

Micromax™ 1713

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 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.

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 ¹	145 to 210	Pa.s

Application Technique	Value	Unit
Mask mesh ²	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 ² /g
Recommended film thickness	22 to 28 µm
Leveling time	5 to 10 min
Electrical Properties	Value Unit
Resistivity ³	27 to 33 Ohm per square
Hot Temperature Coefficient Resistance ⁴	-50 to 50 ppm/°C
Cold Temperature Coefficient Resistance ⁵	-50 to 50 ppm/°C
Noise ⁶	≤-30 dB
Short Term Overload Voltage ⁷	5 V/mm
Standard Working Voltage ⁸	2 V/mm
Maximum Rated Power Dissipation ⁹	135 m/(W.mm ²)
Storage and Stability	Value Unit
Shelf life ¹⁰	6 months

¹HAT UC & #14 Spindle, 10rpm, 25°C ± 1°C

²Screen Types: Stainless steel

³Typical 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.

⁴Temperature Coefficient of Resistance +25+125°C

⁵Temperature Coefficient of Resistance -55 to 25°C

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

⁷Short 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.

⁸Standard working voltage : 0.4 x Short Term Overload Voltage.

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

¹⁰in 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 ± 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 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

10kΩ/sq or lower resistors change very slightly on refiring. The 100k and 1MΩ/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™ 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

North America	Europe	Asia
470 Research Drive Wilmington, DE, USA 855.622.7813	Bristol & Bath Science Park Dirac Crescent, Emersons Green, Bristol, BS16 7FR, United Kingdom 44.117.4769148	No. 45 Hsing-Point Road Taoyuan City, 330457 Taiwan 886.3.3773588

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

DISCLAIMER: All statements, technical information and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. No statement or recommendation shall constitute a representation unless set forth in an agreement signed by officers of seller and manufacturer. NO WARRANTY OF MERCHANTABILITY, WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY IS MADE. The following warranty is made in lieu of such warranties and all other warranties, express, implied, or statutory. Products are warranted to be free from defects in material and workmanship at the time sold. The sole obligation of seller and manufacturer under this warranty shall be to replace any noncompliant product at the time sold. Under no circumstances shall manufacturer or seller be liable for any loss, damage or expense, direct, indirect, incidental or consequential, arising out of the inability to use the product. Notwithstanding the foregoing, if products are supplied in response to a customer request that specifies operating parameters beyond those stated above, or if products are used under conditions exceeding said parameters, the customer by acceptance or use thereof assumes all risk of product failure and of all direct, indirect, incidental and consequential damages that may result from use of the products under such conditions, and agrees to exonerate, indemnify, defend and hold harmless MacDermid, Incorporated and its affiliates therefrom. No suggestion for product use nor anything contained herein shall be construed as a recommendation to use any product in a manner that infringes any patent or other intellectual property rights, and seller and manufacturer assume no responsibility or liability for any such infringement.

© 2026 MacDermid, Inc. and its group of companies. All rights reserved. "(R)" and "TM" are registered trademarks or trademarks of MacDermid, Inc. and its group of companies in the United States and/or other countries.