

## Microcircuit Materials

# Silver Conductors

Du Pont Product	Applications	Differentiating Features	Product Characteristics
5000	Flexible Circuits, Keyboards, MTS	High Abrasion Resistance (2-4H) Low Silver %, High Conductivity	Vinyl Resin System General Purpose Conductor
5021	Flexible Circuits, Keyboards, MTS, In-mold	Fast Curing Excellent Flexibility	Lowest Cure Temperature Silver For MTS, Can Be Used On Polycarbonate & Graphics Inks Excellent for in-mold applications
5025	Flexible Circuits, Keyboards, MTS	Long Screen Life, High Operating Temperature , Good For Polydomes & Component Attach	Proprietary Resin, General Purpose, Multilayer Compatible <b>Best Overall Conductor</b>
5028	Flexible Circuits, Keyboards, MTS	High Conductivity	Proprietary Resin, High Solids Version of 5025
5029	Smart Cards RFID	High Solids, High Conductivity After Lamination	Proprietary Resin, High Solids Version of 5028
5096D *Available late 2005	Thermoforming, Flexible Circuits	May Be Thermoformed With Substrate	Uniquely Flexible
9145	EL Lamps, Touchscreens	Adheres To ITO Sputtered Substrates	Fluoropolymer Resin
APP11	Flexible Circuits, Keyboards, MTS	Reduced Silver Migration Performance	Lower Cost Option to 5025



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Du Pont Product	Operating Use Temp (</=°C)	Silver Percent (%)	Coverage Range	Viscosity (Pa.s) Thinner	Curing Box Oven/ Reel-to-Reel (minutes)	Typical Resistivity (mΩ/sq./mil)	Typical Resistivity After 1 Flex (mΩ/sq./mil)
5000	90	51	29.8 sq in gm @ .3 mil	3.5-16 8260	120°C (8-10) 140°C (1-1.5)	8-14	< 50
5021	70	60	22 sq in gm @ .4 mil	10-28 3610	120°C (1-5) 140°C (.8-1.5)	13-17	< 50
5025	90	61	22 sq in gm @ .4 mil	20-30 8210	120°C (5-10) 140°C (1-1.5)	12-15	< 40
5028	90	70	20 sq in gm @ .4 mil	15-30 3610	120°C (8-10) 140 (1.5-2)	7-12	< 100
5029	90	80	18 sq in gm @ .4 mil	35-50 3610	120-130°C (2-5) **	12-15	4-8 after Lamination
5096D	70	55	39 sq in gm @ .4 mil	50-100 8210	120°C (5-6) **	180-220	< 200-300
9145	85	58	21 sq in gm @ .4 mil	20-100 8211	130°C (5-7) 140°C (1.5-2)	<50	NA
APP11	90	60	22 sg in gm @ .4 mil	15-45 8210	120°C (5-6)	≤ 15	≤ 50

\*\* For Polyester substrates: For PVC substrates cure 2-30 minutes at 50-90°C.



# Microcircuit Materials

## Silver/Carbon and Carbon Conductors

Du Pont Product	Product Type	Differentiating Features	Product Characteristics
5089	Silver Carbon	Medium Resistance Conductor Excellent Linearity	Blend With 5025, 7102, 7861D, & 5524.
5524	Silver Carbon	Multilayer Compatable UL 105C Qualified	Blend With 5025, 7102, 7861D, 5089, 7082, 5524, 7106M & 3571
APP21	Silver Carbon	Improved Silver Migration Resistant Formulation	Blend With 5025, 7102, 7861D, 5089, 7082, 5524, 7106M & 3571
7082	Carbon	High Temperature & Resistance Applications, UL 105C Qualified	Blend With 5025, 7102, 7861D, 5089, 7082, 5524, 7106M & 3571
7102	Carbon	High Temperature Applications UL 105C Qualified	Blend With 5025, 5089, 7106M, 7082, 5524 & 3571 <b>Overprint 5000, 5025</b>
7105	Carbon	High Conductivity Carbon Low Crease Resistivity, High Abrasion Resistance (2H-4H)	Blend With 5000, <b>Overprint 5025</b>
8144* * Available late 2005	Carbon	Adheres To ITO Sputtered Substrates	For Use In EL Lamps, Blend With & Overprint 9145 Silver
7861D	Carbon		Blend with 5025, 7102, 5089 and 5524, <b>Overprint 5007, 5021</b>

PAGE 4



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Rev. 09/2005

## Microcircuit Materials

# Silver Carbon and Carbon Conductors

Du Pont Product	Operating Use Temp (*C)	Silver Percent (%)	Coverage Range (cm <sup>2</sup> /g)	Viscosity (Pa.s) Thinner	Curing Conditions Box Oven /Reel to Reel (minutes)	Sheet Resistivity (sq./mil)	Resistivity After Flex (mΩ/sq./mil)
5089	90	42	24.2 sq in gm @ .4 mil	200-260 3610	120°C (5-6) 140°C (1-1.5)	50-80 milliohms	< 250 milliohms
5524	90	55	23 sq in gm @ .4 mil	200-270 3610	120°C (5-6) 140°C (1-1.5)	25-30 milliohms	< 200 milliohms
APP21	90	55	23 sq in/gm @ .4 mil	80-140 8210	120°C (5-6)	≤ 35 ohms	< 200 milliohms
7082	90	Carbon	46 sq in gm @ .4 mil	100-220 3610	120°C (5-6) 140°C (1-1.5)	400 ohms	
7102	90	Carbon	39 sq in gm @ .4 mil	60-125 3610	120°C (5-6) 140°C (1-1.5)	25-30 ohms	
7105	90	Carbon	48 sq in gm @ .3 mil	15-70 8260	120°C (5-6) IR 130°C (2-3)	20-30 ohms	
8144* * Available late 2005	85	Carbon	39 sq in gm @ .4 mil	20-80 5928	130°C (5-7) 140°C (1.5-2)	<120 ohms	
7861D	70	Carbon	39 sq in gm @ .4 mil	40-80 8210	120°C (5-6) 140°C (1.5-2)	<60 ohms	

PAGE 3



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Rev. 09/2005

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## Dielectrics, Encapsulants and Spacers

Du Pont Product	Product Type	Differentiating Features	Product Characteristics
5017A	UV Curable Spacer & Encapsulant	Colorless	Spacer Or Overprint Material Only
5018	UV Curable Dielectric	Blue Color	High Breakdown Voltage & Moisture Resistance
5018A	UV Curable Dielectric	Colorless version of 5018	High Breakdown Voltage & Moisture Resistance
5018G	UV Curable Dielectric	Green Color	High Breakdown Voltage & Moisture Resistance
5036	Solvent-Based Encapsulant	Can Be Used In Conjunction With 5021 Over Polycarbonate And Graphics Inks	Protective Overprint, Not Designed To Be Used As Dielectric In Insulating Conditions
8153	Solvent-Based Dielectric For EL Lamps	Compatibility With EL System, Adheres To ITO Sputtered Substrates	High K Value

## Microcircuit Materials

# Dielectrics, Encapsulants and Spacers

Du Pont Product	Operating Use Temp (*C)	Color	Coverage	Viscosity (Pa.s) Thinner	Curing Conditions	Breakdown Voltage (V/mil DC)	Insulation Resistance (GΩ/sq./mil)
5017A	90	None	64 sq in gm @ 1 mil	3-5 NA	500-1500 mJ/cm2 **	NA	10
5018	90	Light Blue	42 sq in gm @ 1 mil	15-30 NA	500-1500 mJ/cm2 **	1000 ***	10
5018A	90	None	42 sq in gm @ 1 mil	15-30 NA	500-1500 mJ/cm2 **	1000 ***	10
5018G	90	Light Green	42 sq in gm @ 1 mil	15-30 NA	500-1500 mJ/cm2 **	1000 ***	10
5036	90	None	39.5 sq in gm @ .4 mil	25-45 3610	120 C(5-6) 140 C (1-1.5)	NA	10
8153	85	White	18.6 sq in gm @ 1 mil	10-20 8210	130 C(5-10) 140 C (1.5-2)	> 500 ***	10

\*\* UV cure level is greatly dependent on UV source and measurement technique. Curing parameters must be carefully evaluated to optimize adhesion, flexibility and dielectric properties.

\*\*\* Two separate prints, providing ~ 1mil minimum total thickness, are recommended for all cross-over applications. Double wet pass per print improves surface quality.



# Microcircuit Materials

## Special Applications and Product Limitations

### Silver Conductors

- 5000 Should not be used with adhesive attached components unless thoroughly tested for compatibility with adhesive.
- 5021 Conductor for use over polycarbonate and graphics inks. Can be used in conjunction with 5036 as insulator. Excellent performance with in-mold use.
- 5029 Not designed for non-laminated use.

### Silver/Carbon and Carbon Conductors

Adhesion may vary with substrate surface.

### Dielectrics

Double wet pass on each print of UV cured dielectrics will improve surface quality and decrease pinholing possibility.