

# Micromax™ 1739R

## Electronic Inks & Pastes

### PRODUCT DESCRIPTION

#### 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  $\Delta R$  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.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

### PRODUCT INFORMATION

|                        |                     |
|------------------------|---------------------|
| Application            | Hybrid resistor     |
| Solvent or thinner     | Micromax™ 4036      |
| Blend member or series | 17 Resistors Series |

### TECHNICAL DATA

| Rheological Properties | Value      | Unit |
|------------------------|------------|------|
| Viscosity <sup>1</sup> | 145 to 210 | Pa.s |

| Application Technique  | Value    | Unit |
|------------------------|----------|------|
| Mask mesh <sup>2</sup> | 200      |      |
| Mask emulsion          | 12 to 18 | μm   |

| Application Technique                                | Value Unit                   |
|------------------------------------------------------|------------------------------|
| Drying time                                          | 10 to 15 min                 |
| Drying temperature                                   | 150 °C                       |
| Theoretical coverage                                 | 80 to 110 cm <sup>2</sup> /g |
| Recommended film thickness                           | 22 to 28 µm                  |
| Leveling time                                        | 5 to 10 min                  |
| Electrical Properties                                | Value Unit                   |
| Resistivity <sup>3</sup>                             | 9 to 11 kOhm per square      |
| Hot Temperature Coefficient Resistance <sup>4</sup>  | -100 to 100 ppm/°C           |
| Cold Temperature Coefficient Resistance <sup>5</sup> | -100 to 100 ppm/°C           |
| Noise <sup>6</sup>                                   | -6 dB                        |
| Short Term Overload Voltage <sup>7</sup>             | 200 V/mm                     |
| Standard Working Voltage <sup>8</sup>                | 80 V/mm                      |
| Maximum Rated Power Dissipation <sup>9</sup>         | 426 m/(W.mm <sup>2</sup> )   |
| Voltage Coefficient of Resistance <sup>10</sup>      | -30 ppm                      |
| Storage and Stability                                | Value Unit                   |
| Shelf life <sup>11</sup>                             | 6 months                     |

<sup>1</sup>HAT UC & #14 Spindle, 10rpm, 25°C ± 1°C

<sup>2</sup>Screen Types: Stainless steel

<sup>3</sup>Typical resistor properties based on laboratory tests using recommended processing conditions: terminations : Micromax™ Palladium/Silver Conductor Composition 7484R 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.

<sup>4</sup>Temperature Coefficient of Resistance 25 to 125°C

<sup>5</sup>Temperature Coefficient of Resistance -55 to 25°C

<sup>6</sup>Resistor geometry : 1 mm x 1 mm, Firing cycle, 60 minute cycle to peak temperature of 850°C for 10 minutes.

<sup>7</sup>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.

<sup>8</sup>Standard working voltage : 0.4 x Short Term Overload Voltage.

<sup>9</sup>Maximum Rated Power Dissipation : (Standard Working Voltage)<sup>2</sup>/Resistance

<sup>10</sup>ppm/V/mm, Resistor geometry 1 mm x 1 mm laser trimmed with P-cut to 1.5x average fired value. VCR measured from 5-50 VDC.

<sup>11</sup>In 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 with Micromax™ 7484R 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 tested using a 1.5 mm x 1.5 mm resistor with prefired silver/palladium Micromax™ 7484R terminations. Variations in resistor geometry will result in slight variations in resistivity and TCR.

### Printing

Specified properties are based on resistors printed to  $25 \pm 3$   $\mu\text{m}$  dried print thickness. This is readily achieved using 200-mesh stainless steel screens with  $15 \pm 3$   $\mu\text{m}$  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 dried.

### Effect of variations in thickness

Print thickness outside the 20-30  $\mu\text{m}$  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 $\Omega$ /sq or lower resistors change very slightly on refiring. The 100k and 1M $\Omega$ /sq resistors show significant increases in resistivity on refiring; however, TCR's remain well within the  $\pm 100$  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™ 7484R 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 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

[www.macdermidalpha.com](http://www.macdermidalpha.com)

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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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