Typical Properties of Dielectric Material for Flexible Printed Circuitry

Flexible circuits have advantages over rigid FR4 PCBs because they can be bent, folded, twisted, and wound many times in highly narrow areas. This provides designers with the freedom to place components together; otherwise, these components will not fit, thereby reducing the packaging size of their products.

The most widely used flexible circuit and flexible printed circuit (FPC) materials today are manufactured by Dupont Corporation and are called "Kapton." This polyimide film-based material is heat resistant, has dimensional stability, and has a low dielectric constant of 3.6.

Property (Typical)	Units	Polymide	Polymide (Adhesiveless)	Polyester
Representative Trade Name		**KAPTON**	**KAPTON**	**MYLAR**
Physical				
Thickness Range	**mil**	**0.5 to 5**	**1-6**	**2-5**
Tensile Strength (@25°C)	psi	25,000	50,000	20,000 to 35,000
Break Elongation	%	70	50	60 to 165
Tensile Modulus (@25°C)	100,000 psi	4.3	7	5
Tear Initiation Strength	lb/in	1000	700-1200	1000 to 1500
Tear Propagation Strength	g/mil	8	20	12 to 25
Chemical				
Resistance to:				
Strong Acids		Good	Good	Good

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Strong Alkalis		Poor	Good	Poor
Grease and Oil		Good	Good	Good
Organic Solvents		Good	Good	Good
Water		Good	Good	Good
Sunlight		Good	Good	Fair
Fungus		Non-nutrient	Non-nutrient	Non-nutrient
Water Absorption	% (24 hours)	2.9	0.8	<0.8
Thermal				
Service Temperature (min/max)	**degree C**	**-0.625**	**-125/+200**	**-60/+105**
Coefficient of Thermal Expansion (@22°C)	PPM/degree C	20	20	27

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Change in Linear Dimensions (100℃, 30min)	%	<0.3	0.04-0.02	<0.5
Electrical				
Dielectric Constant (ASTM D150) 1MHz		3.4	3.4	3
Dissipation Factor (ASTM D150) 1MHz		0.01	0.003	0.018
Dielectric Strength (ASTM D149) @ 1 mil thickness Volume Resistivity (ASTM D257)	V/mil ohm-cm	6000 1.0E+16	6000 1.0E+16	3400 1.0E+16