Celanese
The chemistry inside innovation™

Micromax™ 4331

Electronic Inks and Pastes

1Ω/sq - 1MΩ/sq Resistors For Cermet Trimmers And Potentiometers

Micromax™ 4300-Series Resistors are cadmium free* and designed for use in high performance cermet trimmers and potentiometers. Micromax™ 4300-Series Resistors are intended to be applied to ceramic substrates by screen printing and fired in a conveyor furnace in an air (oxidizing) atmosphere, to form specific resistive elements.

Product benefits

- Cadmium free*
- Improved low ohm performance
- Suitable for various wiper materials including stainless steel
- Excellent contact resistance variation (CRV), rotational life, and solder dip stability
- Compatible with high silver containing conductors
- Fast Firing - 850°C, 30 min profile

*Cadmium 'free' as used herein means that this is not intentionally added to the referenced product. Trace amount however may be present.

Product information

Solvent or thinner	Micromax™ 8250
Blend member or series	4300srs

Rheological properties

Viscosity	120 - 200[1]	Pa.s

[1]: Brookfield HAT, UC&SP, SC4-14/6R, 10 rpm, 25°C ± 0.2°C

Application technique

Mask mesh	325	
Mask emulsion	10 - 16	µm
Drying time	10 - 15	min
Drying temperature	150	°C
Theoretical coverage	95[2]	cm^2/g
Recommended film thickness, dried	23 - 27	µm
Leveling time	10 - 15	min

[2]: based on average fired thickness of 10µm for pads

Electrical properties

Surface resistivity	300000 - 1.2E6[3]	mOhm per square
Hot Temperature Coefficient Resistance	-200 - 200[4]	ppm/K
Cold Temperature Coefficient Resistance	-200 - 200[5]	ppm/K
Short Term Overload Voltage	≥30	V/mm

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Standard Working Voltage	12[7]	V/mm
Maximum Rated Power Dissipation	144[8]	m/(W.mm²)

[3]: 10 x 1.25mm resistor; Micromax™ 7780 termination, tolerance

[4]: at +25°C to +125°C

[5]: at -55°C to +25°C

[6]: short time overload voltage; 5 sec pulse sufficient to cause 0.25% change in resistance

[7]: standard working voltage : 0.4 x STOL

[8]: maximum rated power dissipation; SWV^2 / R (ohms)

Storage and stability

Shelf life	6[9]	months

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

Additional information

How to use

Processing

- Blendability
  - Adjacent members of Micromax™ 4300-Series are blendable.
- Substrates
  - Properties are based on tests using 96% alumina substrates. Substrates of other compositions and from various manufacturers may result in variations in performance properties. Care must be taken to avoid air-bubble entrapment. It is the responsibility of users to determine the effects of the above variables in their particular situations.
- Printing
  - Micromax™ 4300-Series Resistor compositions should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean, burr-free spatula (flexible plastic) for 0.5-1 minute.
  - Note : Optimum printing characteristics of Micromax™ 4300-Series Resistors are generally achieved in the temperature range 20-23°C. Specified properties are based on resistors printed to 23-27µm dried print thickness. This is generally achieved using a 325-mesh stainless steel screen with a 10-16µm emulsion thickness. Control and reproducibility of print thickness is essential to obtain predictable, reproducible fired resistor properties.
- Drying
  - Allow the wet print to level for 10-15 minutes at room temperature in a clean draft free environment, followed by drying for 10-15 minutes at 150°C in a well ventilated oven or conveyor dryer.
- Firing
  - It is essential that the air supply to the furnace is clean, dry and

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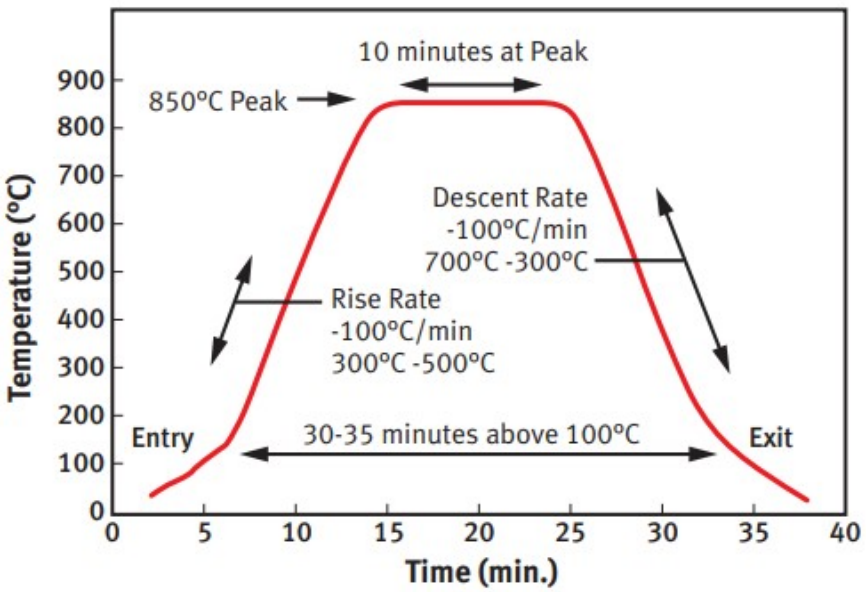
free of contaminants. Micromax™ 4300-Series Resistors are fired on a 30-minute firing cycle to a peak of 850°C held for 10 minutes.

- Variations in peak firing temperature may result in variations in the final fired properties. Resistor compositions must be fired in clean air. Insufficient airflow or pollution of the air in the furnace may result shifts of resistivity and TCR.

FIGURE 1. 30 MINUTES PROFILE



Properties

Typical Fired Properties

Test	Properties
CRV*[1] (%)	<1.0
Rotational Life*[1] (200 Cycle)	<1.0

*1 10 finger Paliney wiper; 50 gram force; 10 x 1.25mm resistor

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

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be thoroughly mixed prior to use.

Safety and handling

For safety and handling information pertaining to this product, read Safety Data Sheet (SDS).