



QQ550 Cadmium-free Low Temperature Glass Encapsulant

Thick Film Composition 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

Low temperature cadmium-free glass encapsulant composition QQ550 is intended to form an insulating and protective layer over thick film circuits and especially over thick film resistors that are laser trimmed. It is applied to ceramic substrate by screen printing and fired in a conveyor furnace in an air (oxidising) atmosphere.

Key Features:

- Cadmium-free product
- Protection against environmental conditions
- Protection against reactive chemicals and potting compounds
- Easy burn-out of organic vehicle
- Fireable on a firing cycle with a peak temperature around 500°C
- Low firing temperatures gives predictable changes in resistance values of 1-5%
- Smooth surface

Design notes

When firing to avoid entrapment of organics in the fired film, where possible it is advisable to allow adequate time (5-10 minutes) during heating 300°C to 400°C (This would also extend the overall firing time) Predictable changes in

Composition Properties

Viscosity [Pa.s] Brookfield HBT, Utility cup & spindle (SC4-14/6R), 10 rpm, 25°C ± 0.2°C	90 - 130
Coverage [cm²/g]* Calculated value based on a 35µm wet film thickness	130
Thinner	8250
Shelf Life [months]	6

Processing Conditions

Printing	325 mesh stainless steel screen
Drying	Allow prints to level for 5-10 minutes at room temperature, then dry for 10-15 minutes at 150°C
Firing	Peak temperature 500-510°C without dwelling at peak temperature with a total cycle time of 20-25 minutes, in an air atmosphere

Typical Fired Properties¹

Fired Thickness [µm]	12
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¹ Typical properties are based on laboratory data using recommended processing procedures.

resistance values will occur during encapsulation, typically 1 to 5 % - depending on the resistor composition and firing temperature.

Fired films of QQ550 should appear light green in colour and vary from a matt surface when fired at 475°C to a glossy surface when fired at 525°C Laser trimming of resistors encapsulated with QQ550 is generally similar to that of unencapsulated resistors. As long as the encapsulant thickness is about 12µm or less

(typically about 10-12µm) only a modest increase in laser beam power or change in other operating parameters will be required. Clean, continuous cuts with a minimum heat affected area adjacent to the cut show the best resistor stability. Optimum settings will vary with the laser trimming used and production rate desired. Generally, beam power, pulse frequency and trimming speed should be set to maximise peak power while minimising average power. In order to

achieve this condition, the pulse frequency should be maintained at its lowest level consistent with the development of a clean cut.

Compatibility

Whilst DuPont has tested this composition with 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 material in their specific situations in order to completely satisfy themselves with the overall quality and suitability of the composition for its intended application(s).

Recommended Processing Procedure

Storage

Containers may be stored in a clean, stable environment at room temperature ($< 25^{\circ}\text{C}$), with their lids tightly sealed. Storage in freezers (temperature $< 0^{\circ}\text{C}$) is NOT recommended as this

could cause irreversible changes in the material.

For guidance regarding storage of material, please consult DuPont Technical Note EUT 7.2 "Shelf Life Policy".

Shelf life

This composition's shelf life is from date of shipment, for factory-sealed (unopened) containers, stored under room-temperature conditions. Refer to table - for shelf life period.

Substrates

Substrates of different compositions and from various manufacturers may result in variations in performance properties.

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 behaviour of the material and its printing characteristics. Refer to table - "Composition Properties"

Printing

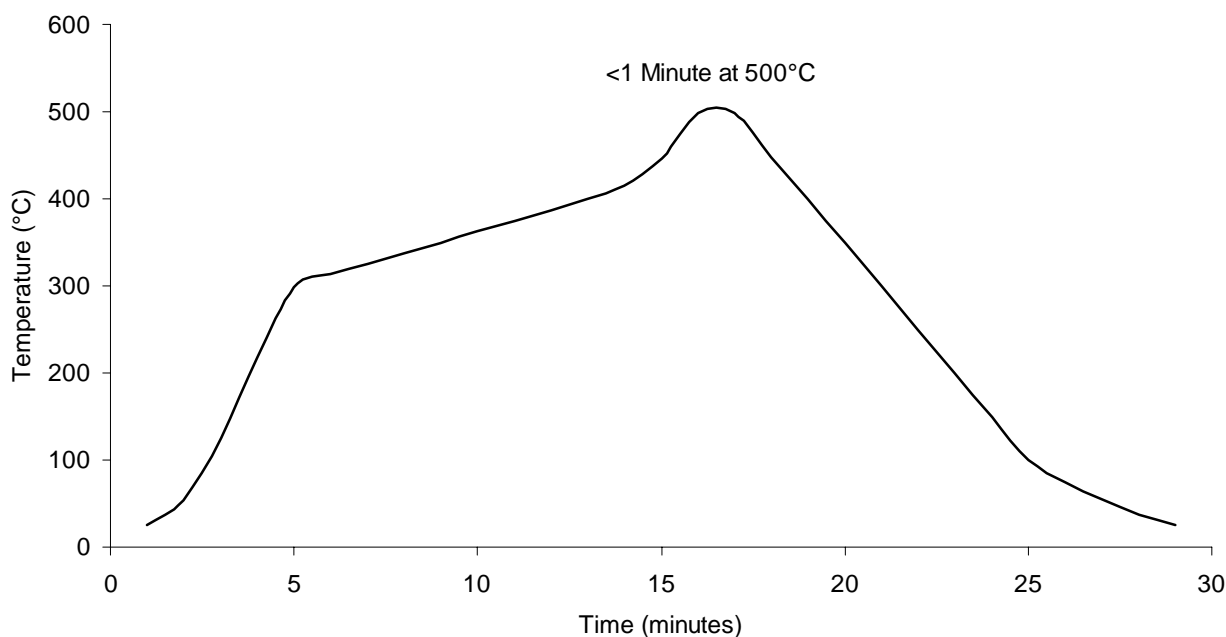
The composition should be thoroughly mixed before use. This is best achieved by slow, gently, hand stirring with a clean burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Care must be taken to avoid air entrapment.

Printing should be performed in a clean and 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 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.

Class 10,000 printing area is recommended for building

QQ550 Recommended Firing Profile



complex hybrids and multilayer circuits, otherwise severe yield losses could occur. Refer to table - "Processing Conditions"

Drying

Allow prints to level at room temperature, then dry in a well ventilated oven or conveyor dryer. Refer to table - "Processing Conditions"

Firing

Fire in a well ventilated belt, conveyor furnace, or static furnace. Air flows and extraction rates should be optimized to ensure that oxidizing conditions exist within the muffle, and that

no exhaust gases enter the room.

Full information on requirements for firing is contained in DuPont Technical Guide EUT 7.4 "Process Guide - Firing". Refer to table - "Processing Conditions"

General

Performance will depend to a large degree on care exercised in screen printing. Scrupulous care should be taken to keep the 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 thick film 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 product MSDS and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".

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.**