

DuPont Microcircuit Materials

THICK FILM COMPOSITION

HFB Series Buried Resistors - 943 Low Loss Green Tape™ System

Product Description

The HFB Series Buried Resistors are intended for preparing co-fired, buried resistors in 943 Low Loss Green Tape™ laminates. HFB12 (25Ω/sq) and HFB22 (200Ω/sq) resistors are blendable using normal techniques, allowing intermediate resistance values to be achieved. Conventional laser trimming techniques are not generally applicable for buried resistors.

Product Benefits

HFBXX resistors offer the following benefits:

- Small Size Resistors
- Pb-free compositions
- Firing at 850° C
- Compatible with 943 Green Tape™

Processing

Compatibility

DuPont has tested these compositions with the specified materials and the recommended processing conditions. It is impractical to cover every combination of materials, customer processing conditions and circuit layout. It is therefore essential that customers thoroughly evaluate the material in their specific situations to completely satisfy themselves with the overall quality and suitability of the composition for its intended application (s).

Composition Properties

Test	Specifications
Viscosity (Pa.S) Brookfield HBT, UC&SP, 10 RPM, 25°C	150 - 250
Coverage (cm ² /g)	100 - 120
Thinner	8250

Table 2 - Typical Fired Resistor Properties ¹

HFBXX	HFB12	HFB22
Sheet resistance (Ω/sq)	25	200
Shipping specification (Ω/sq)	20 - 30	160 - 240
ΔR after 1 refire (%)	-25 to -35	-32 to -42
ΔR after 2 refires (%)	-38 to -48	-48 to -58
ΔR after 3 refires (%)	-50 to -60	-60 to -70
Effect of reducing resistor size. ΔR(%) 40x40mil to 10x10mil resistor.	+40 to +55	+40 to +55
<small>¹The above data were obtained using HF502 gold termination with a 18μm dried resistor thickness and a resistor geometry of 1x1mm (40x40mil).</small>		

Table 1 & 2 shows typical physical properties for HFBXX

Thinner

These compositions are 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 non-recommended thinner may affect the rheological behavior of the material and its printing characteristics.

Printing

The HFBXX resistor compositions should be thoroughly mixed before use. This is best achieved by slow, gentle, hand stirring with a clean burr-free flexible plastic spatula for 1-2 minutes. Care must be taken to avoid air entrapment.

Terminations

HFBXX resistors are compatible with HF502 Au and HF612 Ag conductor terminations. The reported properties are based on tests using HF502 Au conductor terminations. Slightly higher resistance values are observed with HF612 Ag conductor terminations.

Drying

Allow prints to level for 5-10 minutes at room temperature in a clean, draft-free environment, then dry in a well-ventilated oven or conveyor dryer.

Firing

Consult the 943 Low Loss Green Tape™ datasheet for recommended firing conditions for HFBXX series resistors.

Fire in a well-ventilated belt, conveyor furnace, or static furnace. Airflows and extraction rates should be optimized to ensure that oxidizing conditions exist within the muffle, and that no exhaust gases enter the room. Resistor compositions must be fired in clean air. Insufficient airflow or pollution of the air in the furnace may result in shifts in resistance and other fired resistor properties. Variations in firing temperature profile may result in variations in the final fired properties of the resistor.

Storage and Shelf Life

Containers should be stored, tightly sealed, 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.

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. Contact DuPont Customer Service for product specific shelf life restrictions.

Safety and Handling

DuPont thick film and Green Tape™ products are intended for industrial use by trained personnel. These products contain organic and inorganic ingredients. It is important for workers to avoid overexposure to chemicals contained in these products or chemicals that might become available when processing them. Overexposure to other materials used in the operation should also be avoided, for example, cleaning solvents and degreasing fluids.

Well-designed area and personal air sampling/analysis can show if exposures are within required and recommended limits. Properly designed engineering controls, such as local ventilation and process enclosures, are effective in limiting employee exposure and to avoid the creation of hazardous conditions (e.g. forming an explosive vapor concentration). Engineering controls and procedures must comply with all applicable federal, state and local safety, health and environmental laws and regulations.



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The following additional precautions should be taken when handling these products:

- Read the Material Safety Data Sheet (MSDS) and product labels before using the products;
- Use appropriate personal protective equipment (PPE) and practice good industrial hygiene. DO NOT INGEST! DANGEROUS IF SWALLOWED!
- Keep product container closed when not in use to prevent solvent evaporation and spilling hazards;
- If contact with skin occurs, wash affected area immediately with soap and water
- Avoid prolonged breathing of vapors and dusts/particulate. Keep exposure levels within the required or recommended limits. Always use sufficient ventilation as noted above.

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

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