

Micromax™ 1731

Electronic Inks and Pastes

Series 17 Resistors

High Reliability Hybrid Microcircuits And Precision Resistor Network 10Ω - 1MΩ/sq Silver Alloy Terminations

Micromax™ Series 1700 Resistor Compositions have been developed as part of a materials system for use in the manufacture of high reliability hybrid circuits requiring high stability, low TCR, and low process sensitivity.

Product benefits

- Post laser trim stability of less than 0.5% average ΔR under all standard testing conditions.
- TCRs of less than 100 ppm/°C, even with blends.
- Low sensitivity to variations in firing temperature, time at peak and resistor geometry.

Product information

Solvent or thinner
Blend member or series

Micromax™ 4036
17 Resistors Series ^[1]

[1]: Blend Member A

Rheological properties

Viscosity

145 - 210^[2] Pa.s

[2]: HAT UC & #14 Spindle, 10rpm, 25°C ± 1 °C

Application technique

Mask mesh

200^[3]

Mask emulsion

12 - 18 μm

Drying time

10 - 15 min

Drying temperature

150 °C

Theoretical coverage

80 - 110 cm²/g

Recommended film thickness, dried

22 - 28 μm

Leveling time

5 - 10 min

[3]: Screen Types: Stainless steel

Electrical properties

Surface resistivity

900000 - mOhm per
1.1E6^[4] square

Hot Temperature Coefficient Resistance

-50 - 50^[5] ppm/K

Cold Temperature Coefficient Resistance

-50 - 50^[6] ppm/K

Noise

-15^[7] dB

Short Term Overload Voltage

60^[8] V/mm

Standard Working Voltage

25^[9] V/mm

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Maximum Rated Power Dissipation $625^{[10]}$ m/(W.mm²)

[4]: Typical resistor properties based on laboratory tests using recommended processing conditions: terminations : Micromax™ Palladium/Silver Conductor Composition 9308 prefired at 850 °C; substrate : 96% alumina; printing : 200-mesh stainless steel screen (18 µm emulsion thickness) to a dried thickness of 25±3 µm; firing : 60-min cycle to peak temperature of 850 °C for 10 minutes. Shipping specifications. Resistor geometry : 1.5 mm x 1.5 mm.

[5]: Temperature Coefficient of Resistance 25 to 125 °C

[6]: Temperature Coefficient of Resistance -55 to 25 °C

[7]: Resistor geometry : 1 mm x 1 mm, Firing cycle, 60 minute cycle to peak temperature of 850 °C for 10 minutes.

[8]: Short Term Overload Voltage : required (5 second duration) to induce a resistance change of 0.25% in a 1 mm x 1 mm resistor at 25 °C.

[9]: Standard working voltage : 0.4 x Short Term Overload Voltage.

[10]: Maximum Rated Power Dissipation : (Standard Working Voltage)² / Resistance

Storage and stability

Shelf life $6^{[11]}$ months

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

Additional information

How to use

Processing

• Terminations

- Unless otherwise stated, reported properties are based on tests with Micromax™ 9308 silver/palladium conductor composition, prefired at 850 °C. Excellent results have also been obtained using other silver/palladium conductor compositions. The precious metal alloy compositions are prefired at 850 °C.

• Substrates

- Reported properties are based on tests on 96% alumina substrates. Substrates of other compositions and from various manufactures may result in variations in performance properties.

• Resistor geometry

- Micromax™ Series 1700 compositions are Quality Assurance tested using a 1.5 mm x 1.5 mm resistor with prefired silver/palladium Micromax™ 9308 terminations. Variations in resistor geometry will result in slight variations in resistivity and TCR.

• Printing

- Specified properties are based on resistors printed to 25±3 µm dried print thickness. This is readily achieved using 200-mesh stainless steel screens with 15±3 µm emulsion thickness. Nylon or polyester screens may be used in some applications although a lower mesh count of 150-175 will usually be required to achieve equivalent print thickness.

• Drying

- Prints should be allowed to level at room temperature and then

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dried.

- **Effect of variations in thickness**
 - Print thickness outside the 20-30 μm range may result in compromised TCR and/or stability characteristics.
- **Firing**
 - Micromax™ Series 1700 resistivity and TCR specifications are based on a 60-min firing cycle with a 10-min peak at 850 °C, 20 min above 800 °C and 30 min above 600 °C.
- **Refire sensitivity**
 - 10k Ω /sq or lower resistors change very slightly on refiring. The 100k and 1M Ω /sq resistors show significant increases in resistivity on refiring; however, TCR's remain well within the ± 100 ppm/°C limits.
- **Encapsulant**
 - In general, glass encapsulation is not required. However, in applications which require mechanical protection or protection from extreme environments such as high temperature nitrogen or forming gas, Micromax™ QQ550 encapsulant fired at 500 °C is recommended. Glass encapsulation of 1 mm x 1 mm resistors terminated with silver/palladium Micromax™ 9308 shifts the resistivity of Micromax™ Series 1700 resistors by less than 1%.

Properties

- Information in this datasheet shows anticipated typical physical properties for Micromax™ 1700 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 (<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).