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## Insulating Films

### Thermalfilm™ Polyimide Plastic Films

RoHS Compliant

Thermalfilm™ and Thermalfilm™MT are low cost polyimide plastic insulating films designed to be an improved replacement for mica. These insulators have a distinctive amber color and can be easily recognised and assembled on a production line.

Thermalfilm™MT, made from high performance Kapton™MT material, provides thermal conductivity nearly 2.5 times greater than standard Thermalfilm™.

Both insulators have an extremely high resistance to flow or thin out under high compressive stresses, particularly at elevated temperatures.

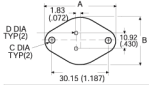
Excellent physical, mechanical and electrical properties remain nearly constant over a wide range of temperatures and frequencies. They are radiation resistant, have no melting points, and have no known organic solvents.

The polyimide plastic film is UL listed as a component in UL's publication "Component - Plastic Material" dated September 18, 1969. The UL card number is E39505R, Guide QMFZ2 filed by E. I. du Pont de Nemours & Co., Inc. Thermalfilm is rated 94 V-O.

**Notes:**

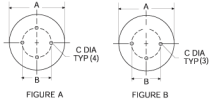
- Thermalfilm™ MT part numbers begin with "46"
- Insulator thickness is .05mm +/- 0.006mm (0.002" +/- 0.00025") unless otherwise specified.
- Dimensional tolerances are +/- 0.38mm(0.015"), hole diameters are +/- 0.25mm (0.010") and angularity is +/- 1.1/2" unless otherwise specified.

For TO-3



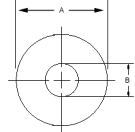
Part Number	RoHS	PCN	A	B	C	D
43-03-1G	RoHS ✓ Compliant	N/A	43.94 (1.730)	31.75 (1.250)	3.56 (0.140)	1.57 (0.062)
43-03-2G	RoHS ✓ Compliant	Product Change Notice	42.04 (1.655)	27.00 (1.063)	3.96 (0.156)	1.57 (0.062)
43-03-3G	RoHS ✓ Compliant	N/A	42.04 (1.655)	27.00 (1.063)	3.96 (0.156)	4.22 (0.166)
43-03-4G	RoHS ✓ Compliant	Product Change Notice	39.70 (1.563)	26.67 (1.050)	3.56 (0.140)	1.57 (0.062)
43-03-6G	RoHS ✓ Compliant	N/A	42.04 (1.655)	28.58 (1.125)	3.96 (0.156)	1.57 (0.062)

For TO-5 and TO-18



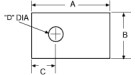
Part Number	RoHS	PCN	FIG.	A	B	C
43-05-1G (TO-5)	RoHS ✓ Compliant	Product Change Notice	A	9.91 (0.390)	5.08 (0.200)	0.91 (0.036)
43-05-2G (TO-5)	RoHS ✓ Compliant	Product Change Notice	B	9.91 (0.390)	5.08 (0.200)	0.91 (0.036)
43-18-1G (TO-18)	RoHS ✓ Compliant	Product Change Notice	A	6.35 (0.250)	2.54 (0.100)	0.91 (0.036)

Washer



Part Number	RoHS	PCN	Thread	A	B
43-02-4G	RoHS ✓ Compliant	Product Change Notice	#4	6.35 (0.250)	3.05 (0.120)
43-02-10G	RoHS ✓ Compliant	Product Change Notice	#10	14.27 (0.562)	5.16 (0.203)
43-02-25G	RoHS ✓ Compliant	Product Change Notice	1/4"	20.62 (0.812)	6.73 (0.265)

For TO-220, TO-126, Case 77, Case 199, Case 90, TO-218, TO-3P



Part Number	RoHS	PCN	A	B	C	D
43-77-1G (TO-126, case 77)	RoHS ✓ Compliant	Product Change Notice	11.10 (0.437)	7.92 (0.312)	3.56 (0.140)	2.36 (0.093)
43-77-2G (case 90, case 199)	RoHS ✓ Compliant	Product Change Notice	17.45 (0.687)	14.27 (0.562)	5.54 (0.218)	3.18 (0.125)
43-77-6G (case 90, case 199)	RoHS ✓ Compliant	Product Change Notice	20.62 (0.812)	14.27 (0.562)	7.14 (0.281)	3.96 (0.156)
43-77-8G (case 90, case 199)	RoHS ✓ Compliant	Product Change Notice	18.92 (0.745)	13.84 (0.545)	5.38 (0.212)	3.81 (0.150)

Check Distributor Stock  
Enter a part number for pricing and availability.

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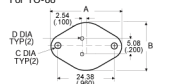
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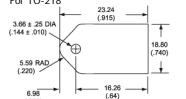
43-77-20G (TO-220,TO-218,TO-3P)	RoHS ✓ Compliant	Lead Free Pb	23.24 (0.915)	18.80 (0.740)	6.98 (0.2.75)	3.66 (0.144)
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For TO-66



Part Number	A	B	C	D	Thickness
43-66-2	33.32 (1.312)	19.35 (0.762)	3.56 (0.140)	1.57 (0.062)	0.05 (0.002)

For TO-218



Part Number	RoHS	PCN	Thickness
43-02-95	N/A	N/A	0.05 (0.002)

Bulk Thermalfilm™

Part Number	RoHS	PCN	Thickness
4300G 2 MIL	RoHS ✓ Compliant	Lead Free Pb	0.051 (0.002)
4500 5 MIL	N/A	N/A	0.127 (0.005)

Thermalfilm™ / Thermalfilm™MT

Property	Electrical -Typical Value @ 25°C		Test Method
	Thermalfilm™	Thermalfilm™MT	
Dielectric Strength	03mm (1 -mil) 275.6 x 10 <sup>3</sup> volts/mm (7,000 volts/mil)	177.2 x 10 <sup>3</sup> volts/mm (4500 volts/mm)	ASTM D149-64
Dielectric Constant	3.5	4.3	ASTM D150-64T
Dissipation Factor	0.002	0.002	ASTM D150-64T
Volume Resistivity	10 <sup>17</sup> ohm-cm	10 <sup>17</sup> ohm-cm	ASTM D257-61
Surface Resistivity	10 <sup>16</sup> ohms	10 <sup>16</sup> ohms	ASTM D257-61
Corona Start Voltage .025mm (1 - mil)	465 volts	465 volts	ASTM D1868-61T
Insulation Resistance	100.00 megohm mfd.	100.00 megohm mfd.	Based on 0.05 mfd wound capacitor using 0.25mm (1 - mil) Film
PHYSICAL			
Ultimate Tensile Strength (MD)	1.72 x 10 <sup>8</sup> Pa (25,000 psi)	103 MPa (1500 psi)	ASTM D882-64T
Bursting Strength Test (Mullen)	3.10 x 10 <sup>5</sup> Pa (45 psi)	0.31 MPa (45 psi)	ASTM 0774-63
Tear Strength - Initial	27,559 gm/mm (700 gm/mil)	35,433 gm/mm (900 gm/mil)	ASTM D1004-61
Density	1.42 gm/cm <sup>3</sup> (88.7 lb/ft <sup>3</sup> )	1.78 gm/cm <sup>3</sup> (111.1 lb/ft <sup>3</sup> )	ASTM D1505-63T
Folding Endurance(MIT)	>10,000 cycles	>10,000 cycles	ASTM D2176-63T
THERMAL			
Melting Point	None	None	
Zero Strength Temperature	815°C (1499°F)	815°C (1499°F)	Hot Bar (Du Pont Test)
Cut Through Temperature	435°C (815°F) 525°C (977°F)	435°C (815°F) 525°C (977°F)	Weighted Probe on Heated Film (Du Pont Test)
Service Temperature	-260°C to 240°C (-464°F to 464°F)	-260°C to 240°C (-464°F to 464°F)	
Thermal Conductivity	0.1560W/mK (0.09 BTU/hr.-ft.-°F)	0.3799W/mK (0.219 BTU/hr.-ft.-°F)	Model TC-1000 Twin Heatmeter Comparitive Tester
Flammability	V-0, UL "E" card E39505	V-0, UL "E" card E39505	UL 94

Note: One mil equals .001 inch  
Thermalfilm Resistance Calculator

Enter the area of the device that will contact the heat sink:

Interface Resistance =

**Formula**

$$\text{Interface resistance} = \frac{\text{Interface thickness (mm)} \cdot 1000}{\text{thermal conductivity (W/m-K)} \cdot \text{contact area (mm}^2\text{)}}$$

Thermalfilm MT Resistance Calculator

Enter the area of the device that will contact the heat sink:

Interface Resistance =

**Formula**

$$\text{Interface resistance} = \frac{\text{Interface thickness (mm)} \cdot 1000}{\text{thermal conductivity (W/m-K)} \cdot \text{contact area (mm}^2\text{)}}$$

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