

# Micromax™ 1949R

## Microcircuit and Component Materials

### 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  $0 \pm 100$  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  $\pm 0.1\%$ .
- 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%.

### Product information

Solvent or thinner  
Blend member or series  
[1]: Blendable srs B

Micromax™ 8250  
1900srs<sup>[1]</sup>

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### Rheological properties

|                                                      |                               |
|------------------------------------------------------|-------------------------------|
| Viscosity                                            | 145 - 210 <sup>[2]</sup> 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 <sup>2</sup> /g |
| Recommended film thickness, dried | 22 - 28 μm                  |
| Leveling time                     | 5 - 10 min                  |

### Electrical properties

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

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

[4]: shipping specifications, temperature coefficient of resistance : -55 to 25 °C and 25 to 125 °C

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

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

[7]: maximum rated power dissipation : (standard working voltage)<sup>2</sup> / resistance

### Storage and stability

|                                                                            |                         |
|----------------------------------------------------------------------------|-------------------------|
| Shelf life                                                                 | 6 <sup>[8]</sup> months |
| [8]: in unopened containers, from date of shipment, at temperature <25 ° C |                         |

### Additional information

How to use

### Processing

#### • Termination

- 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 3 kΩ/sq (including Micromax™ 1911R, Micromax™ 1921, Micromax™ 1931 and Micromax™

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1933) are blendable with respect to resistivity and TCR.

- The adjacent members of the group of compositions from 3 kΩ/sq through 1 MΩ/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 maximum trimming accuracy, it is vital to get a clean laser cut

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(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  $25 \pm 3\mu\text{m}$
  - 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.

### 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).