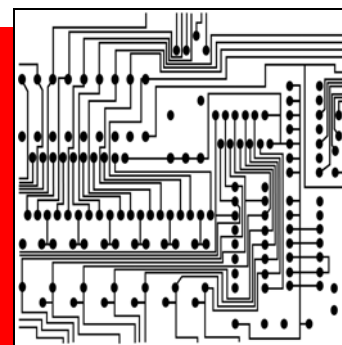


Physical Properties of Polyester Film Base

—High Complexity PCB Starts With the Right Phototools—

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GENERAL INFORMATION

- KODAK ESTAR™ Thick Base
- Clear Base, Uncoated
- Polyethylene Terephthalate (PET)
- 7-mil thickness (0.007-inch, 178 um)

Thermal Coefficient of Expansion (length, width)	0.001% / ° F (0.0018% / ° C)
Humidity Coefficient of Expansion (length, width)	0.0008% / % RH
Specific Gravity	1.39
Young's Modulus	6.8 x 10 ⁵ psi
Poisson's Ratio < 1 year at room temperature	0.25
Tensile Strength Yield ASTM D882-67	13,500 psi
Tensile Strength Break ASTM D882-67	25,600 psi
Elongation at Yield ASTM D882-67	5.5%
Elongation at Break ASTM D882-67	115%
Tear Strength Initiation Graves Tear ASTM D1004-06	24 lbs.
Tear Strength Propagation Tongue Tear ASTM D1938-67	0.5 lbs.
Toughness ASTM D882-67	21,500 lb. / cubic inch
Refractive Index at wavelength 589 nm	N = 1.50 Vertical axis through thickness N = 1.64 Width direction in plane of sheet N = 1.66 Length direction in plane of sheet

Note: The values in this table are not manufacturing specifications. The values are averages of several measurements, and are provided as a general guide to physical properties.

Temperature Effects

Temperature	Physical Behavior
255° C (490° F)	Melting Point. Solid becomes fluid.
130° C (255° F)	Distortion and Shrinkage. Crystallization Occurs.
>100° C (212° F)	Distortion can occur with non-uniform heating.
100° C (212° F)	Shrinkage up to 0.15% occurs, stabilizes in 24 hrs.
82° C (180° F)	Shrinkage up to 0.06% occurs, stabilizes in 48 hrs.
80° C (176° F)	Transition Temperature. Increase in Volume. Film loses some stiffness.
49° C (120° F)	Shrinkage up to 0.02% occurs, stabilizes in 10 days.

Burning	Statement
480° C (900° F) Auto-ignition Temperature	Auto-ignition temperature at which material starts to burn without the benefit of an external spark.
Underwriters' Laboratories (UL) 94V-2 Compliance	KODAK Films made on ESTAR Thick Base (178 um) meet or exceed the requirements contained in UL04V-2.
Flame Propagation Rate: 280 Seconds: for 178 um film 130 Seconds: for 102 um film	Films of this nature are classified as slow burning, based on a standard burning test, NAPM / ANSI IT9.6-1991. The UL Burning Test method uses a 35-inch filmstrip that is lit at the bottom edge by a gas flame. The film is immediately relit if the flame becomes extinct during the course of the test. Total time for burning the entire strip is inversely proportional to the flame propagation rate.

Kodak

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MORE INFORMATION

For the latest version of technical support publications for Kodak products, visit Kodak on-line at: http://www.kodak.com/go/PCBproducts
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If you have questions about Kodak products, call Kodak.

In the U.S.A.:

1-800-242-2424, Ext. 19, Monday–Friday
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9 a.m.–7 p.m. (Eastern time)

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From outside the US/Canada: 1-716-724-4000
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Note: The Kodak materials described in this publication for use with Kodak films are available from dealers who supply Kodak products. You can use other materials, but you may not obtain similar results.

NOTICE: The sensitometric curves and data in this publication represent product tested under the conditions of exposure and processing specified. They are representative of production coatings, and therefore do not apply directly to a particular box or roll of photographic material. They do not represent standards or specifications that must be met by Eastman Kodak Company. The company reserves the right to change and improve product characteristics at any time.

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EASTMAN KODAK COMPANY • ROCHESTER, NY 14650

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