



DuPont Electronic Materials

7401 Glass Encapsulant

Thick Film Composition/ Preliminary Data Sheet

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, details of which are available upon demand.

Product Description

High temperature glass encapsulant composition 7401 is intended for use as an insulating and protective layer over hybrid circuits and resistor networks. 7401 has been designed to be compatible with 7400 surge resistor series. As well as providing a dense hermetic fired film. 7401 has been specifically formulated to allow resistors to be laser trimmed through the encapsulant. 7401 is applied to ceramic substrates by screen printing and fired in an air (oxidising) atmosphere.

Major Features:

- Lead, nickel, and cadmium free
- Blue colour
- Thin, dense fired film
- Fired at a peak temperature of 850°C
- Provides excellent high voltage pulse stability when used in conjunction with 7400 Series surge resistors
- Laser trimmable

Composition properties

Viscosity

100 - 250 Pa.s, Brookfield HBT, Utility cup & spindle (SC4-14/6R), 10rpm, 25°C ±0.2°C.

Thinner

7401 is optimised for screen printing and thinning is not normally required. DuPont Electronics Composition Thinner 4553 may be used sparingly for slight adjustments to viscosity or to replace evaporation losses. However, the use of too much thinner or the use of a non-recommended thinner may affect the rheological behaviour of the material and its printing characteristics.

Coverage

160-180 cm²/g based on a fired film thickness of 12µm.

Compatibility

Encapsulant 7401 is designed to be compatible with Dupont 7400 Series surge resistor compositions. Whilst DuPont has tested these compositions with the materials specified and under the recommended processing conditions, it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layouts.

It is therefore essential that customers thoroughly evaluate the materials in their specific situations, in order to completely satisfy themselves with the overall quality and suitability of the compositions for their intended application(s)

Recommended processing procedure

Storage

Containers of 7401 may be stored in a clean, stable environment at room temperature (<25°C), with their lids tightly sealed. Storage in freezers (temperature <0°C) is NOT recommended, as this could cause irreversible changes in the material.

Jar rolling is unnecessary and is NOT recommended, as this could change the rheology of the material.

For guidance regarding storage of material in refrigerators (0°C to +6°C), consult DuPont Technical Note EUT 7.2 "Shelf Life Policy".

Shelf life

Encapsulant composition 7401 has a shelf life of 6 months from date of shipment, for factory-sealed (unopened) containers, stored under room temperature conditions.

Printing

Encapsulant composition 7401 should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Care must be taken to avoid air-bubble entrapment. Printing should be carried out in a clean, well-ventilated area.

Additional information on requirements for printing areas is contained in DuPont Technical Guide, EUT 7.3 "Processing-Screen Printing Rooms", available on request.

Note: optimum printing characteristics of 7401 are generally achieved in the temperature range 20°C-23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing.

7401 encapsulant should be printed with a 325 mesh stainless steel screen, to obtain a fired thickness of 10-14µm.

Drying

Allow prints to level for 5-10 minutes at room temperature in a clean, draught-free environment, followed by drying for 10-15 minutes at 150°C in a well ventilated oven or conveyor dryer.

Firing

Fire in a well ventilated belt or conveyor furnace in air with a 30 minute cycle with a peak of 850°C held for 10 minutes. Predictable shifts in resistance values of 7400 series resistors will occur after encapsulation, typical changes are shown in the table below.

Care must be taken to ensure that any gases/vapours from other chem-

icals/materials (e.g. halogenated solvents) do not enter the furnace muffle. It is also essential that the air supply to the furnace is clean, dry and free of contaminants.

Air flows and extraction rates should be optimised to ensure that oxidising conditions exist within the muffle, and that no furnace exhaust gases enter the room.

Additional information on requirements for firing is contained in DuPont Technical Guide EUT 7.4 "Process Guide-Firing".

Resistance change on overglaze firing⁽¹⁾

Resistor	ΔR
7410	<5%
7420	<5%
7450	<5%
7499	<5%
743R	<10%

⁽¹⁾ Termination QM21 prefired using a 30 minute cycle. Resistor and encapsulant fired using a 30 minute cycle.

Laser Trimming

Laser trimming of resistors encapsulated with 7401 should be carried out at higher power setting than is normally used with low firing encapsulants. Typical conditions that have

been used for 7401 encapsulant at 12µm fired thickness with 7400 Series resistors are as follows: bite size 4-5µm, pulse frequency 4-5 kHz; average power 4.0-5.0 W, giving trim speeds of up to 25mm/s.

General

Yields and performance will depend to a large degree on the care exercised during processing, particularly in screen printing. Scrupulous care should be taken to keep the conductor composition, printing screens and other tools free of metal contamination.

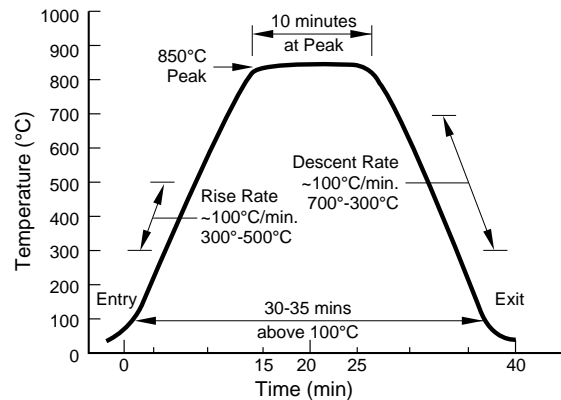
Dust, lint and other particulate matter may also contribute to poor yields.

Health/Safety considerations

DuPont microcircuit compositions are intended for use in an industrial environment by trained personnel. All appropriate health/safety regulations regarding storage, handling and processing of such materials should be complied with.

For information on health/safety regulations, please refer to the specific MSDS for 7401 and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".

Typical 30 Minute Profile



This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experimentation. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience become available. Since we cannot anticipate all variations in actual end-use conditions, DuPont makes no warranties and assumes no liability in connection with any use of this information. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right. **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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