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

Product Benefits
- Lead, nickel, and cadmium free
- Blue color
- Thin, dense fired film
- Fired at a peak temperature of 850ºC
- Provides excellent high voltage pulse stability when used in conjunction with DuPont 7400 series surge resistors
- Laser trimmable

Compatibility
Encapsulant DuPont 7401 is designed to be compatible with DuPont 7400 series surge resistor compositions.

Processing
Thinner
DuPont 7401 is optimized for screen printing and thinning is not normally required. DuPont 4553 thinner, may be used sparingly for slight adjustments to viscosity or to replace evaporation losses.

Printing
Encapsulant composition DuPont 7401 should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic) for 1-2 minutes. Care must be taken to avoid air-bubble entrapment. Printing should be carried out in a clean, well-ventilated area. Note: optimum printing characteristics of DuPont 7401 are generally achieved in the temperature range 20ºC - 23ºC. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing. DuPont 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, environment, followed by drying for 10-15 minutes at 150ºC in a well ventilated oven or conveyor dryer.

Table 1
Composition Properties

<table>
<thead>
<tr>
<th>Test</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity (Pa.S) (Brookfield HBT, 10 rpm, SC4-14/6R, 25°C)</td>
<td>100 - 250</td>
</tr>
<tr>
<td>Coverage¹ (cm³/g)</td>
<td>160 - 180</td>
</tr>
<tr>
<td>Thinner</td>
<td>DuPont 4553</td>
</tr>
</tbody>
</table>

¹based on a fired film thickness of 12µm

Table 1 shows anticipated typical physical properties for DuPont 7401 based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.
**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 (See figure 1). Predictable shifts in resistance values of DuPont 7400 series resistors will occur after encapsulation, typical changes are shown in the table below.

Care must be taken to ensure that any gases/vapors from other chemicals/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 optimized to ensure the oxidizing conditions exist within the muffle, and that no furnace exhaust gases enter the room.

**Laser Trimming**

Laser trimming of resistors encapsulated with DuPont 7401 should be carried out at higher power setting than is normally used with low firing encapsulants. Typical conditions that have been used for DuPont 7401 encapsulant at 12µm fired thickness with DuPont 7400 series resistors are as follows: bite size 4-5 µm, pulse frequency 4-5kHz; average power 4.0-5.0 W, giving trim speeds of up to 25 mm/s.

**General**

Yields and performance will depend to a large degree on the care excised during processing, particularly in screen printing. Great 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.

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### Resistance change on overglaze firing²

<table>
<thead>
<tr>
<th>Resistor</th>
<th>∆R</th>
</tr>
</thead>
<tbody>
<tr>
<td>7410</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>7420</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>7450</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>7499</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>743R</td>
<td>&lt;10%</td>
</tr>
</tbody>
</table>

² Termination 7484 prefired using a 30 minute cycle. Resistor and encapsulant fired using a 30 minute cycle

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**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.

**Safety and Handling**

For Safety and Handling information pertaining to this product, read the Material Safety Data Sheet (MSDS).
For more information on DuPont 7401 or other DuPont Microcircuit Materials products, please contact your local representative:

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

**Europe**
Du Pont (U.K.) Limited  
Coldharbour Lane  
Bristol BS16 1QD  
U.K.  
Tel.: 44-117-931-3191

**Asia**
DuPont Kabushiki Kaisha  
Sanno Park Tower, 11-1  
Nagata-cho 2-chome  
Chiyoda-ku, Tokyo 100-611  
Japan  
Tel.: 81-3-5521-8650

DuPont Taiwan Ltd  
45, Hsing-Pont Road,  
Taoyuan, Taiwan 330  
Tel.: 886-3-377-3616

DuPont China Holding Co. Ltd  
Bldg 11, 399 Keyuan Rd., Zhangji Hi-Tech Park, Pudong New District, Shanghai 201203, China  
Tel.: 86-21-6386-6366 ext.2202

DuPont Korea Inc.  
3~5th Floor, Asia tower #726,  
Yeoksam-dong, Gangnam-gu  
Seoul 135-719, Korea  
Tel.: 82-10-6385-5399

E.I. DuPont India Private Limited  
7th Floor, Tower C, DLF Cyber Greens, Sector-25A, DLF City, Phase-III, Gurgaon 122 002 Haryana, India  
Tel.: 91-124-4091818

Du Pont Company (Singapore) Pte Ltd  
1 HarbourFront Place, #11-01 HarbourFront Tower One, Singapore 098633  
Tel.: 65-6586-3022

http://mcm.dupont.com  

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