

DuPont™ Kapton® PV9100 Series

polyimide films

Technical Data Sheet

Introduction

DuPont™ Kapton® PV9100 series polyimide films are flexible substrates for thin film photovoltaic (PV) applications, designed for ease of manufacturing and robust mechanical performance. Kapton® polyimide film is widely used as a dielectric substrate for its high temperature resistance, self extinguishing burn characteristics, toughness and flexibility, which have set the standard for reliability in electrical and non-electrical applications. Kapton® has more than 45 years of proven performance as the material of choice in applications involving temperature extremes and harsh environments.

Photovoltaic Applications

DuPont™ Kapton® polyimide films are in commercial use as well as in evaluation as substrates in thin film a-Si and CIGS photovoltaic applications, in which the stiffness and dimensional stability at elevated deposition temperatures are critical to producing solar cells with maximum efficiency and yields. The low coefficient of thermal expansion (CTE) of Kapton® PV9100 series polyimide films minimizes the stress at the interface during high temperature thin film deposition and processing.

Properties	PV9101	PV9102	PV9103
Thickness - microns	50	38	25
Tensile Strength MD / TD (MPa) @ 25°C ASTM D-882	390 / 470	360 / 380	280 / 330
Elongation MD / TD (%) @ 25°C ASTM D-882	75 / 55	70 / 60	60 / 40
Modulus MD / TD (GPa) @ 25°C ASTM D-882	5.8 / 6.3	5.8 / 7.6	4.5 / 5.5
Modulus MD (GPa) @ 450°C DMA (RT-500°C, 5°C/min)	0.4	0.3	0.2
CTE (ppm/°C) MD / TD @ 50-350°C (TMA RT-450 1st, RT-500 2nd (2nd heat data) 10°C/min.*	14 / 8	15 / 4	14 / 4
Tg (°C) DMA (RT-500°C, 5°C/min) tan delta peak*	370	370	375
Isothermal Weight Loss (%) TGA @ 500°C, ~30 minutes*	<1	<1	<1
Moisture Absorption (%) (Immersion 24hrs @ 25°C)	1.7	1.7	2.3
DC Dielectric Strength (V/μm) 500 V/sec. rise, 6.3 mm electrode	470	552	560

*CTE, Tg, high temperature modulus and Isothermal weight loss are performed in nitrogen environment



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Next Generation Developments

Flexible substrates and systems providing even higher temperature (up to 500°C) capability for CIGS are under development. When flexibility and space/weight savings are key, such as in building integrated photovoltaic (BIPV) applications, DuPont™ Kapton® polyimide films used as thin film substrates offer advantages not seen with typical larger, heavier constructions and are key for the high growth building integrated PV market.

Also we are developing complementary system products including encapsulants, backsheet components and moisture barrier topsheet composite for flexible BIPV programs.

For more information on DuPont™ Kapton® or other polyimide films, please contact your local representative, or visit our website for additional regional contacts:

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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-51459 or H-50102-2"

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