

Thick Film Conductive Trace Deposition Methods

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1. Materials

The Lower temperature (400C – 600C) process

It is mostly used in Plasma displays. Therefore CTE of the final film matches with ones of Sodalime glass.

a. Silver Paste

Silver paste is the most common conductive material in Electronic applications due to its high conductivity and relatively cheap prices. However it has high mobility (Migrations).

Therefore Gold Thick film paste is used in some applications where higher stability is required

i. Conventional screen printable Silver pastes

Process: Screen Printing (Patterned Screen) – Dry – Firing

Fired thickness: 10-15 um

Process Temperature: 450C - 600C

1. [Dupont 7713](#)

2. [ESL 590](#)

ii. Photo-patternable Silver paste

Processing Dupont Fodel Materials ([Process](#)): Screen printing(Blank Screen) – Dry – Exposure – Developing - Firing

Fired thickness: 6-10 um

Process Temperature: 500-600C

Resolution: 60um/60um line/space

1. [Dupont Fodel Silver](#)

b. Other Material - Dupont offers a full line of [microcircuit materials for printed electronics](#)

i. Gold paste

Advantages: Very stable, High conductivity

Disadvantages: Very expensive, relatively higher firing temperature (650 – 800C)

ii. Ni Paste, Cu paste: Available but not very reliable.

2. Screen Printing

Mesh selection by the resolution of the pattern and target thickness of the paste.

250um(line/space), 15-20 um thick : #325 mesh

150um (line/space), 6 -10 um thick : #400 mesh

3. Summary

Silver thick Film material is the most common and easiest choice to replace thin film traces for the device. Screen printing with fine pattern (150um/150um line/space) is quite common in the Display industry and it can be done with some process optimization efforts. Photo Sensitive Silver material (Fodel) is a convenient choice with very fine resolution and reliability. However the difference in the material cost between regular silver and Fodel has been always the blocking stone on the road. It is about 10X expensive.

Thanks

Seungwoo Lee

DuPont Microcircuit Materials

Printed Electronics Product Overview

This is a product overview of DuPont Microcircuit Materials (MCM) offerings of functional inks for the Printed Electronics Market. There are several inks available depending on the specific application, substrate, and dispensing method. Please contact your local MCM representative for specific product recommendations.

Biosensor Materials

Product	Material	Description
Electrode Materials		
BQ221	Carbon	High Activity for Blood Glucose Sensors
BQ242	Carbon	Good Activity for Blood Glucose Sensors
7105	Carbon	Excellent Conductivity for All Applications
7102	Carbon	Good Conductivity for All Applications Including Polycarbonate
5870	Ag/AgCl	80/20 Ag/AgCl for All Sensor Types
5874	Ag/AgCl	68/32 Ag/AgCl for All Sensor Types
5876	Ag/AgCl	32/76 Ag/AgCl for Ionophoretic/Specialty Applications
5807	Ag/AgCl	20/80 Ag/AgCl for Specialty Applications
5025	Silver	All-Purpose Conductor
5064	Silver	Excellent Conductivity (4mohm/sq/mil)
5028	Silver	Excellent Conductivity/May be Used on Polycarbonate
5524	Silver/Carbon	Silver/Carbon Blend (25 mohm/sq/mil)
BQ321	Platinum	Platinum Conductor for Sensors
BQ331	Gold	Gold Conductor for Sensors
Dielectric Materials		
5018	Dielectric	All-Purpose UV-Curable (Blue)
5018G	Dielectric	All-Purpose UV-Curable (Green)
5018A	Dielectric	All-Purpose UV-Curable (Colorless)
5036	Dielectric	All-Purpose Thermal Cure

RFID Antenna Materials

Product	Material	Description
5028	Conductor	High Conductivity Fast Drying Silver Conductor
5029	Conductor	Thick Printing Silver Conductor
5064	Conductor	High Conductivity Silver Conductor
5069	Conductor	Water Based Flexographic Silver Conductor

Membrane Touch Switch Materials

Product	Material	Description
5000	Silver	Silver Conductor for Low Voltage Applications
5021	Silver	Low Temperature Very Flexible Silver Conductor
5025	Silver	Silver Conductor for Higher Temperature
5028	Silver	High Conductivity Fast Drying Silver Conductor
5064	Silver	High Conductivity Silver Conductor
6492	Silver	Syringe Dispensed Silver Conductor
7102	Carbon	Carbon Conductor
3571	Dielectric	Blend Member Dielectric
5018	Dielectric	Blue UV Curable Dielectric
5018A	Dielectric	Colorless UV Curable Dielectric
5018G	Dielectric	Green UV Curable Dielectric
5036	Dielectric	Blend Member Dielectric Compatible with 7102 and 7082
7082	Resistor	1K Ohm/sq Resistor Ink
7105	Resistor	Highly Conductive Carbon Ink

Printed Materials for Printed Circuit Boards

Product	Material	Description
CB028	Conductor	Silver Conductor
CB100	Via Plug	Silver Via Fill
CB102	Via Plug	Solventless Silver Via Fill
CB200	Conductor	Copper Conductive Material
CB230	Conductor	Silver Coated Copper Solderable Conductive Material
CB459	Conductor	Platable Silver Conductor
CB500	Temporary Conductor	Silver Conductor Removable Plating Link for Electroplating Applications

Touch Screen Materials

Product	Material	Description
9169	Conductor	Low Temperature Silver Conductor for Adhesion on ITO
5018	Dielectric	Blue UV Curable Dielectric
7713	Conductor	500 C Fireable Silver Conductor
7723	Conductor	Lead-Free 500C Fireable Silver Conductor

Specialty Silver Materials

Product	Material	Description
4817N	Silver	Dip/Sprayable Plateable Silver Conductor
4922N	Silver	Brush/Band Plateable Silver Conductor
4929N	Silver	Screen Printable Plateable Silver Conductor
5064	Silver	All Purpose High Conductivity Silver Conductor
5504N	Silver	Screen Printable Plateable Thermoset Conductive Epoxy
5815	Silver	Dip/Sprayable Thermoset Conductive Epoxy
6492	Silver	Syringe Dispensable Plateable Silver Conductor

LuxPrint® Electroluminescent Materials

Product	Material	Description
8144	Carbon	Carbon Conductor for ITO
9145	Silver	Silver Conductor for ITO
7164	Translucent	Translucent Conductor
8153	Dielectrics	High K Dielectric
8150B	Phosphor	High Brightness White Phosphor
8150L	Phosphor	Long Life White Phosphor
8152B	Phosphor	High Brightness Blue Green Phosphor
8152L	Phosphor	Long Life Blue Green Phosphor
8154L	Phosphor	Long Life Yellow Green Phosphor
8155	Vehicle	Medium

DuPont MCM also offers a wide range of products for other Printed Electronic applications, including Flexible Displays and Printed Batteries. Please visit our website for [technical information](#) or [contact us](#) for specific product recommendations.

For more information on DuPont Microcircuit Materials products, please contact your local representative:

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CERMET SILVER CONDUCTOR

590
590-G

ESL 590 and ESL 590-G conductive pastes offer versatility and superior performance in many applications. These low cost compositions may be selected for applications requiring shielding, solder seal metallization for axial components, and conductive wiring. With their versatility, 590 and 590-G can also be used in AC and DC plasma displays, and as terminations for monolithic capacitors and capacitor electrodes. Both 590 and 590-G exhibit excellent adhesion, high conductivity and electroplatability. They also feature very low firing temperature characteristics.

Suitable substrates include silicon wafers, various ceramics, porcelain enameled steel, soda-lime and other glass substrates. These conductive coatings are compatible with various glossy and matte finish dielectrics.

PASTE DATA

RHEOLOGY:	Thixotropic, screen printable paste	
VISCOSITY: (Brookfield RVT, ABZ Spindle, 10 rpm, 25.5°C±0.5°C)	590	250±25 Pa·s
	590-G	225±25 Pa·s
BONDING MECHANISM:	Fritted	
SHELF LIFE: (25°C)	6 months	

PROCESSING

SCREEN MESH/EMULSION:	325/25 µm
LEVELING TIME: (25°C)	5-10 minutes
DRYING AT 125°C:	10-15 minutes

590/G 9808-F

ESL Affiliates

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See Caution and Disclaimer on other side.

FIRING RANGE:	590	500°C-700°C
	590-G	450°C-580°C
OPTIMUM PEAK TEMPERATURE/TIME AT PEAK:	590	580°C/10-15 min.
	590-G	450°C/35 min.
RATE OF ASCENT/DESCENT:		60°C-100°C/minute
SUBSTRATE OF CALIBRATION:		glass
THINNER:		ESL 401 or 404

TYPICAL PROPERTIES

FIRED THICKNESS:	590	12.5±2.5 µm
	590-G	12.0±3.0 µm
RESISTIVITY:		3-5 mΩ/sq.
PRINTING RESOLUTION: (Line/Space)		125 µm x 125 µm
SOLDER WETTABILITY: (RMA flux, 5 sec. dip)	62 Sn/36 Pb/2 Ag, 220°C±5°C	good-excellent
ADHESION: (90° pull, 2.5 mm x 2.5 mm pads, 62 Sn/36 Pb/2 Ag)		
	Initial pull strength:	10±0.5 N

590/G 9808-F

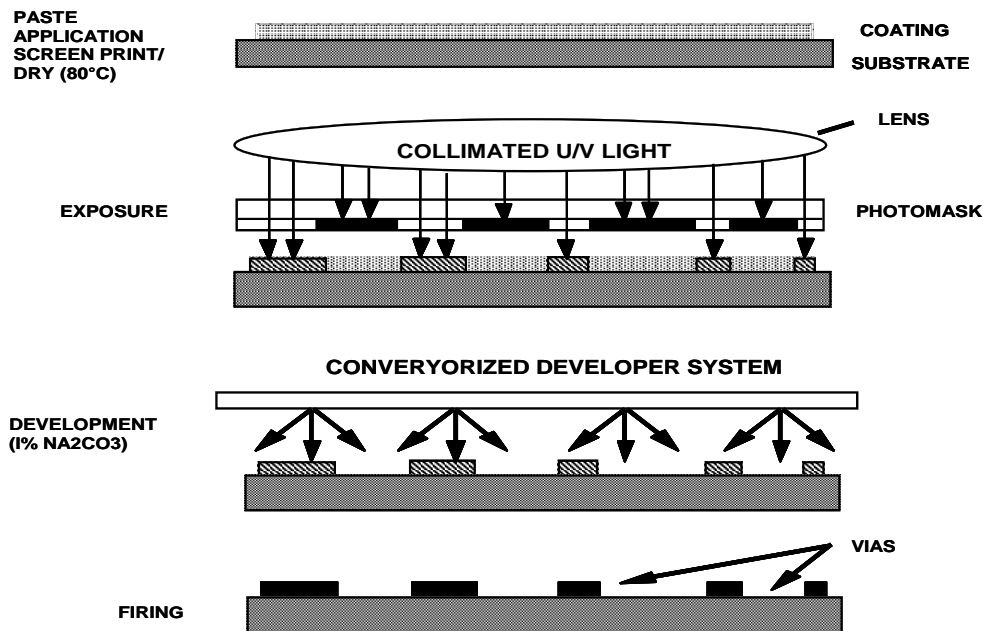
CAUTION: Proper industrial safety precautions should be exercised in using these products. Use with adequate ventilation. Avoid prolonged contact with skin or inhalation of any vapors emitted during use or heating of these compositions. The use of safety eye goggles, gloves or hand protection creams is recommended. Wash hands or skin thoroughly with soap and water after using these products. Do not eat or smoke in areas where these materials are used. Refer to appropriate MSDS sheet.

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Processing Fodel® materials:

In addition to the typical thick film production equipment, processing Fodel® compositions properly requires the use of two additional pieces of equipment, a UV exposure unit (Hg or Hg/Xe lamp), and an aqueous conveyerized spray developer (to spray ~1% Na₂CO₃ solution). These equipment are common in the printed wiring board industry. Fodel® compositions are sensitive to UV light frequencies between 360 to 450 nm. Since Fodel® compositions are UV light sensitive, they must be handled and processed under yellow safe lighting conditions. See “Fodel Safe Lighting” pages.

Using standard stainless steel mesh printing screens, follow the data sheet recommendations and print the composition. Dry at 80°C. With artwork phototool pattern in place, expose the printed sample to UV light at the specified energy level. Then, “develop” the part by sending it through the spray developer & rinse. (Most spray developers include a DI water rinse module and air knife as part of the equipment.) See Fodel® Process Illustration below. Fodel® compositions are negative acting, meaning that areas exposed to UV light are polymerized or hardened, while unexposed areas remain soft or soluble in the developer solution. The dried developed part may now be inspected and fired using standard thick film furnace profiles.



Fodel® Process Illustration

DuPont™ Fodel® 8G Thick-Film Paste

DuPont™ Fodel® photoimageable thick-film paste is well established as a leading technology for the metallization of plasma display panel (PDP) front bus electrodes to provide high resolution and improved image quality for large format, full high definition televisions. The newest paste technology, Fodel® eighth generation (8G) system, provides improved printability and wider process latitude. The ruthenium pyrochlore-based black pigments have been replaced with a novel and proprietary black pigment system based entirely on lower cost metals, so that PDP manufacturers can compete more cost effectively.

Features and Benefits

- Improved overall system performance - better resistivity, blackness, processing margin, latitude and cycle time
- Lower material costs to allow PDP manufacturers to compete more effectively with LCD technology
- Easy to use
- Wider processing latitude (better printability)
- Made without lead or ruthenium metals
- Reduced thickness
- Excellent picture quality, enabling full HD resolution

Easy-to-Use Fodel® Process Enables Full HD Resolution

