



DUPONT™ PYRALUX® HT

FLEXIBLE CIRCUIT MATERIALS SYSTEM

DESCRIPTION

DuPont™ Pyralux® HT flexible circuit material is a complete all-polyimide flex laminate system that includes a double-sided, copper-clad laminate and a unique all-polyimide coverfilm or bonding material that becomes a flexible coverlay after processing. The bonding material can be used as a coverfilm, offering good coverage over circuits, or as a bonding material for multilayer flex applications. This material system is ideal for multilayer flex and rigid flex applications which require high operating temperature performance, advanced material performance, and high reliability.

Pyralux® HT Copper Clad Laminate features

- >225 °C IPC service temperature
- UL94V-0, UL 746F, 200 °C UL MOT (max. operating temperature)
- Certified to IPC-4204A/11
- Excellent punching and drilling performance
- Excellent thermal resistance
- Thin Cu-clads with superior handling
- Excellent dielectric thickness tolerance/electrical performance
- High Cu-polyimide adhesion strength
- Full compatibility with PWB industry processes

Table 1 - DuPont™ Pyralux® HT Product Offerings

Product Code*	Dielectric Thickness mil (µm)	Copper Thickness µm (oz/ft ²)
HT8515R	1.0 (25)	18 (0.5)
HT8525R	2.0 (50)	18 (0.5)
HT9111R	1.0 (25)	35 (1.0)
HT9121R	2.0 (50)	35 (1.0)

The “R” at the end of the clad code specifies rolled-annealed copper foil.

Additional balanced and unbalanced copper constructions using rolled-annealed copper foil (“R”) or electrodeposited copper foil (“E”) and other polyimide film dielectric thicknesses (≤6 mil) are available through your DuPont sales representative.

Pyralux® HT Bonding Film features

- >225 °C IPC service temperature when used as a bondply with Pyralux®HT copper clad laminate (tested with double treat copper – additional testing underway).
- UL 94V-0
- Certified to IPC-4203A/24
- Low resin flow
- Excellent punching and drilling performance
- Fully compatible with coverlay lamination processes
- Excellent conformation over circuitry
- Excellent thermal resistance

Table 2 - DuPont™ Pyralux® HT Bonding/Cover Film Product Offerings

Product Code*	Dielectric Thickness mil (µm)
HT0100	1.0 (25)
HT7049	1.5 (38)
HT0200	2.0 (50)
HT0300	3.0 (75)

Pyralux® HT bonding film processing guide available from your DuPont sales representative.

The entire Pyralux® HT system is RoHS compliant, halogen free and Pb-free alloy compatible.

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Table 3 - Typical DuPont™ Pyralux® HT Clad Material Properties

Laminate Property	IPC TM-650 (* or other)	HT-9111R 1 mil dielectric	HT-9121R 2 mil dielectric
Adhesion to copper (Peel Strength) As fabricated, N/mm (lb/in) After solder, N/mm (lb/in)	Method 2.4.9	1.6 (9) 1.6 (9)	>1.8 (10) >1.8 (10)
Solder Float at 288°C (550°F)	Method 2.4.13	Pass	Pass
Dimensional Stability Method B, % Method C, %	Method 2.2.4	-.04 to -.08 -.05 to -.08	-.04 to -.08 -.04 to -.07
Dielectric Thickness Tolerance, %	Method 4.6.2	±10	±10
UL Flammability Rating	*UL-94	V-0	V-0
Dielectric Constant*, 1 MHz	Method 2.5.5.3	3.4	3.4
Dissipation Factor*, 1 MHz	Method 2.5.5.3	0.003	0.002
Dielectric Strength, kV/mil	Method 2.5.6.1	5-6	5-6
Relative Permittivity 10 GHZ, In-Plane Direction	ASTM D2520 (rect. cavity)	3.5	3.4
Relative Permittivity 10 GHZ, Normal to Plane Direction	Transmission Lines	3.2	3.1
Loss Tangent 10 GHz	ASTM D2520 (rect. cavity)	0.003	0.003
Volume Resistivity, ohm-cm	Method 2.5.17.1	E16	E17
Surface Resistance, ohms	Method 2.5.17.1	>E16	>E16
Moisture and Insulation Res., ohms	Method 2.6.3.2	E11	E11
Moisture Absorption, %	Method 2.6.2	0.8	0.8
Tensile Strength, MPa (kpsi)	Method 2.4.19	>345 (>50)	>345 (>50)
Elongation, %	Method 2.4.19	>60	>60
Initiation Tear Strength, g	Method 2.4.16	700–1000	900–1200
Propagation Tear Strength, g	Method 2.4.17.1	>10	>20
Chemical Resistance, min. %	Method 2.3.2	Pass, >95%	Pass, >95%
Solderability	*IPC-S-804, M. 1	Pass	Pass
Flexural Endurance, min. cycles	Method 2.4.3	6000	6000
Glass Transition (Tg), C	DMA	220	220
Modulus, kpsi	—	700	700
In-Plane CTE (ppm/°C) T<Tg	—	25	25
In-Plane CTE (ppm/°C) T>Tg	—	40 (est.)	40 (est.)
IPC Service Temp. for Clad, °C	Method 2.6.21	>225	>225
Decomposition Temperature 2%/5%, °C	IPC-TM-650 2.4.24.6	577/599	577/599

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Table 4 - DuPont™ Pyralux® HT Bonding/Cover Film Properties

Property	Typical Value	Test Method
Peel Strength to HT and AP Clad Dielectric, N/m (pli)	1.8 (10)	IPC-TM-650 2.4.9
Peel Strength AR to Copper Foil, N/m (pli), 36 µm Cu	1.4 (8)	IPC-TM-650 2.4.9
Peel Strength AR, to Alternative Oxide, N/m (pli), 18 µm Cu	1.1 (6)	IPC-TM-650 2.4.9
Solder Float, 1 min. at 320°C	Pass	IPC-TM-650 2.4.13
Dielectric Constant 10 GHZ, In-Plane Direction	3.2	ASTM D2520
Dielectric Constant 10 GHZ, Normal Direction	2.9	ASTM D2520
Loss Tangent 10 GHz	0.003	ASTM D2520
Moisture Absorption, %	0.8%	IPC-TM-650 2.6.2
Resin Flow, micron/micron	2:1	IPC-TM-650 2.3.17.1
Dielectric Strength, volts/um (volts/mil)	275 - 161 (7000 - 4100)	ASTM-149
XY-CTE, 50 to 250°C	65	TMA
Z-CTE, Below and Above Tg (225 °C)	54/230	TMA
Tensile Strength, MPa (kpsi)	165 (24)	IPC-TM-650 2.4.18.3
Modulus, MPa (kpsi)	2800 (405)	IPC-TM-650 2.4.18.3
% Elongation	170	IPC-TM-650 2.4.18.3
Glass Transition Temperature (Tg), °C	233	IPC-TM-650 2.4.24c
UL Flame Recognition	V-0	UL94
Decomposition Temperature 2%/5%, °C	548/579	ASTM D3850 in air
IPC Flexural Test. Bend Ratio 4.5, Bends	570/583	IPC-TM-650 2.4.24.6

GENERAL INFORMATION

Quality and Traceability

DuPont™ Pyralux® HT flexible circuit material copper clads are manufactured under a quality system registered to ISO9002 by Underwriters Laboratories. The copper clad laminates are certified to IPC-4204/11. The bonding/cover film is certified to IPC-4203/24. Complete material and manufacturing records, which include archive samples of finished product, are maintained by DuPont. Each manufactured lot is identified for reference and traceability. The packaging label serves as the primary tracking mechanism in the event of customer inquiry and includes the product name, batch number, size, and quantity.

Storage Conditions and Warranty

DuPont™ Pyralux® HT flexible circuit material laminates 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, the DuPont warranty, as provided in the DuPont Standard Conditions of Sale, shall remain in effect for a period of two years following the date of shipment.

Safe Handling

Anyone handling DuPont™ Pyralux® HT flexible circuit materials should wash their hands with soap before eating, smoking, or using restroom facilities. Although DuPont is not aware of anyone developing contact dermatitis when using DuPont™ Pyralux® HT products, some individuals may be more sensitive than others. Gloves, finger cots, and finger pads should be changed daily. DuPont™ Pyralux® HT flexible circuit materials are fully cured when delivered. However, lamination areas should be well ventilated with a fresh air supply to avoid build-up from trace quantities of residual solvent (typical of polyimides) that may volatilize during press lamination. When drilling or routing parts made with DuPont™ Pyralux® HT, provide adequate vacuum around the drill to minimize worker exposure to generated dust. As with all thin, copper-clad laminates, sharp edges present a potential hazard during handling. All personnel involved in handling Pyralux® HT clads should use suitable gloves to minimize potential cuts.



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Packaging

DuPont™ Pyralux® HT copper clad laminate is supplied in the following standard sheet sizes:

- 24" x 18" (610 mm x 457 mm)
- 24" x 36" (610 mm x 914 mm)
- 24" x 12" (610 mm x 305 mm)
- 12" x 18" (305 mm x 457 mm)

Custom clad sizes are available by special order.

Pyralux® HT bonding/cover film composites are supplied on 24-inch wide rolls in either 100 feet or 250 feet lengths, on nominal 3-inch cores. Narrower widths or cut sheets are available by special order.

All DuPont™ Pyralux® HT packaging materials are 100% recyclable

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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 K-28742 (4/15)