

DUPONT™ KAPTON® HPP-ST

POLYIMIDE FILM

DuPont™ Kapton® HPP-ST is a two-sided, treated film that offers the same excellent balance of physical, chemical, and electrical properties over a wide temperature range offered by general purpose Kapton® HN. Additionally, this high performance film has superior dimensional stability and excellent adhesion with most adhesion systems. Adhesion data for HPP-ST can be referenced in the adhesion to Kapton® technical bulletin.

In applications where low shrinkage and superior adhesion are important, Kapton® HPP-ST is the polyimide film of choice.

APPLICATIONS

- Electronic parts
- PCB stencils
- Screen printing
- Insulation tubing

PRODUCT SPECIFICATIONS

Kapton® HPP-ST is manufactured, slit and packaged according to the product specifications listed in H-38479, Bulletin GS-96-7.

CERTIFICATION

Kapton® HPP-ST meets ASTM D-5213 (type 1, item A) requirements.

Table 1 - Typical Properties of Kapton® HPP-ST at 23°C (73°F)

Property	Unit	1 mil 25µm	2 mil 50µm	3 mil 75µm	5 mil 125µm	Test Method
Physical						
Tensile Strength	kpsi (MPa)	33.5 (231)	34 (234)	34 (234)	33.5 (231)	ASTM D-882-91
Elongation	%	72	72	78	82	ASTM D-882-91
Tensile Modulus	kpsi (GPa)	400 (2.8)	400 (2.8)	400 (2.8)	400 (2.8)	ASTM D-882-91
Adhesion	pli (N/mm)	10 (1.8)	10 (1.8)	10 (1.8)	10 (1.8)	IPC-TM-650 Method 2.4.9*
Density	g/cc	1.42	1.42	1.42	1.42	ASTM D-1505-90
MIT Folding Endurance	cycles	285,000	55,000	6,000	3,000	ASTM D-2176-89
Tear Strength-propagating (Elmendorf), N		0.07	0.21	0.38	0.58	ASTM D-1922-89
Tear Strength, initial (Graves), N		7.2	16.3	26.3	46.9	ASTM D-1004-90
Thermal	-					
Flammability		94V0	94V0	94V0	94V0	UL-94
Shrinkage (30 min at 150°C)	%	0.03	0.03	0.03	0.03	IPC-TM-650
Method 2.2.4A						
Limiting Oxygen Index	%	37	43	46	45	ASTM D-2863-87
Electrical						
Dielectric Strength	kV/mil (kV/mm)	7.7 (303)	6.1 (240)	5.1 (201)	3.9 (154)	ASTM D-149-91
Dielectric Constant	1kHz	3.4	3.4	3.5	3.5	ASTM D-150-92
Dissipation Factor at 1 kHz		0.0018	0.0020	0.0020	0.0026	ASTM D-150-92
Volume Resistivity	ohm-cm	1.5 x 10 ¹⁷	1.5 x 10 ¹⁷	1.4 x 10 ¹⁷	1.0 x 10 ¹⁷	ASTM D-257-91

^{*}Acrylic adhesive to 1 oz. copper

DUPONT™ KAPTON® HPP-ST

Table 2 – Physical Properties of Kapton® HPP-ST Film

	Typical Value at		
Physical Property	23°C (73°F)	200°C (392°F)	Test Method
Yield Point at 3%, MPa (psi)	69 (10,000)	41 (6000)	ASTM D-882-91
Stress to produce 5% elonga- tion, MPa (psi)	90 (13,000)	62 (9000)	ASTM D-882-91
Impact Strength, N·cm·(ft lb)	78 (0.58)		DuPont Pneumatic Impact Test
Coefficient of Friction, kinetic (film-to-film)	0.48		ASTM D-1894-90
Coefficient of Friction, static (film-to-film)	0.63		ASTM D-1894-90
Refractive Index (sodium D line)	1.70		ASTM D-542-90
Poisson's Ratio	0.34		Avg. three samples Elongated at 5%, 7%, 10%
Low Temperature Flex Life	pass		IPC-TM 650, Method 2.6.18

Table 3 – Thermal Properties of Kapton®HPP-ST Film

Thermal Property	Typical Value	Test Condition	Test Method
Melting Point	None	None	ASTM E-794-85 (1989)
Thermal Coefficient of Linear Expansion	20 ppm/°C (11 ppm/°F)	-14 to 38°C (7 to 100°F)	ASTM D-696-91
Coefficient of Thermal Conductivity, W/m-K cal cm·sec·°C	0.12 2.87 x 10 ⁴	296 K 23°C	ASTM F-433-77 (1987)
Specific Heat, J/g K (cal/g °C)	1.09 (0.261)		Differential calorimetry
Heat Sealability	not heat sealable		
Solder Float	pass		IPC-TM-650, method 2.4.13A
Smoke Generation	Dm=<1	NBS smoke chamber	NFPA-258
Glass Transition Temperature (Tg)	A second order transition occurs in Kapton® between 360°C(680°F) and 410°C(770°F) and is assumed to be the glass transition temperature. Different measurement techniques produce different results within the above temperature range.		

Table 4 – Electrical Properties of Kapton®HPP-ST Film at 23°C (73°F)

Property Film Gage	Typical Value		Test Condition	Test Method
Dielectric Strength 25 μm (1 mil) 50 μm (2 mil) 75 μm (3 mil) 125 μm (5 mil)	V/m kV/mm 303 240 201 154	(V/mil) (7700) (6100) (5100) (3900)	60 Hz 1/4 in electrodes 500 v/sec rise	ASTM D-149-91
Dielectric Constant 25 μm (1 mil) 50 μm (2 mil) 75 μm (3 mil) 125 μm (5 mil)	3.4 3.4 3.5 3.5		1 kHz	ASTM D-150-92
Dissipation Factor 25 μm (1 mil) 50 μm (2 mil) 75 μm (3 mil) 125 μm (5 mil)	0.0018 0.0020 0.0020 0.0020 0.0026		1 kHz	ASTM D-150-92
Volume Resistivity 25 μm (1 mil) 50 μm (2 mil) 75 μm (3 mil) 125 μm (5 mil)	Ω•cm ¹⁷ 1.5 x 10 ¹⁷ 1.5 x 10 ¹⁷ 1.5 x 10 ¹⁷ 1.4 x 10 ¹⁷ 1.0 x 10 ¹⁷			ASTM D-257-91



DUPONT™ KAPTON® HPP-ST POLYIMIDE FILM

DIMENSIONAL STABILITY

The dimensional stability of Kapton® polyimide film depends on two factors—the normal coefficient of thermal expansion and the residual stresses placed in the film during manufacture. The latter causes Kapton® to shrink on its first exposure to elevated temperatures as indicated in the bar graph in **Figure 1**. Once the film has been exposed, the normal values for the thermal coefficient of linear expansion as shown in **Table 5** can be expected.

Figure 1. Residual Shrinkage vs. Exposure Temperature and Thickness, Kapton® HN and HPP-ST Films

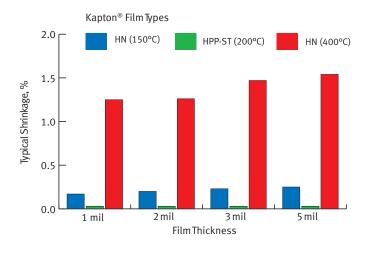


Table 5 – Thermal Coefficient of Expansion, Kapton® HPP-ST Film, 25 µm (1 mil), Thermally Exposed

Temperature Range, °C, (°F)	ppm/°C
30-100 (86-212)	17
100-200 (212-392)	32
200-300 (392-572)	40
300-400 (572-752)	44
30-400 (86-752)	34

FOR MORE INFORMATION ON DUPONT™ KAPTON® POLYIMIDE FILMS, PLEASE CONTACT YOUR LOCAL REPRESENTATIVE, OR VISIT OUR SALES & SUPPORT WEBPAGE FOR ADDITIONAL REGIONAL CONTACT INFORMATION.

kapton.com

Copyright © 2018 DuPont. All rights reserved. The DuPont Oval Logo and DuPont" are registered trademarks or trademarks of E. I. du Pont de Nemours and Company or its affiliates.

This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in end-use conditions, DuPont makes no warranties, and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right.