Micromax™ HFB21

Electronic Inks and Pastes

Buried Resistors

The Micromax™ HFB Series buried resistors are designed to be co-processed with the Micromax™ GreenTape™ 9K7 low temperature co-fired ceramic system as an integral component of the fired tape structure. The series is comprised of 5 members ranging from 25Ω to 1000Ω per square. Adjacent members are blendable to achieve intermediate values. Due to the nature of the buried resistor applications, conventional laser trimming techniques are not applicable. The buried resistors should be positioned symmetrically within the stacked tape layers.

Product benefits

- Small size resistors
- Firing at 850 °C
- Compatible with Micromax™ GreenTape™ 9K7
- Lead, Cadmium, Nickel and Phthalate free*

* Lead, Cadmium, Nickel and Phthalate 'free' as used herein means that lead, cadmium, nickel and phthalate are not intentional ingredients in and are not intentionally added to the referenced product. Trace amount however may be present.

Product information

Solvent or thinner	Micromax™ 8250
Blend member or series	HFBXXsrs

Rheological properties

Viscosity	150 - 250[1]	Pa.s

[1]: Brookfield HAT, UC&SP, 10 rpm, 25 °C

Application technique

Drying time	10	min
Drying temperature	80 - 120	°C
Theoretical coverage	100 - 120	cm^2/g

Electrical properties

Surface resistivity	90000 - 110000	mOhm per square

Storage and stability

Shelf life	6[2]	months

[2]: in unopened containers, from date of shipment, at temperature <25 °C

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Additional information

How to use

Processing

- Terminations
  - The Micromax™ HFB Series resistors are compatible with gold and silver conductor terminations. The reported properties are based on tests using the Micromax™ LL505 gold conductor terminations. Slightly higher resistance values are observed with Micromax™ LL612 silver conductor terminations.
- Printing
  - The resistor compositions should be thoroughly mixed prior to use. This is best achieved by slow, gentle hand stirring using a clean, burr-free spatula (flexible plastic or stainless steel) for 1-2 minutes. Care should be taken to avoid air entrapment.
  - Printing should be performed in a clean, well-ventilated area where the room temperature is 20-23°C. For optimum control and print reproducibility, the paste materials should be stored within this temperature range prior to use. Control of print thickness is essential to obtain predictable and reproducible fired resistor properties.
- Thinning
  - The compositions are optimized for screen printing and thinning is not normally required. Use the recommended Micromax™ thinners to make slight viscosity adjustments or replace solvent losses due to evaporation. The use of too much thinner or non-recommended thinners may affect the materials' rheological and printing properties.
- Drying
  - Allow wet prints to level at room temperature; then dry in a well-ventilated oven or conveyer dryer for 10 minutes at 80-120°C.
- Firing
  - Fire in a well ventilated belt or static furnace at the recommended Micromax™ GreenTape™ 9K7 850°C profile. Air flows and extraction rates should be optimized to ensure that oxidizing conditions exist and no exhaust gases enter the room.
  - Insufficient airflow or a polluted atmosphere within the furnace may result in shifts in resistivity or TCR values. Refer to the Micromax™ GreenTape™ 9K7 data sheet for the recommended firing profiles. Profile variations may be necessary to accommodate the size of the laminates to be cofired.

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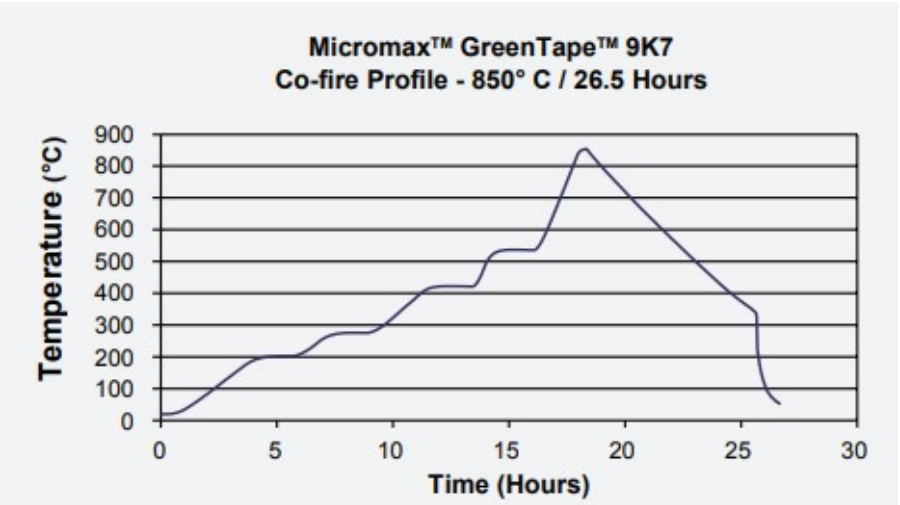

850C / 26.5 Hour Co-fire Profile Control Points			
Segment	**Temperature (°C)**	**Time (min.)**	**Ramp Rate (°C / min.)**
1	25 - 195	260	0.7
2	Hold 195 - 210	95	-
3	210 - 265	80	0.7
4	Hold 265 - 275	110	-
5	275 - 415	150	0.9
6	Hold 415 - 420	115	-
9	420 - 530	58	1.9
10	Hold 530 - 535	105	-
11	535 - 850	125	2.5
12	Hold 850	20	-
13	850 - 300	420	-1.3

Properties

Typical Fired Properties*1

Test	Properties
Termination	LL505 Au
ΔR after 1 refire (%)	-5 to -15
ΔR after 2 refire (%)	-15 to -15
ΔR after 3 refire (%)	-25 to -35

*1 The above date were obtained using Micromax™ HF502 gold termination with a 18µm dried

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resistor thickness and a resistor geometry of 1mm x 1mm (40 x 40mil).

Information in this datasheet shows anticipated typical physical properties for Micromax™ HFBXX series based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.

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.

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 Safety Data Sheet (SDS).