

# Micromax™ PTC105L

## Electronic Inks and Pastes

### PTC Carbon Resistor

Micromax™ PTC105L Carbon-based PTC resistor can be used in self-regulating heating circuits that operate at <100 °C. The Positive Temperature Coefficient (PTC) of the cured film can be used to design circuits which heat up quickly to an equilibrium temperature and then stabilize at that temperature without external controls.

### Product benefits

- Self-thermostating temperature control
- Power reduction at operating temperature
- Fast warm-up to operating temperature
- Thermal stability at 100 °C for 24hrs
- Power on/off cycling stability - with rapid plateau
- Adhesive compatibility - wide range/choice available

### Product characteristics (Self-regulating features)

For heating / de-misting applications, the required heater resistance is designed around the approximate 7-10 KΩ/sq paste (at ~ 7.5 micron dried film thickness) by placing varying geometry resistors in series or parallel. Depending on the power applied and the ambient temperature when the circuit is powered up, it will rapidly heat and self-regulate at the designed operating temperature. At this point, a considerable increase in resistance will have occurred and a lower power consumption will result.

### Electrical Properties

Test	Properties
Sheet Resistivity	7.0-10.0 KΩ/sq
R Magnification Factor (25-105 °C)	8 - 10

Information in this datasheet shows anticipated typical physical properties for Micromax™ PTC105L based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.

### Product information

Solvent or thinner	Micromax™ 8199
Maximum Service Temperature	100 °C

### Rheological properties

Viscosity	27 - 33 <sup>[1]</sup> Pa.s
-----------	-----------------------------

[1]: Brookfield RVT, #14 spindle, 10 rpm, 25 °C

# Micromax™ PTC105L

## Electronic Inks and Pastes

### Application technique

Drying time	10 - 20 <sup>[2]</sup> min
Drying temperature	130 <sup>[2]</sup> °C
Recommended film thickness, dried	6 - 9 <sup>[3]</sup> µm
[2]: box oven	
[3]: 280 mesh stainless steel	

### Typical mechanical properties

Adhesion, pull tape	no material class transfer <sup>[4]</sup>
[4]: 3M Scotch Tape #600	

### Storage and stability

Shelf life	6 <sup>[5]</sup> months
[5]: in unopened containers, from date of shipment, at temperature <25 °C	

### Additional information

How to use

### Design & Compatibility

#### • Design

- While the chemical make-up of the Micromax™ composition PTC105L is patented by Celanese, it is advisable to check that specific designs and applications do not infringe on any other patents. Heater circuits typically consist of Micromax™ PTC105L carbon composition overprinted on a silver termination having inter-digitized tracks. The overprinted carbon composition forms a wide geometry resistor and the distance along the width (between the inter-digitized tracks) is generally used to target the final heater circuit resistance value. The gap (or spacing) between the silver tracks, determines the power density and consequently the heating characteristics of the circuit.

#### • Compatibility of adhesives

- If an adhesive is used directly over the PTC composition, it is essential that the compatibility of the adhesive is tested to ensure that the performance of the heater is not compromised by any adhesive interactions. Adhesive incompatibility may result in erratic / excessive resistance shifts and/or significant changes in PTC characteristics.

### Processing

#### • Applying Power

- When the heater circuit is powered, it will rapidly heat and self-regulate / equilibrate at a designated temperature. This equilibrium temperature is influenced primarily by a very large increase in circuit resistance, see Figure 1. This is non-linear and generally referred to as Resistance Magnification (or PTC effect).

# Micromax™ PTC105L

## Electronic Inks and Pastes

In addition, the equilibrium temperature can be altered by the design and more specifically, the spacing between the silver tracks. Temperature stability can be seen through to 200 cycles (Power on / off cycles) Micromax™, see Figure 2.

- **Terminations**
  - Micromax™ PE825, Micromax™ PE826, Micromax™ 5025, or Micromax™ 5065 polymer thick film silver inks.
- **Substrates**
  - 125µm print treated and heat stabilized polyester
- **Screen types**
  - Polyester, Stainless Steel
- **Printing**
  - Semi-automatic and manual printers.
  - 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 1-2 minutes. Care must be taken to avoid air en-trapment. Printing should be performed in a clean and 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 this temperature prior to commencement of printing. Avoid leaving paste on the screen for extended periods of inactivity.
  - Depending on the amount of paste on the screen and the number of parts to be printed, paste should be added to the screen routinely to prevent the paste from drying out.
- **Typical circuit line thickness**
  - 6 - 9 µm
- **Ink residence time on screen**
  - > 1 hour
- **Clean-up solvent**
  - Ethylene glycol diacetate
- **Drying**
  - Box oven : 130 °C for 10-20 minutes
  - Reel-to-reel : 140 °C for 2 minutes
  - Allow prints to level at room temperature, then dry in a well-ventilated oven or conveyor dryer.
- **Hysteresis effect**
  - After the removal of power from a heater circuit, the polymer PTC composition exhibits a hysteresis effect. This is basically a "time lag" in the circuits' ability to return to its original starting resistance. This does not affect the self-regulating performance but may result in erroneous resistance measurements.

### 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

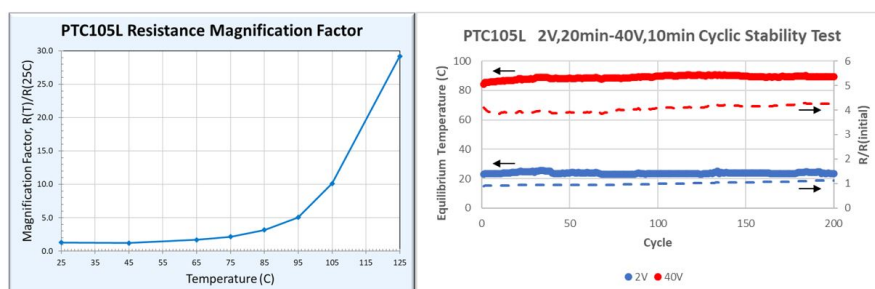
# Micromax™ PTC105L

## Electronic Inks and Pastes

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).



**NOTICE TO USERS:** Values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colourants or other additives may cause significant variations in data values. Properties of moulded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Other than those products expressly identified as medical grade (including by MT® product designation or otherwise), Celanese's products are not intended for use in medical or dental implants. Regardless of any such product designation, any determination of the suitability of a particular material and part design for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use. To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information. The information contained in this publication should not be construed as a promise or guarantee of specific properties of our products. It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist. We recommend that persons intending to rely on any recommendation or to use any equipment, processing technique or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards. We strongly recommend that users seek and adhere to the manufacturer's current instructions for handling each material they use, and entrust the handling of such material to adequately trained personnel only. Please call the telephone numbers listed for additional technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before attempting to process our products.

© 2025 Celanese or its affiliates. All rights reserved. Celanese®, registered C-ball design and all other trademarks identified herein with ®, TM, SM, unless otherwise noted, are trademarks of Celanese or its affiliates. Fortron is a registered trademark of Fortron Industries LLC.