balanced and unbalanced constructions available
- Certified to IPC-4204/1
- RoHS Compliant

Packaging

Pyralux® LF Copper-Clad Laminate is supplied in sheet form, with standard dimensions of 24 x 36 in (610 x 914 mm), 24 x 18 in (610 x 457 mm), and 12 x 18 in (305 x 457 mm). There is a minimum of four sheets and a maximum of 25 sheets per pack.

Processing

Lamination conditions for DuPont™ Pyralux® LF flexible circuit materials are typically in the following ranges:

Part Temperature:182 - 199 °C (360 - 390 °F)
 Pressure:14 - 28 kg/cm² (200 - 400 psi)
 Time:.....1 - 2 hours, at temperature

Pyralux® LF Copper-Clad Laminate processing guide available from your DuPont sales representative.

Table 1 - Standard Pyralux® LF Single-Side Clad Offerings

Product Code*	Copper Thickness µm (oz/ft ²)	Adhesive Thickness µm (mil)	Kapton® Thickness µm (mil)
LF7012R	18 (0.5)	13 (0.5)	13 (0.5)
LF7062R	18 (0.5)	13 (0.5)	25 (1.0)
LF7004R	18 (0.5)	25 (1.0)	13 (0.5)
LF7002R	35 (1.0)	13 (0.5)	13 (0.5)
LF9110R	35 (1.0)	25 (1.0)	25 (1.0)
LF9120R	35 (1.0)	25 (1.0)	51 (2.0)
LF9150R	35 (1.0)	25 (1.0)	127 (5.0)
LF9210R	70 (2.0)	25 (1.0)	25 (1.0)
LF9220R	70 (2.0)	25 (1.0)	51 (2.0)

Table 2 - Standard Pyralux® LF Double-Side Clad Offerings

Product Code*	Copper Thickness µm (oz/ft ²)	Adhesive Thickness µm (mil)	Kapton® Thickness µm (mil)
LF7022R	18 (0.5)	13 (0.5)	13 (0.5)
LF7014R	18 (0.5)	13 (0.5)	25 (1.0)
LF7010R	35 (1.0)	13 (0.5)	25 (1.0)
LF9111R	35 (1.0)	25 (1.0)	25 (1.0)
LF9121R	35 (1.0)	25 (1.0)	51 (2.0)
LF9151R	35 (1.0)	25 (1.0)	127 (5.0)
LF9212R	70 (2.0)	25 (1.0)	25 (1.0)
LF9222R	70 (2.0)	25 (1.0)	51 (2.0)
LF7090R	70 (2.0)	51 (2.0)	51 (2.0)

*At the end of the product code, "R" designates rolled-annealed copper (e.g., LF9210R), "E" designates electro-deposited copper (e.g., LF9210E), and "D" designates double-treated rolled-annealed copper (e.g., LF9210D).

Pyralux® LF Copper-Clad Laminate Construction Selection

A variety of Pyralux® LF Copper-Clad Laminate constructions, both balanced and unbalanced, are commercially available. For help beyond the standard offerings in Table 1, please use the Laminate Product Selector at pyralux.dupont.com to identify the appropriate product code for your copper-clad laminate solution.



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Product Performance

Table 3 - DuPont™ Pyralux® LF Copper-Clad Laminate Properties

Property	LF9110R Typical Value	Test Method
Dielectric Constant (Dk), 1 MHz	3.6	IPC-TM-650 2.5.5.3
10 GHz	3.0	ASTM D2520
Loss Tangent (Df), 1 MHz	0.02	IPC-TM-650 2.5.5.3
10 GHz	0.02	ASTM D2520
Peel Strength (Adhesion to Copper) After Lamination, N/mm (lb/in)	1.8 (10.0)	IPC-TM-650 2.4.9
After Solder, N/mm (lb/in)	1.6 (9.0)	
Dimensional Stability (MD/TD)	± 0.10 %	IPC-TM-650 2.2.4
Solder Float, 288 °C for 10 s	Pass	IPC-TM-650 2.4.13
Volume Resistivity, $\Omega \cdot \text{cm}$	> 10^{15}	IPC-TM-650 2.5.17
Surface Resistance, Ω	> 10^{14}	IPC-TM-650 2.5.17

Data within this table are typical values for the listed product. Performance can vary depending on construction and processing.

Safe Handling

Prior to handling, DuPont recommends referencing the Pyralux® Safe Handling Guide available at pyralux.dupont.com.

Quality and Traceability

DuPont™ Pyralux® LF Copper-Clad Laminate is manufactured under a certified ISO9001:2015 Quality Management System facility. A Certificate of Conformance is available with every batch. Complete material and manufacturing records for each lot, with samples of finished product, are retained for reference purposes. The roll labels contain the lot number, DuPont order number, customer order number, IPC specification, customer specification, and customer part number; save these labels for reference in case of inquiries.

Storage Conditions and Warranty

Pyralux® LF Copper-Clad Laminate should be stored in the original packaging at temperatures of 4 - 29 °C (40 - 85 °F) and below 70% humidity. The product should not be frozen and should be kept dry, clean, and well-protected. Subject to compliance with the foregoing handling and storage recommendations, DuPont's warranties, as provided in the DuPont Standard Conditions of Sale, shall remain in effect for a period of two years following the date of shipment.



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For more information on DuPont™ LF Copper-Clad Laminate or other DuPont products, please visit our website.

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CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102-5 and "DuPont Policy Regarding Medical Applications" H-50103-5.

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