

# Micromax™ 1728

## Electronic Inks and Pastes

### Series Resistors System HR Compositions

Micromax™ 17G-Series screen printable resistor compositions are specially formulated and tested for use on gold conductor terminations. These compositions range from 3  $\Omega$ /sq to 1 M $\Omega$ /sq. Each member is blendable with the adjacent members. There are no blend breaks. The length effects have been characterized for very small resistors.

### Product benefits

- Qualified and tested on Au conductor
- Excellent encapsulated and unencapsulated post laser trim stability after laser trimming and long term storage
- Optimised for 60 minute 850 °C firing profile
- Fully blendable resistor series
- Phthalate, Cadmium, Nickel oxide free\*

\* Phthalate, Cadmium and Nickel oxide 'free' as used herein means that cadmium, phthalate and nickel oxide are not intentional ingredients in and are not intentionally added to the referenced product. Trace amounts however may be present.

### Product information

Solvent or thinner	Micromax™ 4036
Blend member or series	17Gsrs

### Rheological properties

Viscosity	125 - 175 <sup>[1]</sup> Pa.s
[1]: Brookfield HAT, UC&SP, SC4-14/6R, 10 rpm, 25 °C $\pm$ 0.2 °C	

### Application technique

Mask mesh	200 <sup>[2]</sup>
Mask emulsion	12 - 18 <sup>[2]</sup> $\mu$ m
Drying time	10 - 15 min
Drying temperature	150 °C
Theoretical coverage	80 - 110 <sup>[3]</sup> cm <sup>2</sup> /g
Recommended film thickness, dried	22 - 28 $\mu$ m
Leveling time	$\geq$ 10 min

[2]: Screen Types: Stainless steel

[3]: based on wet thickness of 50 $\mu$ m

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### Electrical properties

Surface resistivity	900000 - mOhm per 1.1E6 <sup>[4]</sup> square
Hot Temperature Coefficient Resistance	-100 - 100 <sup>[5]</sup> ppm/K
Cold Temperature Coefficient Resistance	-100 - 100 <sup>[6]</sup> ppm/K
Noise	-13 <sup>[7]</sup> dB
Short Term Overload Voltage	75 <sup>[8]</sup> V/mm
Standard Working Voltage	30 <sup>[9]</sup> V/mm
Maximum Rated Power Dissipation	562 <sup>[10]</sup> m/(W.mm <sup>2</sup> )

[4]: Shipping specifications : Reported to Dried thickness 25µm. Fired on Micromax™ 5715 Au prefired termination. Resistor geometry : 1.5 mm x 1.5 mm. Firing : 60-min cycle to peak temperature of 850°C for 10 min. All tests performed on 96% alumina substrate.

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

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

[7]: resistor geometry : 1mm x 1mm; firing cycle : 60 min cycle to peak temperature of 850°C for 10 min

[8]: short term overload voltage : voltage required (5 sec duration) to induce a resistance change of 0.25% in a 1mm x 1mm trimmed resistor at 25°C

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

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

### Storage and stability

Shelf life	6 <sup>[11]</sup> months
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[11]: in unopened containers, from date of shipment, at temperature between 5-30°C

### Additional information

How to use

### Design & compatibility

#### • Compatibility

- Whilst Micromax™ has tested this composition with the materials specified above and the recommended processing conditions, it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layouts. It is therefore essential that customers thoroughly evaluate the material in their specific situations in order to completely satisfy themselves with the overall quality and suitability of the composition for its intended application(s).

### Processing

#### • Terminations

- Use of a different termination material may cause a shift of TCR and resistivity values from those stated.

#### • Blendability

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- Adjacent members of Micromax™ 17G-Series are blendable.
- **Substrates**
  - Substrates of different compositions and from various manufacturers may result in variations in performance properties.
- **Screen types**
  - 200 mesh stainless steel screen with a 12-18µm emulsion build up. Nylon or polyester screens may be used in some applications. A 150-175 mesh screen will usually be required to achieve equivalent print thickness.
  - Recommended dried thickness 25+/-3µm.
- **Printing**
  - The composition should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean burr-free spatula (flexible plastic or stainless steel) for about 1-2 minutes. Care must be taken to avoid air entrapment. Printing should be performed in a well ventilated area.
  - Note : Optimum printing characteristics are generally achieved in the room temperature range of 20°C - 23°C. It is therefore important that the material, in its container, is at the temperature prior to commencement of printing. Class 10,000 printing area is recommended for building complex hybrids and multilayer circuits, otherwise severe yield losses could occur.
- **Thinning**
  - Micromax™ 17G-Series compositions are optimized for screen printing and thinning is not normally required. Use the Micromax™ recommended thinner for slight adjustments to viscosity or to replace evaporation losses. The use of too much thinner or the use of a non-recommended thinner may affect the rheological behaviour of the material and its printing characteristics.
- **Drying**
  - Allow prints to level for over 10 minutes at room temperature, then dry for ≥ 10-15 minutes at 150°C.
  - Dry in a well ventilated oven or conveyor dryer.
- **Firing**
  - 850°C peak held for 10 minutes on 60 minute cycle in an air atmosphere. Micromax™ 17G-Series 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.
  - Fire in well ventilated belt, conveyor furnace or static furnace. Air flows and extraction rates should be optimized to ensure that oxidizing conditions exist within the muffle and that no exhaust gases enter the room.
- **Encapsulant**
  - In general, glass encapsulation is not required. However, in applications which require mechanical protection or protection

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from extreme environments such as high temperature nitrogen or forming gas, Micromax™ encapsulant compositions QQ550 and QQ620 are recommended.

- **Resistor geometry**

- Micromax™ 17G-Series compositions are quality Assured tested using a 1.5mm x 1.5mm resistor with prefired Micromax™ Au termination. Variations in resistor geometry will result in slight variations of resistivity and TCR values. Length effect curves are based on tests of 0.5-1.5 mm wide resistors varying in aspect ratio from 0.4 - 4.0sq.

### Properties

- All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications, details of which are available upon demand.

### General

Performance will depend to a large degree on care exercised in screen printing. Scrupulous care should be taken to keep the composition, printing screens and other tools free of metal contamination. Dust, lint and other particulate matter may also contribute to poor yields.

### Storage and shelf life

Containers may be stored in a clean, stable environment at room temperature (between 5°C – 30°C) with their lids tightly sealed. Storage in high temperature (>30°C) or in freezers (temperature <0°C) is NOT recommended as this could cause irreversible changes in the material. The shelf life of compositions in factory-sealed (unopened) containers between (5°C – 30°C) is 6 months from date of shipment.

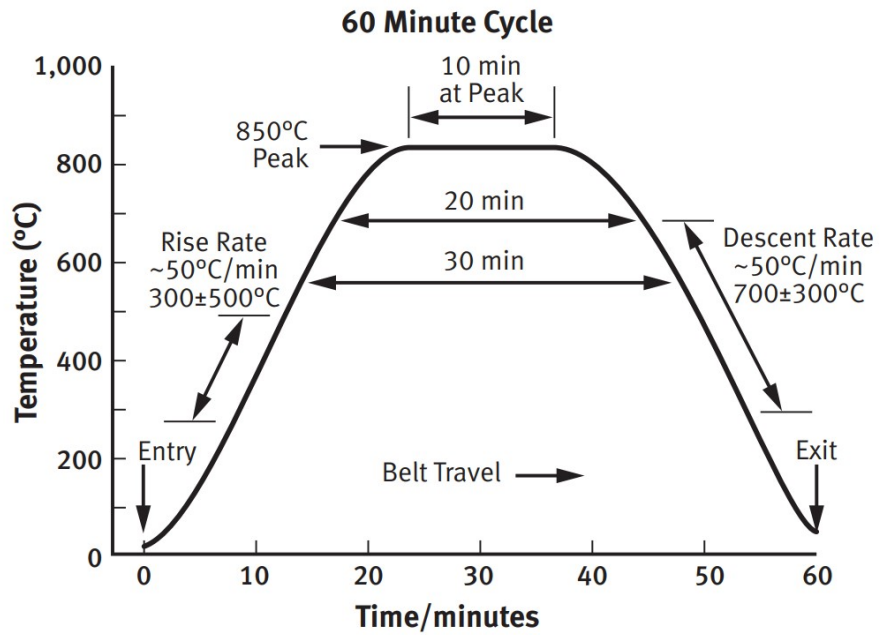
### Safety and handling

For safety and handling information pertaining to this product, read Safety Data Sheet (SDS).

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**Chart 1. Firing Profile**



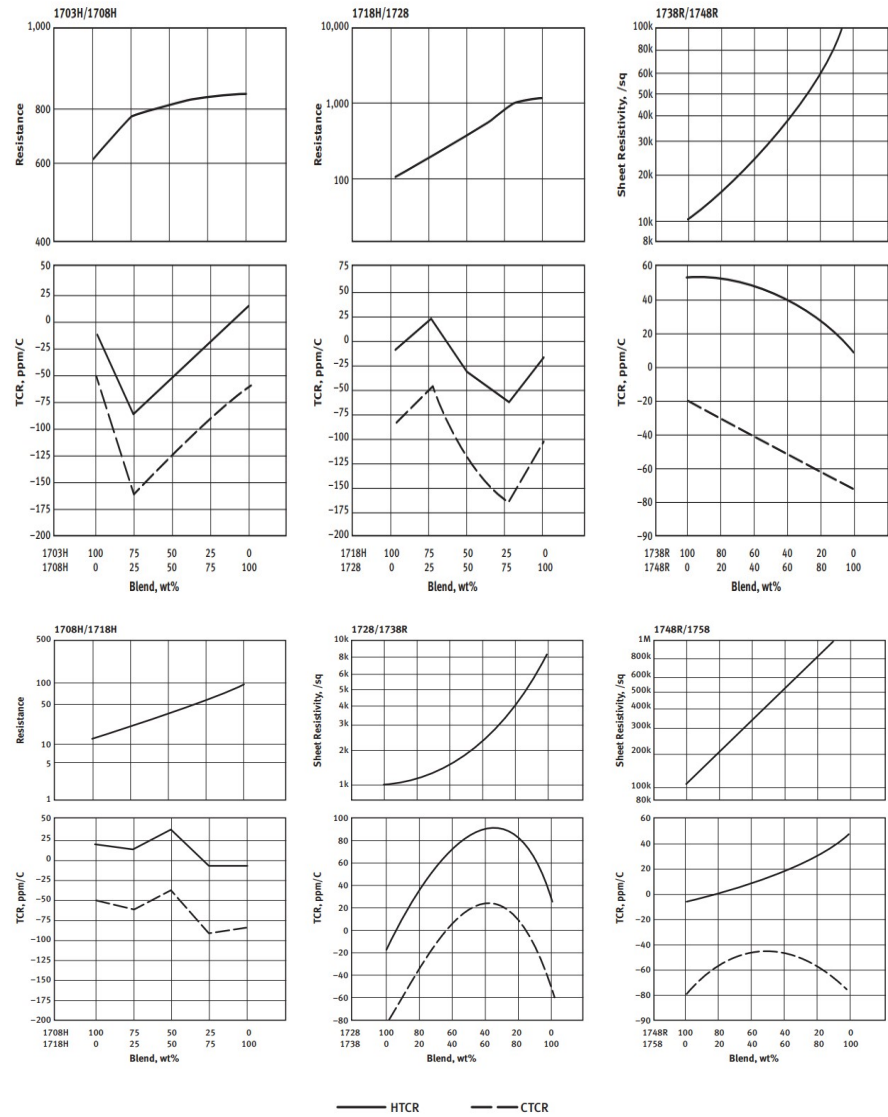
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**Figure 2. Blending Characteristics**

Adjacent members of 17G-Series are blendable. Resistivities and TCRs blend smoothly and predictably for all blend ratios.

The data required in these curves were generated using resistors terminated with prefired 5715 Au Conductor.



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**Figure 3. Length Effect Curves for Resistivity**

Data for the 0.5–4.0 sq resistors are reported for resistor widths of 0.5mm–1.5 mm. The 1.5 mm x 1.5 mm resistor was controlled to a dried thickness of 25µm. All of the resistivity data have been referenced to this resistor. Terminations are prefired 5715 Gold Conductor.

