

DuPont™ Fodel® QM44F

PHOTOIMAGEABLE THICK-FILM PASTE

Technical Data Sheet

Product Description

DuPont™ Fodel® QM44F photoimageable thick-film composition is a Fodel® version of DuPont QM44 and the first silver compatible Fodel® dielectric. It should be used in circuits requiring small vias and precise geometries.

Product Benefits

- Capable of forming 3 mil diameter vias
- Compatible with silver conductors
- Low shrinkage dried to fired (45%)
- Thin, 2 print dielectric film
- Robust electrical properties

Design notes

Although testing indicates 25 mil vias can be photo imaged successfully, it is recommended to screen print larger features when possible.

Compatibility

The dielectric is compatible with a full range of Ag and mixed metal conductors, including silver/palladium, silver/platinum, and gold conductors.

Recommended Processing Procedure Using Safe Lighting

To prevent accidental polymerization, handle Fodel® materials under yellow or amber “safe lights” which have no UV, violet, or blue light wavelengths. Use safe lights in all areas where parts are printed, dried, exposed, and developed. Protect parts from all sources of white light unless these sources are carefully checked to ensure that they will not cause polymerization. To determine whether white light is present in your production area, turn off all yellow lights and look for any remaining white light. (This assumes that there are no white light leaks from yellow light fixtures). For additional information on Safe Lighting, refer to Fodel® Design Guide.

Typical Physical Properties

Test	Properties
Fired Thickness [μm]	30 - 32
Insulation Resistance (@100VDC)	$\geq 1 \times 10^{12}$
Dissipation Factor, wet (%)	< 0.50
Breakdown Voltage (V@25μm)	> 1000
Dielectric Constant (@1KHz)	8 - 10
* Typical properties are based on laboratory data using recommended processing procedures.	
Composition Properties	
Viscosity [Pa.s] (@ 10 rpm)	50 - 90
Solids [%]	64.5 - 66.0
Coverage [cm ² /g] (based on fired thickness of 15μm)	100 - 120
Thinner	DuPont 8250

This table shows anticipated typical physical properties for Fodel® QM44F based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.

Thinner

This composition is optimized for screen printing, thinning is not normally required. Use the DuPont recommended thinner for slight adjustments to viscosity or to replace evaporation losses. The use of too much thinner or the use of a non recommended thinner may affect the rheological behavior of the material and its printing characteristics.

Printing

The composition should be thoroughly mixed before use. This is best achieved by slow, gently, hand stirring with a clean burr-free plastic spatula for 0.5 - 1 minute. Care must be taken to avoid air entrapment.

Printing should be performed in a clean and well ventilated area. Optimum printing characteristics are generally achieved in the room temperature range of 20°C - 23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing.

DuPont™ Fodel® QM44F photoimageable thick-film composition may show some degree of tackiness during printing. Therefore, it is a recommended practice to print slowly. Increased snap-off will be helpful as well.

Screen Printing Parameters

Screen (stainless steel)	200 mesh
Wire diameter	35µm
Emulsion	0 - 13µm
Squeegee	80 durometer
Print speed	1 - 2"/sec.
Drying	12 min. @ 80°C
Dried thickness	28 - 30µm

Drying

Allow prints to level 5 - 10 min. at room temperature, then dry in a well ventilated oven for 12 - 14 min. at 80° C. Properly dried film shows slight tackiness when hot and none when cool. Overdried film may require longer time to expose.

Exposure

Photospeed of the dielectric film is quite fast, typical exposure time is 2 - 3 seconds when power is at 11.0 mW/cm². UV light source (Hg) is peaked at 360nm. Optimum result is obtained when phototool is in contact with the film. It is advised to adjust exposure time according to intensity of the light source.

Development

Film is developed in a conveyORIZED spray developer using 0.8% (wt.) Na₂CO₃ aqueous solution. To set the proper development time, a dried part (unexposed) is sent through the developer first to determine time to clear (TTC). Then the belt speed of the developer is adjusted so that exposed part is developed at 1.5xTTC. Once the part is developed and water rinsed, excess water should be removed immediately by blowing with an air gun. The preferred solution temperature should be maintained at 85°F (30°C).

Considering that vias will become slightly bigger after firing due to shrinkage, it is recommended to adjust the exposure/development condition such that after development, via size is slightly smaller than artwork.

Firing

Fire each dielectric print separately in a well ventilated conveyor furnace, in air. A 30 minute cycle with a peak temperature of 850°C held for 10 minutes should be used.

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 three months from date of shipment. Some settling of solids may occur and compositions should be thoroughly mixed prior to use.

Safety and Handling

For Safety and Handling information pertaining to this product, read the Material Safety Data Sheet (MSDS).



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Trouble-shooting/recommendation

Problem	Indication	Solution
3 mil via is not formed after development, other vias are smaller than artwork	Over exposed or under developed	Fix development time, decrease exposure time or vice versa
3 mil via is formed, but larger than artwork	Under exposed or over developed	Fix development time, increase exposure time
Film washed away partially or completely	Under exposed	Increase exposure time
Film did not wash away, but none of the vias developed	Over exposed	Decrease exposure time
Film washed away partially, no vias developed	Film too thick	Adjust print thickness
Film washed away at any exposure time	Over dried	Decrease drying temperature and/or length of time
Film sticks to phototool	Under dried	Increase drying time



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