

Micromax™ 2051

Electronic Inks & Pastes

PRODUCT DESCRIPTION

2000 Resistor Series

The Micromax™ 2000srs resistor compositions are intended to be applied to ceramic substrates by screen printing and fired in air to form resistors in hybrid microcircuits. The series offers versatility to the designer with improved TCR tracking between resistors of different size and value, and a choice of termination materials. Stability is outstanding either with or without encapsulation. To the manufacturer, Micromax™ 2000srs offers broad processing latitude.

Product benefits

- Excellent laser post-trim stability, encapsulated or unencapsulated
- HTCR's less than 50 ppm
- Small length and thickness effects on resistivity and TCR
- Small shifts of resistivity and TCR on refiring
- Compatible with Ag/Pt or Ag/Pd terminations
- Excellent noise characteristics

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

PRODUCT INFORMATION

General Properties	Value Unit
Application	Hybrid resistor
Solvent or thinner	Micromax™ 4553
Blend member or series ¹	2000 Resistor Series

TECHNICAL DATA

Rheological Properties	Value Unit
Viscosity ²	140 to 220 Pa.s

Application Technique	Value Unit
Mask mesh ³	325
Mask emulsion	10 to 15 μm
Drying time	10 to 15 min
Drying temperature	150 to 170 $^{\circ}\text{C}$
Theoretical coverage	141 cm^2/g
Shrinkage	53 %
Shrinkage	39 %
Electrical Properties	Value Unit
Resistivity ⁴	90 to 110 kOhm per square
Hot Temperature Coefficient Resistance ⁵	0 to 50 ppm/ $^{\circ}\text{C}$
Cold Temperature Coefficient Resistance ⁶	≥ -75 ppm/ $^{\circ}\text{C}$
Electrostatic discharge ⁷	≤ 0.1 (avgDeltaR)(%)
Noise ⁸	-9 dB
Short Term Overload Voltage ⁹	370 V/mm
Standard Working Voltage ¹⁰	148 V/mm
Maximum Rated Power Dissipation ¹¹	150 m/(W.mm ²)
Storage and Stability	Value Unit
Shelf life ¹²	6 months

¹Blend Series A+B

²Brookfield HAT, UC&SP; [SC4-14/6RI], 10 rpm, 25 $^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$

³Screen Types: Stainless steel

⁴Sheet resistance values are normalized to 20 μm dried thickness.

⁵TCR measured in the ranges 25 $^{\circ}\text{C}$ to 125 $^{\circ}\text{C}$

⁶TCR measured in the ranges -55 $^{\circ}\text{C}$ to 25 $^{\circ}\text{C}$

⁷ESD measured on 1 mm x 1 mm resistor trimmed to 1.5x fired value with a single plunge cut @1x5kv pulse

⁸Quan-Tech noise measured on untrimmed resistors

⁹Short term overload voltage: voltage required in a 5 second duration to induce a resistance change at 25 $^{\circ}\text{C}$ of 0.25% in a 1mm x 1mm resistor trimmed to 1.5x fired value with a single plunge cut

¹⁰Standard working voltage = 0.4 x short term overload voltage

¹¹Maximum rated power dissipation = (standard working voltage)² / resistance

¹²in unopened containers, from date of shipment, stable environment at room temperature between 5 $^{\circ}\text{C}$ - 30 $^{\circ}\text{C}$

PROCESSING GUIDELINES

Terminations

The reported properties are based on tests using Micromax™ 7484 Ag/Pd conductor compositions as the termination material, prefired at 850°C. Use of different terminating material may cause a shift of resistance and TCR values from those stated.

Blendability

Two parallel low ends to Micromax™ 2000 Series are offered. These cannot be interchanged. Therefore the following members are bendable together A) Micromax™ 2004R/ 2009/ 2019/ 2031/ 2041/ 2051/ 2061/ 2071 or B) Micromax™ 2004/ 2011/ 2015/ 2021/2031 2041/ 2051/ 2061. Only adjacent members are bendable.

Substrates

Properties are based on tests on 96% alumina substrates. Substrates of other compositions and from various manufacturers may result in variations in performance properties, as may different lots of substrates, and any subsequent processing of substrates (e.g. laser scribing or drilling) prior to printing. It is the responsibility of users to determine the effects of any of the above available in their particular situations.

Printing

325 mesh stainless steel screen with 10-15 µm emulsion. Print speeds of 10-20 cm/s may be used. Control and reproducibility of print thickness are essential to obtain predictable, reproducible fired resistor properties.

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) for 0.5 - 1 minute. Care must be taken to avoid air entrapment. Printing should be performed in a clean and well ventilated-area.

Note: The optimum printing characteristics are generally achieved in the room temperature range of 20°C - 23°C.

Drying

Allow prints to level at room temperature, then dry in air in a well-ventilated oven or conveyor dryer.

Firing

Fire in a well-ventilated belt, conveyor 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. Variation in the peak firing temperature and or time at the peak temperature may result in variations in the final fired properties.

Resistors compositions must be fired in clean dry air. Insufficient airflow or pollution of the air in the furnace may result in shifts in resistivity and TCR.

Encapsulant

In applications which require mechanical protection from extreme environments, low temperature encapsulant Micromax™ QQ550 or LF161 are recommended to be screen printed over the resistor and fired, prior to laser trimming.

Laser trimming

To ensure long term stability of the resistors and to achieve maximum trimming accuracy, it is necessary to optimize resistor geometry, cut geometry and trimming parameters. Parameters should be selected that achieve a clean laser cut (kerf). The preferred range of laser trim parameters are as follows: bite size 0.10 to 0.30 mils, power 1 - 3.0W at a frequency of 5Hz.

Properties

Information in this datasheet shows anticipated typical physical properties for Micromax™ 2000 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.

Storage and shelf life

Containers should be stored, tightly sealed, in a clean, stable environment at room temperature between 5°C - 30°C. Shelf life of material in unopened containers is 6 months from date of shipment. Some settling of solids may occur and compositions should be thoroughly mixed prior to use.

Storage conditions on the product data sheets are intended to represent long-term material storage recommendations and not a shipping or temperature-at-receipt requirement.

Transportation: Under normal shipping conditions, without temperature control, Micromax™ products are not expected to exhibit a change in quality or fitness for use. Should extraordinary events result in extended transportation periods, Micromax™ recommends customers confirm products remain suitable for the intended application.

Safety and handling

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

SAFETY & WARNING

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use.

Safety Data Sheets are available.

WASTE TREATMENT

Prior to using any recommendations or suggestions for waste treatment, the user is required to know the appropriate local/state/federal regulations for on-site or off-site treatment which may require permits. If there is any conflict regarding our recommendations, local/state/federal

regulations take precedence.

CONTACT INFORMATION

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE . Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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