Micromax™ 1949R

Electronic Inks and Pastes

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/°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 ±0.1%.
- Solder dipping
  - Average ΔR% 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 ΔR% was typically <0.5%.

Product information

Solvent or thinner	Micromax™ 8250
Blend member or series	1900srs[1]

[1]: Blendable Series B

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Rheological properties

Viscosity	145 - 210[2]	Pa.s

[2]: Brookfield HAT, UC&S, SC4-14/6RI, 10 rpm, 25 °C

Application technique

Mask mesh	200	
Mask emulsion	8 - 12	µm
Drying time	10 - 15	min
Drying temperature	150	°C
Theoretical coverage	70 - 110	cm^2/g
Recommended film thickness, dried	22 - 28	µm
Leveling time	5 - 10	min

Electrical properties

Surface resistivity	8E7 - 1.2E8[3]	mOhm per square
Hot Temperature Coefficient Resistance	-100 - 100[4]	ppm/K
Cold Temperature Coefficient Resistance	-100 - 100[5]	ppm/K
Short Term Overload Voltage	245[6]	V/mm
Standard Working Voltage	98[7]	V/mm
Maximum Rated Power Dissipation	96[8]	$m/(W.mm^2)$

[3]: Shipping specifications : Resistor geometry 1.5mm x 1.5mm

[4]: temperature coefficient of resistance : 25 to 125 °C

[5]: temperature coefficient of resistance : -55 to 25 °C

[6]: short time overload voltage : the 5 sec, duration voltage required to induce a resistance shift of ≤ 0.25%

[7]: standard working voltage : 0.4 x short term overload voltage

[8]: maximum rated power dissipation : $(\text{standard working voltage})^2$ / resistance

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

- 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,

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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 22-28µm 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

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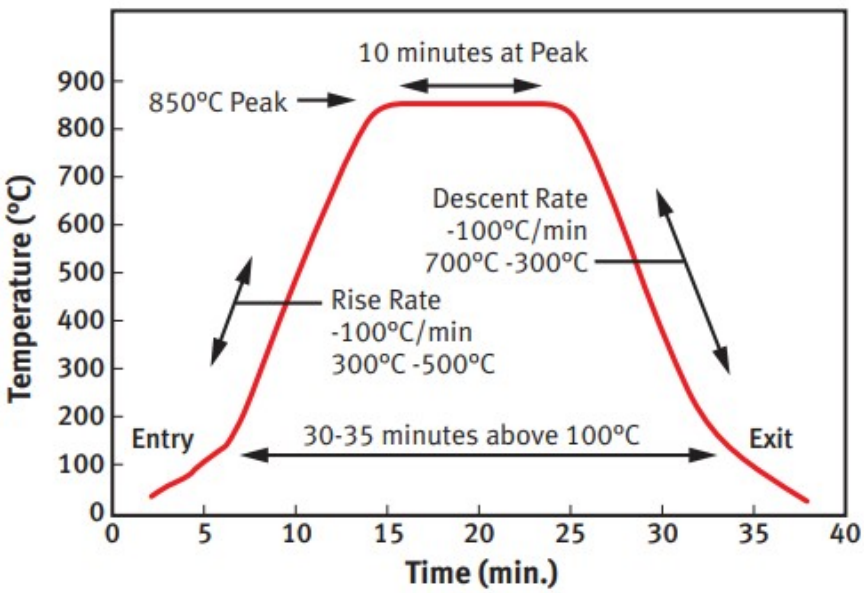
maximum trimming accuracy, it is vital to get a clean laser cut (kerf) and it is recommended to cut into the dielectric by 6-8µm (0.3 mil). Micromax™ 1900-Series resistors have been successfully trimmed at a speed of 9-10 mm/sec, a frequency of 3 kHz and an average power of 0.8 - 1.2 W.

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 (8-12µm emulsion thickness) to a dried thickness of 25 ± 3µm
  - 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



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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).