

# APP11 Silver Conductor

Thick Film Composition

All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications.

## Product Description

Silver conductor APP11 shows greater resistance to silver migration than conventional polymer silver chemistries and is recommended for high volume appliance switch applications. It can be used with manual, semi-automatic and reel-to-reel equipment.

## Product Benefits

- Best general purpose Ag for higher temperature operations

## Processing

- **Screen Printing Equipment**  
Reel-to-reel, Semiautomatic, manual
- **Substrates**  
Polyester, polyimide, paper, epoxy glass
- **Ink Residence Time on Screen**  
> 2 hours
- **Screen Types**  
Stainless steel, Polyester
- **Typical Cure Conditions**  
Box Oven: 120° for 5 - 6 minutes  
Reel-to-reel: 140° for 1 minute
- **Typical Circuit Line Thickness Printed with 325-mesh stainless steel screen**  
12 - 15 microns
- **Clean-up Solvent**  
Ethylene diacetate or methyl propasol acetate

## Dry

Dry and cure in a well ventilated oven or conveyor dryer where the exhaust meets environmental regulations. DO NOT OVERDRY. See Safety & Handling section for additional information

## Storage and Shelf Life

Containers should be stored, tightly sealed, in a clean, stable environment at room temperature (<25°C). Shelf life of material in unopened containers is six months from date of shipment. Some settling of solids may occur and compositions should be thoroughly mixed prior to use.

**Table 1**  
**Typical Physical Properties on 5-mil Polyester Film**

Sheet Resistivity (mΩ/sq/mil)*	≤ 15
Resistivity after Flex (mΩ/sq/mil) 15 sec after test Crease (180°, 1 cycle)	≤ 50
Adhesion/Tape Pull (3M Scotch Tape #810)	No Ag Transfer
Abrasion Resistance, Pencil Hardness (ASTM D3363-74)	≥ 1H
Operating Use Temperature (°C)	≤ 90
Solderability Recommended	Not
Change in Physical Properties after Environment Tests	Insignificant
Change in Electrical Properties after Environmental Tests	<10%

### \* Environmental Tests

- Thermal Shock (+85°C to -40°C, 30 min. each, 5 cycles)
- Dry Heat (+85°C, 20 days)
- Humidity (+60°C, 95% RH, 10 days) [MIL Std 202E, method 103, cond. A]
- Salt Spray (+35°C, 5% salt, 10 days) [ASTM B117]
- Silver Migration (10 VDC, 40°C, 90% RH, 500 hr, tested on 40 and 70-mil gaps)
- Sulfate Dioxide (+45°C, 90% RH, 500 hrs in a 9-liter chamber containing 500 mg of flowers of sulfur)

Table 2 Composition Properties	
Viscosity (Pa.s) (Brookfield RVT#14, 10 rpm, spindle, 25°C)	20 - 40
Solids (150°C) (%)	68 - 72
Coverage (cm <sup>2</sup> /g) (Dependent on screen size and material)	120 - 230
Thinner	8210

## Safety and Handling

DuPont thick film products are intended for industrial use by trained personnel. These products contain organic and inorganic ingredients. It is important for workers to avoid overexposure to chemicals contained in these products or that might become available when processing them. Overexposure to other materials used in the operation should also be avoided, for example, cleaning solvents and degreasing fluids.

Well-designed area and personal air sampling/analysis can show if exposures are within required and recommended limits. Properly designed engineering controls, such as local ventilation and process enclosures, are effective in limiting employee exposure and to avoid the creation of hazardous conditions (e.g. forming an explosive vapor concentration). Engineering controls and procedures must comply with all applicable federal, state and local safety, health and environmental laws and regulations.

The following additional precautions should be taken when handling these products:

- Read the Material Safety Data Sheet (MSDS) and product labels before using the products;
- Use appropriate personal protective equipment (PPE) and practice good industrial hygiene. **DO NOT INGEST! DANGEROUS IF SWALLOWED!**
- Keep product container closed when not in use to prevent solvent evaporation and spilling hazards;
- If contact with skin occurs, wash affected area immediately with soap and water
- Avoid prolonged breathing of vapors and dusts/particulates. Keep exposure levels within the required or recommended limits. Always use sufficient ventilation as noted above

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### United States

DuPont Microcircuit Materials  
14 T.W. Alexander Drive  
Research Triangle Park, NC 27709  
Tel.: 800-284-3382

### Europe

DuPont (UK) Limited  
Coldharbour Lane  
Frenchay  
Bristol BS16 1QD  
England  
Tel.: 44-117-931-3191

### Japan

DuPont Kabushiki Kaisha  
Sanno Park Tower, 11-1  
Nagata-cho 2-chome,  
Chiyoda-ku, Tokyo 100-6111  
Japan  
Tel.: 81-35-434-6573

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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-50102

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