

Micromax™ 1939R

Electronic Inks & Pastes

PRODUCT DESCRIPTION

Palladium Silver Multilayer Hybrid Microcircuits 10-1 M/ Ω /SQ; 30 Min Processing Over Dielectric

Micromax™ 1900 Resistor Series is part of a materials system for high stability, high reliability palladium silver multilayer hybrid circuits. This high-yield series exhibits low process sensitivity under high throughput conditions.

The other system components are palladium/silver conductor compositions Micromax™ 6134 and Micromax™ 7484R, and multilayer dielectric composition Micromax™ 5704. All materials are mutually compatible both in performance and in processing. All can be fired within a 30-min cycle.

Product benefits

- Phthalate and Cadmium free*
- Excellent post laser trim stability over Multilayer Dielectric Composition Micromax™ 5704 after thermal cycling and shock, and after long-term storage under test conditions that reflect typical circuit processing and operating conditions.
- TCRs of less than 0 ± 100 ppm/ $^{\circ}\text{C}$ with palladium silver terminations over Dielectric Micromax™ 5704.
- Excellent compatibility with Micromax™ palladium/silver and gold conductors and Micromax™ Dielectric 5704.
- Wide process latitude in production.

* Phthalate and Cadmium 'free' as used herein means that these are not intentionally added to the referenced product. Trace amounts however may be present.

Product characteristics (Stability)

After thermal shock

Thermal shock test conditions consisted of 30 cycles with 5 min at -65°C , transfer within 10 sec to 150°C and dwell of 5 min before transfer back to -65°C . The average resistivity changes are within $\pm 0.1\%$.

Solder dipping

Average $\Delta R\%$ on trimmed parts dipped into molten 62Sn/36Pb/2Ag solder at 225 +/- °C is typically <0.25%. Alpha 611 flux was used in this testing.

No load stability

Laser trim stability of Micromax™ 1900 Series Resistor compositions was tested under a variety of environmental conditions. 1mm x 1mm resistors were trimmed using a single plunge cut and stored up to 1000 hours at 25°C, 150°C, and 40°C/90%RH. Average $\Delta R\%$ was typically <0.5%.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

PRODUCT INFORMATION

Application	Hybrid resistor
Solvent or thinner	Micromax™ 8250
Blend member or series	1900srs

TECHNICAL DATA

Rheological Properties	Value	Unit
Viscosity ¹	145 to 210	Pa.s
Application Technique	Value	Unit
Mask mesh	200	
Mask emulsion	8 to 12	µm
Drying time	10 to 15	min
Drying temperature	150	°C
Theoretical coverage	70 to 110	cm ² /g
Recommended film thickness	22 to 28	µm
Leveling time	5 to 10	min
Electrical Properties	Value	Unit
Resistivity ²	8 to 12	kOhm per square
Hot Temperature Coefficient Resistance ³	-100 to 100	ppm/°C
Cold Temperature Coefficient Resistance ⁴	-100 to 100	ppm/°C
Short Term Overload Voltage ⁵	145	V/mm

Electrical Properties	Value	Unit
Standard Working Voltage ⁶	58	V/mm
Maximum Rated Power Dissipation ⁷	340	m/(W.mm ²)

Storage and Stability	Value	Unit
Shelf life ⁸	6	months

¹Brookfield HAT, UC&S, SC4-14/6RI, 10 rpm, 25°C

²Shipping specifications: Resistor geometry 1.5mm x 1.5mm

³temperature coefficient of resistance : 25 to 125°C

⁴temperature coefficient of resistance : -55 to 25°C

⁵short time overload voltage : the 5 sec, duration voltage required to induce a resistance shift of $\leq 0.25\%$

⁶standard working voltage : 0.4 x short term overload voltage

⁷maximum rated power dissipation : (standard working voltage)² / resistance

⁸in unopened containers, from date of shipment, stable environment at room temperature between 5°C - 30°C

PROCESSING GUIDELINES

Terminations

Unless otherwise stated, reported properties are based on tests using palladium/silver Conductor Composition Micromax™ 6134 prefired at 850°C with a 30-min profile.

Blendability

Micromax™ 1900-Series consist of two blendable sub-series.

The adjacent members of the group of compositions from 10Ω/sq through 3kΩ/sq (including Micromax™ 1911R, Micromax™ 1921, Micromax™ 1931 and Micromax™ 1933) are blendable with respect to resistivity and TCR.

The adjacent members of the group of compositions from 3kΩ/sq through 1MΩ/sq (including Micromax™ 1935R, Micromax™ 1939R, Micromax™ 1949R and Micromax™ 1959) are blendable with respect to resistivity and TCR.

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.

Dielectric

Reported properties are based on tests over Dielectric Composition Micromax™ 5704 fired at 850°C with a 30-min profile.

Printing

Specified properties are based on resistors printed to 25±3μm dried print thickness. This is readily achieved using 200-mesh stainless steel screens with 8-12μm emulsion thickness.

Effect of variations in thickness

Dried thickness outside the 22-28 μ m range may result in modified TCR and/or stability characteristics.

Drying

Prints should be allowed to level 5-10 min at room temperature and then dried 10-15 min at 150°C.

Firing

Micromax™ 1900-Series resistivity and TCR specifications are based on a 30-min firing cycle with 10 min at a peak temperature of 850°C.

Refire sensitivity

Effects of multiple firing at 850°C on resistivity and TCR may occur. Tests based on 1mm x 1mm resistors indicate minimal change to resistivity, however TCR values will typically become more positive with additional firings.

Encapsulant

In general, glass encapsulation is not required or recommended.

Resistor geometry

Micromax™ 1900-Series Resistor Compositions are Quality Assurance tested using a 1.5 mm x 1.5 mm resistor with pre-fired palladium/ silver Micromax™ 6134 termination over Dielectric Micromax™ 5704. Variations in resistor length will result in slight variations in resistivity. For optimum stability and TCR, resistor lengths of 1 mm or longer are recommended.

Laser trimming

To achieve optimum long-term stability of the resistors and maximum trimming accuracy, it is vital to get a clean laser cut (kerf) and it is recommended to cut into the dielectric by 6-8 μ m (0.3 mil). Micromax™ 1900-Series resistors have been successfully trimmed at a speed of 9-10 mm/sec, a frequency of 3 kHz and an average power of 0.8 - 1.2 W.

Properties

Typical resistor properties based on laboratory tests using recommended processing conditions

Termination: Micromax™ palladium/silver Conductor Composition Micromax™ 6134 pre-fired over Micromax™ Dielectric 5704 at 850°C

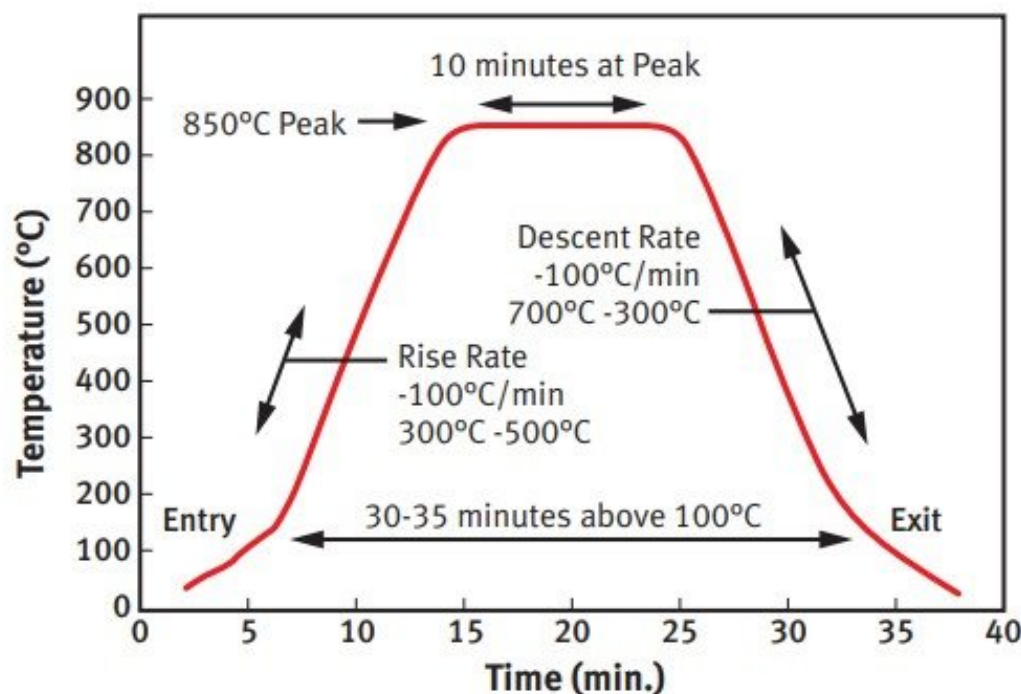
Substrate: 96% alumina

Printing: 200 mesh stainless steel screen (8-12 μ m emulsion thickness) to a dried thickness of 25 $\pm$ 3 μ m

Firing: 30 min cycle to peak temperature of 850°C for 10 min

Information in this datasheet shows anticipated typical physical properties for Micromax™ 1900 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.

FIGURE 1. 30 MINUTES PROFILE



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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